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Eurofound

Labour market change

Employment effects of public innovation support measures

Employment effects of innovation support

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Abstract

The study explores the employment-related effects of innovation support measures for enterprises, including direct and indirect employment, impacts on working conditions, skills and competences, and the general welfare of employees.

While policy talks of promoting growth and job creation, the link between support for innovation and impacts on employment is usually not very explicit. An examination of 15 examples of typical innovation support measures across 10 European countries shows that they generally aim to create economic growth rather than employment specifically, though increases in employment are used as an indicator of growth. Some employment-related effects are identified, including improvements in skills and competences that result from the way measures are implemented.

The conclusions call for a more holistic approach to innovation support, taking all the inputs into economic growth and their interaction into account and especially developing the human dimension of innovation in measure design, monitoring and evaluation.

Contents

Table of acronyms

Acronym	Explanation
BERD	Business expenditure on research and development
CIS	Community Innovation Survey
C-M-O	Context-Mechanism-Outcome
ECEI	European Cluster Excellence Initiative
EEA	European Economic Area
ERDF	European Regional Development Fund
ESF	European Social Fund
ESIF	European Structural and Investment Funds
EU	European Union
FP7	Framework Programme 7
FTE	Full-time equivalent
GERD	Gross expenditure on research and development
HR	Human resources
ICT	Information and communication technology
IPR	Intellectual property rights
OECD	The Organisation for Economic Cooperation and Development
RCT	Randomised control trial
RoI	Return on investment
R&D	Research and development
R&I	Research and innovation
SMEs	Small and medium-sized enterprises
ZEW	Centre for European Research
Country-specific acronyms	
KTP	Knowledge Transfer Partnership (UK)
LGDK	Local Government Denmark (DK)
NEA	National survey on working conditions (NL)
NHS	National Health Service (UK)
SBRI	Small Business Research Initiative (UK)
SBIR	Small Business Innovation Research programme (USA)
SWSRC	Swedish Winter Sports Research Centre (SE)
WAFF	Vienna Employment Promotion Fund (AT)
WBSO	The Promotion of Research and Development Act (R&D tax credit - NL)

Executive Summary

Introduction

The study explores the employment-related effects of public and social partner based innovation support measures for enterprises. These include the generation of direct and indirect employment, but also impacts on working conditions, skills and competences, and the general welfare of employees.

In line with the definition included in the OECD *Glossary of statistical terms*, innovation is taken to mean 'the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations', although there is also consideration of social innovation.

As a basis for this exploration, specific support measures were examined, subject to the availability of evidence of their effects, particularly in evaluations. This was complemented by a literature review on innovation policies and by an investigation of the measures' context, mechanisms and outcomes. An assessment of the strength of evidence available for the selected measures accompanied the analysis.

The above led to the identification of the strengths and weaknesses of particular approaches to innovation support and the implications for the relationship between innovation instruments and their employment effects.

Policy context

The European Commission describes Europe 2020 as the 'EU's agenda for growth and jobs for the current decade'. Yet, the relationship between growth and jobs is not straightforward. Growth implies change, including change in the labour market, especially when growth results from improved competitiveness.

The literature suggests that economic growth can deliver both more and better jobs. Several sources find that in the long-term innovation and job creation go hand in hand. Even technological change and innovation can have a positive net impact on employment opportunities and working conditions, creating at least as many jobs as they destroy, often through increased demand and indirect effects along the supply chain.

Conversely, there are many examples in history of technological change leading to unfortunate social consequences. Furthermore, as innovation has taken increasingly diverse forms involving different business and marketing models, impacts on employment and working conditions have frequently arisen for reasons other than technological change. A broad conception of the changes taking place in the modern economy is thus required to understand the impacts of growth policy on employment.

Overall, the situation has been famously described by Joseph Schumpeter as one of 'creative destruction'. The benefits of growth and development incur the costs of disruption, which is part of processes leading to an efficient allocation of resources. In recent years, this concept has resurfaced in references made to 'disruptive technologies' that threaten or displace established business practices.

Ostensibly, EU and national policies aim to address these threats and other negative employment effects. The Europe 2020 strategy sees innovation as important for creating jobs and keeping the European economy competitive. However, policy initiatives do not make an explicit link between innovation policies, employment and working conditions and in the design of major EU interventions promoting innovation - Horizon 2020 and the Structural and Investment Funds - the employment dimension is only partially represented.

Public policy aims to increase the welfare of citizens and this is usually taken to imply a focus on economic growth. Growth theory often refers to an aggregate production function, where labour, capital and technology are considered to be inputs and national production the dependent variable. Employment is an input into a production process, not an output. The relationship between innovation and employment therefore is that between two inputs into another process.

Equally, focusing on just one of the inputs and its relationship to production and growth is only a partial analysis and can lead to unbalanced policies.

Key findings

15 measures have been considered from 10 countries (Austria, Denmark, Estonia, France, Germany, Italy, the Netherlands, Poland, Sweden and the United Kingdom), including 'Innovation Leaders', 'Strong Innovators' and 'Moderate Innovators' in the categories used by the European Innovation Scoreboard.

Measures were identified at three different levels: support for individual enterprises, support for enterprises working with other enterprises or partners such as knowledge institutions, and strategic measures. Examples include tax credits and grants for start-ups, growth-orientated business support services, measures to encourage interaction between enterprises and knowledge centres, an example of a smart specialisation strategy and a demand-side measure making use of procurement for innovation.

The key findings in relation to each measure show that:

- Innovation measures do not generally aim to create employment as main objective.
- Evaluation culture differs across countries but it is rare for evaluations of innovation measures to assess the employment dimension in any depth.
- Some measures, however, do monitor aspects of employment, such as the age of employees and gender balance.
- The main effect identified is on direct employment, though this is often because increases in employment in enterprises are seen as an indicator of economic growth more generally.
- Some better quality jobs are definitely created for highly-skilled staff or result from innovation support, but it is not clear what happens to other employees in the firm.
- There is much less evidence on wider working conditions, wages, work-life balance or certifiable skills development, nor do the evaluations attempt to assess the sustainability of the employment created.
- A major employment-related feature of most measures – the development of skills and competences as part of the delivery processes – gets little attention, neither in policy design nor in assessments, mainly because policy implementation mechanisms are often not considered in evaluations, which focus on objectives and outcomes.
- Overall, there is a neglect of the human dimension in innovation policy, which undermines its effectiveness.

Conclusions and policy pointers

It is necessary for innovation policy to develop a more holistic approach, taking all the inputs into economic growth and their interactions more explicitly into account.

This would include greater attention to the 'human dimension' of innovation, which starts with the knowledge input into product and process innovation, but also includes the development of skills and competences, to further develop and implement ideas and achieve commercial success.

Certain aspects of the measures considered represent relevant ways to adopt this broader conception of innovation processes. Examples include a German measure that aims to change employment relations in firms, while creating a workforce ready to meet economic change and contribute to innovation, and an Austrian measure that ensures a better gender balance in knowledge centres while also making innovation processes more efficient.

Evaluation of innovation measures could be improved by balancing the heavy focus on assessing the effectiveness and efficiency of a measure with attention to wider aspects, such as its coherence and relevance to the needs of enterprises

Introduction

An intrinsic element of the EU's growth strategy, since the launch of the Lisbon agenda in the year 2000, has been the creation of 'more and better jobs'. The implications of this commitment became even more significant with the onset of the severe crisis for the European economy in 2008. The current strategy, Europe 2020, describes itself as:

> *'A strategy to help us come out stronger from the crisis and turn the EU into a smart, sustainable and inclusive economy delivering high levels of employment, productivity and social cohesion'.*

The European Commission refers to Europe 2020 as the 'EU's agenda for growth and jobs for the current decade'. Yet, the relationship between growth and jobs is not straightforward. Growth implies change, including in the labour market, especially when growth results from improved competitiveness. To achieve this, changes are required in the nature of the products and services offered on the market or in the efficiency of the processes for producing and selling them. In other words, this form of growth requires innovation. It is not surprising therefore that a major part of the growth strategy at EU and national levels is concerned with the promotion of innovation, which inevitably leads to changes in employment. Especially when this involves technological developments and innovation in business practices, the changes can lead to a displacement of labour.

There is, however, another side to this story. Economic growth can deliver both more and better jobs. OECD (2010a), for instance, finds that in the long-term innovation and job creation go hand in hand. Even technological change and innovation can have a positive net impact on employment opportunities and working conditions, often through increased demand and indirect effects along the supply chain. The reduced costs resulting from greater efficiency generally lead to cheaper prices, expanding the market and creating further demand for goods and services which in turn leads to increased employment – replacing the jobs that may have been lost, or potentially increasing the number of employees. Furthermore, a decrease in commodity prices should enable workers to have access to products which may previously have been outside of their price range, thus potentially increasing their quality of life.

The indirect effects of innovation can also be very large (Eurofound, 2017). If an area becomes well known as a forerunner in a particular technology, for example, this can create a burst of activity locally in the form of start-ups, spin-offs and competitors. This will often help to attract further investment, leading to a positive spiral of growth and employment opportunities along the supply chain. Furthermore, the wealth that is generated is often spent locally, providing a boost to local shops and service industries. This can add to the attractiveness of a region and have further beneficial economic and social effects on the area, by attracting more social investment, leading to an upgrading of education, health and care facilities and improving living conditions.

On the other hand, there are many examples in the history of technological change leading to unfortunate social consequences. The invention of the printing press in 1436 displaced skilled human labour and threatened to create 'technological unemployment'. During the industrial revolution in England, in the early 19th century, attacks on machines by 'Luddites' became notorious, but were driven by the fear that technological advances would lead to a decrease in jobs for skilled labourers. In 1821, the economist David Ricardo appeared to support this view, stating in the third edition of his work *On the Principles of Political Economy and Taxation* that '…the substitution of machinery for human labour, is often very injurious to the interests of the class of labourers.' This conclusion was based on the observation that a simple displacement of labour means that fewer workers are required; and that the increased competition for jobs results in a bidding war which leads to decreased wages.

As pointed out in Humphrey (2004), Ricardo's model of machinery can easily be applied to the contemporary situation: the IT revolution has led to numerous innovations in the modern workforce, one of which is the capacity for certain employees to work from anywhere as long as they have access to a phone line and a computer. This has led to a significant outsourcing of specific jobs/tasks to countries where wages and associated costs are lower, causing fears of significant job loss and economic decline across Europe. The rise of robotics in recent years has generated further employment-related fears. A recent report by the National Bureau of Economic Research in the USA (Acemoglu and Restrepo, 2017), analysing the impact of industrial robot usage on US labour markets

between 1990 and 2007, found that robots had been responsible for the loss of some 670,000 manufacturing jobs (around 3%) over that time period.

Furthermore, as innovation has taken increasingly diverse forms, especially involving different business and marketing models, impacts on employment and working conditions have frequently arisen for reasons other than technological change. Understanding the impacts of growth policy on employment consequently requires a broad conception of the range of the changes taking place in the modern economy.

An important consideration in assessing the overall impacts of growth and innovation on employment and working conditions, and the opposing tendencies just referred to, is the time period over which the changes are considered. Where innovation and change have negative effects on employment and employment conditions, the tendency is for these to occur at an early stage in the process, with the more positive direct and indirect impacts emerging over the longer time frame. The beneficiaries of the positive longer-term effects are not necessarily the same as those suffering the earlier adverse effects and this can give rise to social tensions. There is also an argument that the initial effects are more dramatic in that they can occur precipitously in contrast to the subsequent benefits which can be felt over a longer period. The turmoil involved in the changes taking place should therefore not be underestimated.

Overall the situation has been famously described by Joseph Schumpeter (1942) as one of 'creative destruction', an inevitable feature of capitalist economies. The benefits of growth and development come at a cost of a certain amount of disruption, which is part of the processes leading to an efficient allocation of resources. In recent years, this concept has resurfaced in the references made to 'disruptive technologies' that threaten or displace established business practices.

The term 'disruptive innovation' was first coined by Joseph Bowyer and Clayton Christensen in 1995. Disruptors are able to target underserviced areas that are overlooked by better established businesses, which tend to focus on improving products and services for their most demanding customers. After gaining a foothold in these niche areas, disruptors begin to expand their offering to a more mainstream customer base. Once these new technologies are adopted in volume, a disruption can be said to have occurred (Christensen, 2015). According to Christensen, the main difference between 'sustaining' and 'disrupting' innovations is the initial inferiority of the new technology. This means that a disruptive innovation is not an 'upgrade' of an existing service, but rather the creation of something new to meet an overlooked demand. Examples of successful disruptive technologies include the iPhone (which led to the replacement of laptops with smartphones as people's main access point for internet usage) and Netflix (which displaced traditional movie rental businesses in favour of online streaming).

The extent of the disruption, however, strongly depends on the existence and form of the policy initiatives that are pursued - both in the design of policies promoting change and in the number and effectiveness of policies that involve mitigating measures.

The EU's New Skills Agenda, announced in 2016, aims to provide a clear link between employment, innovation and a strong economy and sets out 10 actions to address different aspects of skills development. As part of its orientation, it recognises that:

> *'Skill acquisition and development are essential for the performance and modernisation of labour markets in order to provide new forms of flexibility and security for job seekers, employees, and employers alike'.*

The policy of enhancing both 'flexibility and security' in the labour market as a way of reconciling employers' need for a flexible workforce with workers' need for security and confidence that they will not face long periods of unemployment is referred to as 'flexicurity' and has long been a feature of the 'European Employment Strategy' and its employment guidelines. It represents an active way of mitigating turmoil in the labour market as a result of industrial change through active programmes of skill acquisition and development.

The current study presents a different perspective on some of the same issues. It aims to examine how measures intended to promote innovation in enterprises, that are offered by public and social partner organisations in Europe, also promote employment and the development or improvement of employment-related conditions, such as skills and competences, working conditions and the general

welfare of employees. By analysing the rationale and effectiveness of these support measures and providing information to policymakers on how public funds can be best spent to improve innovation support in Europe and the labour market situation that they create, further insights can be provided into processes that are at the heart of the European growth strategy.

Overall approach and methodology

The overall approach of the study

This section will first explain the shape of the study presented in these pages, what it aims to achieve, the nature of the investigations that support its findings and the way these findings are presented. It will then consider key concepts for the conduct of the study, notably the role of innovation in the contemporary economy and its relationship to employment and the labour market. This includes aspects such as the development of skills and competences and working conditions.

The elements of the study

The general objective of the study is to explore the effectiveness and efficiency of different types of public or social partner-based innovation support measures for enterprises, in terms of their employment and employment-related effects (such as working conditions), differentiating between short- and long-term effects and sustainability.

Addressing this general objective has involved the examination of an array of specific support measures, with a concentration on those where evaluation and performance-related evidence exists. Some instruments that have not been evaluated but that are deemed especially relevant from an employment perspective and have other information available, such as systematic monitoring, were also considered.

The selection of the 15 measures represents most aspects of the main forms of innovation support across Europe. Annex II provides the descriptions of the measures, setting out their characteristics, their employment effects, the relationship between the type of innovation support and employment effects and the quality of the evidence in terms of the evaluation and other material available and the methodology adopted.

The measures selected provide support to 'enterprises', using the EU definition of this term:

> *'An enterprise is any entity, regardless of its legal form, engaged in economic activities, including particular entities engaged in a craft activity and other activities on an individual or family basis, partnerships or associations regularly engaged in economic activities' (European Commission, 2003).*

The word 'firm' is used throughout the text as a synonym for 'enterprise', but the word 'company' is used in the narrower sense, as in English legal usage (Davies, 1997), for an association of people carrying on business as a corporate entity with its own legal identity and usually with limited liability. Around half of enterprises in the EU are not companies in this sense (CSES, 2008). They are sole proprietorships or partnerships or equivalent and are subject to a different tax regime from companies. The distinction is of some consequence in the current study, since a number of the measures considered are only available to companies in the narrow sense, or have different provisions for enterprises that are not companies.

A number of strong common themes have emerged from the examination of the individual measures with important policy implications for the pursuit of growth and innovation and the human dimension of these processes. Additional consideration is therefore given to these themes and to the main drivers and obstacles to policy effectiveness identified. The strengths and weaknesses of particular approaches are highlighted and the implications set out for improving the relationship between innovation instruments and their employment effects. This comparative analysis of the measures and their employment effects provides an important context for a consideration on how to best generate positive employment effects through innovation support measures for enterprises.

It should be noted, however, that there has not been an exhaustive mapping of all available instruments or evaluations, but rather an attempt has been made to capture, in an exploratory exercise, the diversity of innovation support approaches and to identify relevant instruments that have been evaluated. The instruments examined are of various types and address employment and related issues in very different ways. This diversity in scope and outcome will help provide a rich picture of how support measures relate to employment creation and the improvement of employment-related conditions that will be seen to be representative of the main instruments used in support of innovation.

The key concepts: Innovation and employment

While innovation in some circumstances may lead to the creation of new employment, in others it may lead to job destruction, especially in the shorter term and where technology substitutes human labour. Promoting innovation as such does not necessarily lead to employment creation. Consequently, it cannot always be assumed that any particular measure promoting innovation will automatically lead to more jobs and/or better working conditions.

At an early stage of the study, thought was given to characterising the general relationship between innovation and employment.

First of all, it is important to locate both innovation and employment in the economic processes that are the object of public policy. The latter ultimately aims to increase the welfare of citizens and, in the case of economic welfare, this is usually taken to imply a focus on economic growth. Discussion of growth theory often involves reference to an aggregate production function, which shows the relationship between labour, capital and technology as inputs and national production as the dependent variable. Explanation of this relationship in economic textbooks often makes reference still to the Cobb-Douglas production function (Cobb and Douglas, 1928), which in its most general expression has the following form:

$Y = AL^{\beta}K^{\alpha}$, where:

Y = total production (the real value of all goods produced in a year).

L = labour input (the total number of person-hours worked in a year).

K = capital input (the real value of all machinery, equipment, and buildings).

α and β are the output elasticities of capital and labour, respectively. These are constants determined by the technology available at any point in time.

A is the portion of output not explained by the inputs of labour and capital used in production. It can be interpreted as the expression of the impacts of longer-run technological change, that is, the results of innovation.

In the equation, output, labour and capital are expressed in value terms. Total production, for instance, is the value of national output rather than the physical amount. Also, the equation can be interpreted as showing the interaction of the inputs labour, capital and technology in determining output. Rather than adding separately to the value of output, an increase in one of the inputs is multiplied by the given value of the other inputs.

Economic growth (which may be negative) is simply the change in the value of output (Y). All uses of the term 'growth' throughout the study refer to this change in the value of economic output.

Subsequent debates on growth theory within the mainstream neoclassical school of economic thought often concerned the role of technology (and hence innovation) in the determination of output. The Solow-Swan model (Solow, 1956; Swan, 1956) gave a more explicit role for technological change, but took it as a given, determined exogenously by non-economic factors. Nonetheless, it was still seen as an input, like labour, into the production process.

Further work, beginning with that of Arrow (1962) and Romer (1986) started to develop models in which technological change was endogenous and closely related to investment in human capital and knowledge development. These theories also tended to emphasise the significance of policy measures for growth, especially those designed to encourage research and innovation.

As with theories derived from the Schumpeterian tradition, which tend to see economic growth processes in a much more dynamic way than the equilibrium models of neo-classical economics did, the above indicates that development processes, as opposed to simply the quantity of inputs, are much more significant than the earlier models indicate. Behind the 'black box' equations there are other processes at work that are necessary to understand. Basic points to be taken from growth theory in economics, therefore, are that:

- Employment or rather labour is an input into a production process leading to outputs in the form of the goods and services consumed in a market economy. Employment cannot be regarded simply as another output of the production process.
- Similarly, technological change, or more broadly innovation, is also an input into the production process.
- The relationship between innovation and employment is that between two inputs into another process.
- Talking of innovation 'creating' or 'destroying' employment is therefore a misconception or at least a gross simplification.
- Equally, especially in a modern economy, attempts to focus on only one of the inputs and its relationship to production and growth can easily be misconceived and, if used as the basis for policy, lead to less than satisfactory outcomes.

A fuller explanation requires an understanding of the processes that transform inputs into outputs. This is relevant for the purposes of modelling the relationships and changes observed, but similar considerations apply when assessing the effectiveness and efficiency of policy interventions designed to influence the outcomes. The results of the reflection on lessons from economic theory for the study also have implications for the methodology adopted.

First, however, further clarifications are needed on the concept of innovation that has been applied in the study. Conceptions of innovation have evolved, especially over the past 15 years or so. Traditionally, innovation was seen as the application of an invention and this gave rise to the technology-push model of innovation. Here, the driving force of innovation is seen to be technological developments that spring from the ideas of inventors or research and development (R&D) and then are developed by firms and to find a place in the market. This conception of innovation is implicit in the early formulation of the production function referred to above. It is essentially linear and unidirectional and, as the term suggests, relies upon developments in technology pushing through changes in the way that production takes place.

Technology-push theories are implicit in the concept of the product life cycle in marketing theory, which envisages a progression from pre-commercial R&D, prototype development and market launch (Karlson, 1988), through four market stages of market development, growth, maturity and decline (Levitt, 1965), to the beginning of a new cycle arising from further R&D. This, too, is essentially a linear model of development.

In an article published in the Harvard Business Review in 1965, Joseph Levitt suggested that, by targeting innovation at different stages of the product life cycle, businesses can 'stretch' the period between product creation and obsolescence. These life cycle stretching activities are essentially marketing and process innovations and involve creating more frequent usage or developing more varied usage among current users, attracting new users, and finding new uses for the basic 'materials'.

All technology push models tend to ignore the importance of the demand side or see market demand as something to be manipulated. However, there is a high attrition rate at the R&D stage and many research products never become marketable goods. Much research never makes it to the market development phase and, even if it does, the chances of a new product eventually being successful are limited. The financial and reputational risks associated with bringing a new product to market often push enterprises towards replication and adaptation of existing products rather than development of new ones.

An alternative to the supply-oriented 'technology-push' model is that of demand-pull, which sees innovation as arising in response to a variety of demand factors, including social and personal needs, as long as these are backed by effective purchasing power. However, this account, too, is overly simplistic, although in the opposite direction.

Realistic models of innovation need to take into account the interaction between the demand and supply sides. Douthwaite (2002) suggested that, especially for novel products and systems, the best approach is a 'codevelopment' model, in which R&D teams develop a product or technology through active relationships with potential users. This need for the interaction of product developers and users

became more apparent with the growing pervasiveness of information technology, where capturing information about a user's experience became a common feature of software systems; and even more so when information technology firms started to encourage their users to develop applications ('apps') using their core technology. Increasingly the talk was of 'open innovation', where barriers to interaction with users were removed as enterprises realised that there were gains from an open exchange of information in which competition and cooperation are combined. At the same time, it became more evident that traditional models of innovation, based on manufacturing, were less relevant when 70% of OECD economies were made up of the service sector (OECD, 2005a). A string of successful businesses based on new ways of marketing coffee, cosmetics and fashion highlighted the innovation that was possible in marketing and promotion. These were often associated with new business models, especially those that became possible through the new ways of organising businesses and generating income as a result of developments in information and communications technology.

This pointed not only to extending the characterisation of innovation, at least to include marketing and organisational innovation as well as product and process innovation. It also encouraged a more fluid conception of what constituted innovation and how the various actors involved interacted in making it happen. A linear model of innovation no longer appeared to describe the process adequately.

One of the consequences of a move away from a conception of innovation based on technological determinism is that greater attention is paid to business processes, including developments within firms affecting relations between staff and the significance of skills and competences. The human resource dimension of innovation has come to have a greater prominence. As Makó et al (2016) have suggested, a science-based linear approach to innovation may still be relevant in the creation of products or processes that are radically new. However, when incremental innovations are important, an activity-based interpretation of innovation is seen as more relevant, involving a recursive process built on the everyday practice of organisations, with continuous learning processes and cooperative social relations that ensure the necessary flow of information and knowledge. Jackson (2011) speaks of an 'innovation ecosystem' involving a range of external partners. Within the enterprise, however, a range of 'high-involvement practices' are needed, such as good management-employee relationships, employee-driven innovation, and autonomous working teams that impact both on firm productivity and the quality of working life (Makó et al, 2016).

At the same time, interactions between innovation and the policy environment are complex. Cunningham et al (2013) discuss the concept of the policy mix and the role of different policy domains in shaping innovation support. Although these include the policy remits of technology and labour, the policy mix affecting innovation also goes beyond these spheres. Thus, innovation activities are shaped by underlying policy agendas and rationales, the targets (actors, processes) and the instruments employed. Furthermore, instruments interact over time, both within and across policy domains (issues), policy spaces (actors) and geographical areas (levels). The report distinguishes between the interactions of policies and mixes on the one hand and the deliberate design and implementation of instrument mixes on the other (for example, instruments to encourage employment and instruments to support research and innovation - R&I). It also discusses the phenomenon of path dependency – how past policy developments and national policy styles help shape the development of policy mixes. The concept of the policy mix highlights the complexity of innovation outcomes, which again suggests the need to go beyond an input-output model and to address the 'black box' questions. Notably, the conclusion is that their 'systematic search in both literature databases and specialised evaluation and innovation policy databases reveals a rather thin base of evidence regarding deliberate policy mix design and intended or unintended interactions between instruments' (Cunningham et al, 2013, p. IV).

More recent conceptions of innovation are therefore highly relevant for the current study, since the impact of innovation on employment can be significantly affected by the type of innovation and by factors influencing the way support policy is framed. In order to reflect these developments, a modern definition referring to them has been used.

In its Glossary of statistical terms (OECD, 2005b), the OECD defines innovation as follows:

'An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations.'

This captures the developments in the aspects of innovation that have been highlighted in recent years, involving four types of innovation:

- Product innovation - the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended use.
- Process innovation - the deployment of new or improved manufacturing and/or processing techniques within factories and/or delivery methods, to complement or replace existing systems and technologies. This includes significant changes in techniques, equipment and/or software.
- Marketing innovation - the introduction of a new marketing concept, strategy or method, involving significant changes in product design or packaging, product placement, product promotion or pricing.
- Organisational innovation - the implementation of a new organisational method in the firm's business practices, workplace organisation or external relations, including but not restricted to structural change, procedural change, knowledge management and relations with parties external to the firm.

These elements are the standard types of innovation set out in the latest version of the widely-recognised Oslo Manual definition, which was developed by the OECD and Eurostat (2005) to facilitate innovation policy development around the world.

More recently, social innovation has achieved a higher profile and is actively recognised in the main European level programmes for encouraging innovation (Horizon 2020 and the European Structural and Investment Funds). Social innovation refers to bottom-up innovation processes by communities or social groups jointly finding new ways to address their problems and opportunities. This broader context for the study has been judged to be helpful, as indeed has recognition of other dimensions, such as demand-side innovation processes, which include procurement policy specifically designed to encourage innovation.

In this characterisation, an innovation does not have to be completely original, in contrast to an 'invention'. It just has to be new to the situation under consideration. In the context of the study, this will often mean that the change is new to the enterprise being supported but not necessarily to the market. This is in line with the definition of innovation used in the Community Innovation Survey - CIS.

These developments in how innovation is conceived are reflected in varying degrees in innovation policy at both European and national levels and in the individual measures under investigation this consideration is an important element in the policy context shaping their design. This issue, therefore, needs to be considered in more detail, looking at some of the parallel developments in the overall thinking on the design of innovation support measures and business support. However, innovation policy is central to the examination of specific measures and consequently it will be covered in the first parts of the chapter on the instruments and their main characteristics.

The study's methodology

Country selection

A selection of 10 EU Member States was suggested as a basis for investigation, in order to capture diversity in approaches, while being manageable in terms of the scope of the study.

A series of criteria was applied in the country selection:

- Include countries with differing proportions of GERD (Gross expenditure on Research and Development).

- Select countries to reflect the relative numbers in each of the categories of the European Innovation Scoreboard ('Innovation Leaders', 'Strong Innovators', 'Moderate Innovators' and 'Modest Innovators').
- Favour countries within each category with relatively high scores in employment-related indicators in the European Innovation Scoreboard (for example, 'Employment in fast-growing enterprises').
- Include countries with innovative approaches to innovation support.
- Ensure an even geographical distribution across Europe, with as broad a base as possible (large and small countries and including EU Member States and EEA countries).
- Take into account similarity in institutional arrangements and innovation culture (country groups).
- Give preference to countries with a good evidence base – particularly in the form of evaluation reports.

On this basis, a systematic analysis was conducted of the situation in each EU Member State and Norway, making use of the European Innovation Scoreboard 2016 and 2017 (European Commission, 2016c and 2017), since there had been changes in the way that the Scoreboard is constructed. During this investigation, it emerged that the varying strength of evaluation evidence was an important consideration, and that countries with a strong innovation performance showed a greater extent and sophistication of evaluation evidence as well as more developed innovation support systems.

The countries selected as a result of this process were: Austria, Denmark, Estonia, France, Germany, Italy, the Netherlands, Poland, Sweden and the United Kingdom.

The rationale for this selection is as follows:

Table 1: Country selection rationale

Criterion	Result
Differing proportions of GERD (Gross expenditure on Research and Development)	The general tendency has been to select countries with high GERD values, so to ensure that countries with a relatively strong investment in R&D are included.
Reflect the relative numbers in each of the categories of the European Innovation Scoreboard	Countries in each of the three main categories have been selected, but with a bias towards 'innovation leaders'. It was decided not to include 'modest innovators'.
Relatively high scores in employment-related indicators in the European Innovation Scoreboard	This indicator proved to be less helpful than anticipated. It relates to a relatively small proportion of total employment and there is a wide and difficult-to-explain variation between countries.
Countries with innovative approaches to innovation support	Countries with a strong track record of innovation support have been given priority[1].
An even geographical distribution across Europe	While early discussion suggested a move away from this criterion towards an emphasis on innovation performance, there are still countries from all the main country groups. Furthermore nearly 70% of the EU population is represented.
Similarity in institutional arrangements and innovation culture (country groups)	There is a concentration on countries with a strong innovation culture, but the main country groups are still represented.

[1] This relied to a large extent on work CSES carried out on the development of research and innovation policy since 2000 for the European Commission - DG RTD.

Criterion	Result
Preference to countries with a good evidence base – particularly in the form of evaluation reports	Considerable emphasis has been placed on this criterion and predominantly countries with the strongest evidence base have been selected, so to ensure availability and access to information on the measures' effectiveness.

Source: Authors

In the initial stages of the assignment thought was also given to the possibility to develop categories, based on country groups or clusters that had similar characteristics, in order to make generalisation of the results of the study easier and more convincing. The idea was to reflect similarities and contrasts in the institutional arrangements, general approaches to innovation support and general policy orientations among different countries. However, although there are distinctive approaches adopted by Nordic countries and there might be a case for talking about an Anglo-Celtic model, and there are clearly some similarities in the approach to innovation being adopted in Eastern Europe, the nature of differences between France and Germany and Mediterranean countries are not that clear cut and strongly depends on which characteristic is given most emphasis. Furthermore, the differences within countries are often greater than those between countries. It was concluded, therefore, that such a categorisation would not add significantly to the distinctions already adopted, notably in the Innovation Union Scoreboard, where the differences relate to innovation achievements.

Evaluation evidence

An appropriate evaluation methodology is needed to address the role of innovation and employment in growth theory, particularly since it is important to go beyond considering the relationship between inputs and outputs to examine the processes whereby the inputs interact with each other. Similarly, at policy level, it is important to explain not only the nature of the measures' impacts, but also how they were generated. An analysis of processes was therefore seen as key to explain how measures work and also to assess the evidence on their effects.

The intention was that the study should be 'inspired' by theory-based approaches, and especially the realist methodology of Pawson and Tilley (2004). The aim was not to conduct a full theory-based evaluation of all the measures under consideration, but rather to use the realist approach in both the analysis of measures and in a meta-evaluation of the available assessments of the instruments concerned. The approach adopted by theory-based evaluations could help shape the enquiries that were to be undertaken and, in particular, inform the theoretical framework to be developed in advance of the data collection.

As a first element, the theory-based approach puts an emphasis on how the various interventions under consideration are conceived – what did the originators of measures think they were trying to achieve and how did they envisage this happening? Secondly, there needs to be an acknowledgment that context plays a key role in determining the shape of the instrument and its effectiveness and thirdly, there is an insistence that it is necessary to open up the black box that obscures the relationship between the objectives of policy instruments and their effects. This means spelling out how measures actually work, specifying the 'mechanisms' of implementation and relating them to the objectives of the measures, the existing context and the expected and real outcomes.

As a result, in line with the realist approach, the analysis has made use of Context-Mechanism-Outcome (CMO) configurations, whereby:

- 'Context' means the mix of external conditions under which an intervention operates that are relevant to the operation of the intervention's mechanisms. These features include socio-economic policies and systems, institutional settings and cultural frameworks.

  The term 'context' also implies that interventions are deployed in an already busy (and interacting) environment. As a consequence of this interaction, policymakers' decisions regarding designing and deploying new activities are affected by the interventions that already exist. New instruments deployed can in turn counteract or enhance existing instruments.

- 'Mechanisms' are changes in the regular patterns of socio-economic behaviour triggered by the public intervention under examination that lead to observed outcomes.
- 'Outcomes' are the effects generated by the interaction between the programme's mechanisms and contextual conditions.

The **context** of innovation support measures refers to the institutional arrangements within which measures are developed, including the political tensions, the general economic situation and, particularly, the way that the labour market functions. The background culture of a country or region can relate to the openness of enterprises and the population to developing innovation, the image of creativeness and innovation and the adaptability and openness to change of the workforce, among other considerations. Finally, the context can also include the way that information about innovation is made available and exchanged (the media, educations systems, online coverage etc.).

Spelling out the **mechanisms** by which measures are implemented and generate outcomes is the second distinctive aspect of realist methodology. Essentially, the analysis needs to describe how the initiatives are intended to work and how they actually work. This involves examining both explicit accounts of the intended implementation mechanisms and often also some of the implicit assumptions in the mechanism design, plus explaining how the initiative works in practice.

This analysis has to take into consideration the complexity of the design of support measures, especially in terms of the way they interact with each other. Some measures, such as tax credits, are conceived as stand alone, but most measures - especially those developed in recent times such as smart specialisation – have a composite nature. This had to be explored, including how the different parts interacted with each other or form part of a comprehensive (usually national) support system – where measures are presented together as packages among which enterprise clients make use of the most appropriate.

The initial approach to this complexity - also seeking to ensure a good coverage of the different types of innovation support - was to propose a general typology of measures. These were based on a mapping of innovation support measures carried out by the Network of Eurofound Correspondents as well as on the research team's experience. This initial characterisation attempted to take into account different levels of complexity and sophistication in the design of innovation support measures and also how the more complex measures interact with each other. Similarly, it aimed to offer a framework for the researchers, initially to identify relevant measures and subsequently to help structure the explanation of the mechanisms for delivering the intended outcomes. This characterisation would be an initial hypothesis that could be tested against the measures identified and refined as the study progressed.

Developing the last concept in the CMO configuration focused on achieving a common understanding around **outcomes**, including assessing their scope and magnitude, by making reference to an appropriate range of indicators.

These would serve as a list of types of effects that might arise – an important guidance for the revision of the evaluations identified. Inevitably, large gaps were to be anticipated in terms of the extent of the evidence on the impacts on employment and employment-related outcomes.

The potential effects were grouped in the following broad categories:

- **Employment** – covering outcomes relating to new and retained jobs (direct and indirect), in the short and long-term.
- **Economic** – covering changes in productivity, value-added, turnover etc.
- **Knowledge, skills and capacities** – covering outcomes pertaining to changes in employee know-how and skills and associated changes in firm capacity.
- **Labour mobility** – focusing on knowledge transfer between firms and other partners.
- **Working conditions** – covering changes in the overall workplace environment, including work intensity and hours worked, employee roles and responsibilities, gender balance.
- **Welfare** – focusing on outcomes relevant to employees' health and wellbeing and economic and social standing.

More specific indicators distinguishing between firm, meso and macroeconomic levels and between the shorter and longer-run were elaborated under each heading. Preliminary indicators were then developed – maintaining the same bundling of outcomes – for measuring longer-term outcomes (impacts), approximately corresponding to 5+ years. This generated the following list of indicative indicators for measuring longer-term impacts, using the start of the supported activities as the baseline.

Table 2: Longer-term outcome and indicators at micro, meso and macro level

Outcome category	**Micro (firm) level** suggested indicators	**Meso, macro level** suggested indicators
Employment	• Number of employees (firm)	• Employment rate (overall sector, region)
Economic	• Increased productivity (€ value added per person employed) • Change in economic outputs	• Increased productivity (€ value added per person employed) • Change in economic outputs
Knowledge, skills and capacities	• Change in firm behaviour/activities and measured attainments • Profile of employees	• Change in sectoral/regional behaviour/activities and measured attainments • Profile of overall employment
Labour mobility	• Change (horizontal) in employment	• Change (horizontal) in employment
Working conditions	• Change in workplace environment • Change in work intensity	• Change in job security • Change in hours worked
Welfare	• Change in work-life balance (firm level) • Change in employee well-being (firm level)	• Sectoral/regional job satisfaction • Changes in well-being (stress, levels of happiness etc.)

Source: Authors

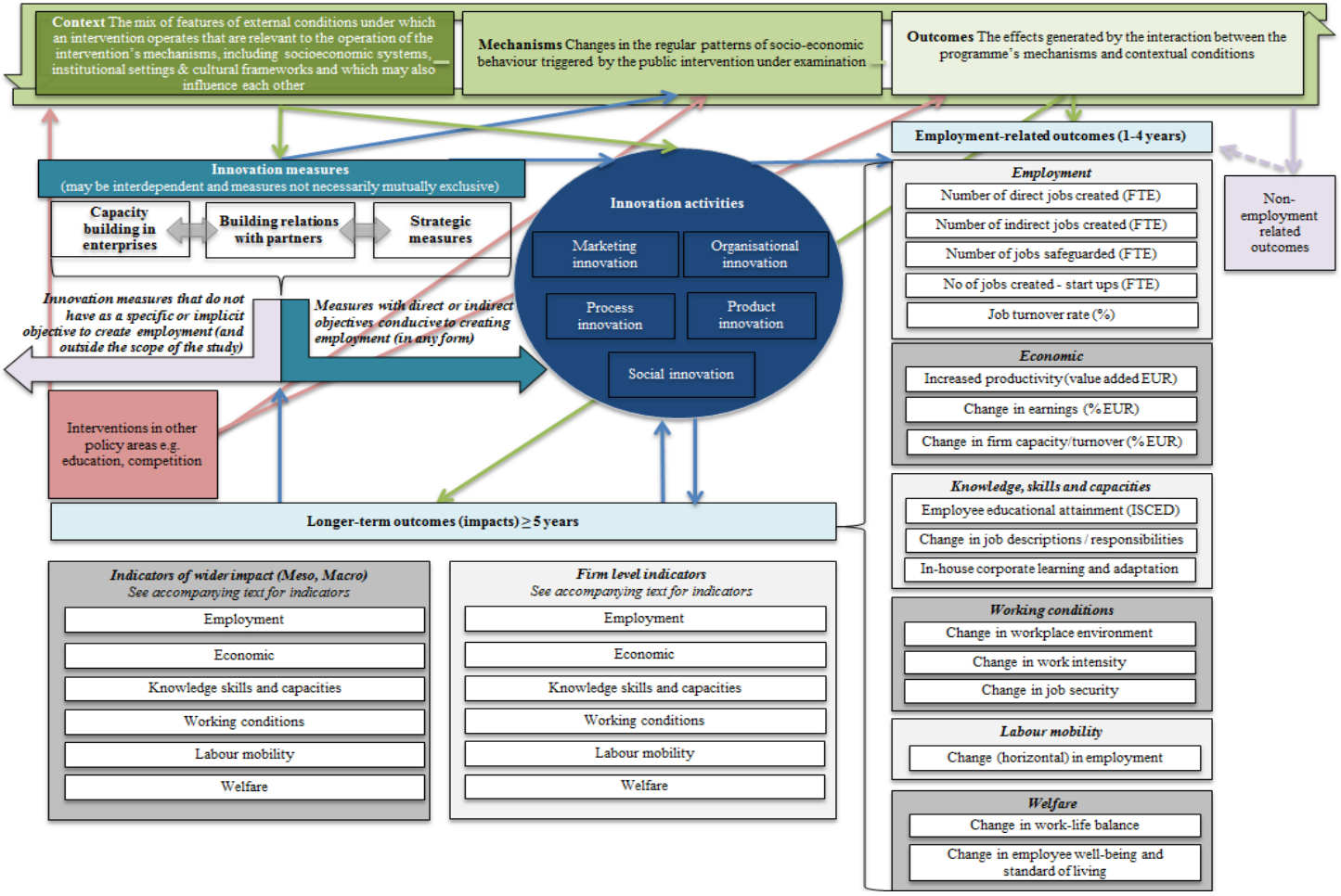
As the study has relied to a large extent on evaluations and other investigations that have already taken place, much depends on the variables and areas that these studies selected as targets for investigation, although the information from evaluations has been supplemented, where possible, with monitoring data and information obtained by interviews on each measure.

The diagram below was developed to summarise the relationships considered in the discussion of the methodology. The theoretical framework shows potential linkages between different types of innovation support and employment effects. It is based on the CMO configuration that has been explained and contains the following elements:

- **Context**: Illustrating the geographical, sectoral and other features under which the intervention (measure) operates.
- **Mechanisms**: The pattern of socio-economic behaviour and changes in behaviour triggered by (other) public interventions.
- **Interventions in other policy areas:** Changes in behaviours and outcomes stemming from other policy areas (for example education, social policy).
- **Outcomes**: The effects generated by the intervention set under a particular context and set of mechanisms.
- **Innovation activities**: The type of activities supported by an intervention. This study defines innovation activities as marketing innovation, organisational innovation, process innovation, product innovation, and social innovation.
- **Innovation measure**: The type of innovation measure under investigation.

- **Employment-related outcomes**: Outcomes generated by a particular CMO configuration related to employment, including employment creation, economic outcomes, knowledge, skills and capacity outcomes, working conditions outcomes, and outcomes relating to labour mobility and welfare.
- **Non-employment-related outcomes**: Innovation-related outcomes not associated with employment (for example new patents), which may over time help create employment-related outcomes (for example through new products which require new skills sets).
- **Longer-term outcomes**: Longer-term outcomes related to employment. These have been divided into firm-level outcomes and wider impacts on a meso (regional, sectoral) and macro (national) level.

Figure 1: Theoretical framework diagram



Source: Authors based on wider literature

The authors used this theoretical framework for the analysis of each of the 15 measures as well as for the comparative analysis. The 15 adaptations are displayed at the end of each individual measure's fiche, in Annex II.

The review of the literature on 'strength of evidence' showed that most of the debate arises from the drive towards evidenced-based medicine and related developments in the health sector. Common methodological references are the Maryland Scientific Methods Scale (Sherman et al, 1979) and in the UK the more recent Project Oracle Standards of Evidence developed by Nesta (2012). These standards provide a hierarchy of evidence, in which randomised control trials (RCTs), developed in medicine for the testing of drugs and other treatments, are regarded as the 'gold standard' in assessments of evidence. Less definitive evidence, such as that derived from patient surveys, is considered of less value or rather is placed at a lower level in the hierarchy of evidence. Problems, however, arise in relation to these standards when an attempt is made to apply them to other policy areas. It is unusual to conduct RCTs in social or economic policy for a range of practical and ethical reasons, although in the UK, Nesta has spent considerable resources to deploy RCTs in evaluations of innovation support. But although Nesta views the use of RCTs in innovation policy as a useful approach in evidencing effectiveness in an instrument, their guidelines equally suggest that RCTs can be used as an exploratory tool in order to raise questions which are better addressed through systematic reviews.

Counterparts of the RCT approach, such as the use of econometric analysis, are sometimes referred to as near equivalents, since they appear to offer similar quantitative rigour, especially when they include a counter-factual analysis, typically through the use of a matched control group. However, questions remain about the completeness of the analysis based on these approaches and their appropriateness as evidence on economic and social policy. Frequently, the approaches proposed in health policy are driven by the question 'what works?' and therefore focus on the effectiveness of medicines or policies. While this is also an important question in social policy, it does fail to take into account other important aspects, such as: Is the problem that the measure is attempting to address well-defined and relevant? Are the mechanisms by which the policy is delivered the most suitable? Is the policy sustainable and transferable? For this reason, especially those who are influenced by a realist and theory-based approach to policy evaluation maintain that a broader range of questions needs to be addressed in a systematic review that looks at the evidence on all sides of the policy. From this perspective a systematic review sits at the apex of evidence assessment for certain types of economic and social policy, including the area under consideration – innovation support.

On the other hand, the team saw the value of having standardised elements in its approach to assessing evidence and therefore proposed a framework, listing the types of evidence that might be encountered given that they are common in economic and social policy and their relative usefulness in contributing to evidence assessment. In addition, researchers were asked to assess how far the evidence they encountered contributed to an assessment of the measure in question against the relevant standard criteria commonly used in evaluations at a European level – relevance, coherence, effectiveness, efficiency, value-added, sustainability and transferability (European Commission, 2015b) with the aim of addressing the question of whether a systematic review had been conducted.

The following table provides an overview of the relative strengths of the different forms of assessment in contributing to the study.

Table 3: Types of evidence relevant for the current study

	Evaluation criteria					
Type of evidence	**Relevance**	**Effectiveness**	**Efficiency**	**Impact**	**Sustainability**	**Coherence**
Systematic review/realist synthesis	***	**	**	***	***	***
Theory-based evaluation	***	**	*	***	***	***

	Evaluation criteria					
Type of evidence	**Relevance**	**Effectiveness**	**Efficiency**	**Impact**	**Sustainability**	**Coherence**
Counterfactual analysis with randomised control group (RCT equivalent)	*	***	***	**	*	*
Econometric studies – including control group	*	***	***	**	*	*
Other econometric studies	*	***	***	**	*	*
Quasi-experimental studies - non-randomised (but counterfactual), pre-post intervention studies	*	***	***	**	*	*
Cost-benefit analysis	*	***	***	**	*	*
Cost-effectiveness analysis	*	***	***	**	*	*
Analysis of monitoring data	*	**	**	*	*	*
Quantitative survey	*	**	**	**	*	**
Opinion survey	**	**	**	**	**	**
Interview programme	**	**	**	**	**	**
Case studies	***	**	*	***	**	**
Qualitative assessment	***	**	*	**	**	**
Evidence reviews	***	**	**	***	***	***

Source: Revised by authors, adapted from Nutley et al (2012), original source Petticrew and Roberts (2003)

Further information on the application of the methodology explained in this section and on the evidence on the employment effects of innovation support measures is presented as Annex I to the report.

Innovation support measures

The chapter starts drawing on policy frameworks at European level, with a brief consideration of policy promoting innovation and what this says about employment and related matters. It then provides a short review of academic literature on the relationship between innovation and employment, before going on to describe the types and range of innovation support. Finally, it considers the findings from the examination of 15 specific innovation support measures.

Innovation policy

In the absence of a comprehensive survey of innovation policies at national level, it is helpful to consider the EU policy framework in this area, because it provides a benchmark and has often explicitly influenced the shape of national policy. Indeed, a number of the measures under consideration receive support from the EU Structural and Investment Funds (ESIF) and are therefore directly influenced by the EU framework in their design and implementation.

Much of policy at EU level in the 2014-2020 programming period has been shaped by the strategic framework for the EU developed as Europe 2020 (European Commission, 2010a) and the accompanying 'Flagship Initiatives'. For the project on hand, the Flagship Initiatives 'Innovation Union' (European Commission, 2010b) and 'An Agenda for new skills and jobs' (European Commission, 2010c) are particularly relevant.

Innovation Union speaks of Europe's competitiveness and 'our capacity to create millions of new jobs' depending on 'our ability to drive innovation in products, services, business and social processes and models' and states that 'achieving our target of spending 3% of EU GDP on R&D by 2020 could create 3.7 million jobs and increase annual GDP by close to €800 billion by 2025'. It also comments that 'perhaps the biggest challenge for the EU and its Member States is to adopt a much more strategic approach to innovation'. However, the employment dimension of this strategy is not developed much further. There are references to the need to improve education systems and address skills shortages and there is also the following interesting observation:

> *'The shift to an innovative economy has major implications for the world of work. Employers need workers who actively and constantly seek out new and better ways of doing things. This requires not only higher skills levels, but a new, trust-based relationship between employer and employee.'*

But, generally, this insight is not followed up and there is little further explicit consideration of the links between innovation, employment and working conditions.

Similarly, in 'An Agenda for new skills and jobs', there is an initial analysis that includes the statement that 'a skilled workforce is an essential asset to develop a competitive, sustainable and innovative economy in line with Europe 2020 goals' and there is extensive consideration of the need to develop skills in various ways and to modernise labour markets through flexicurity policies, but there is little specifically on the links between innovation, employment and working conditions, other than the following observation:

> *'In order to innovate and to deliver promptly and efficiently, EU companies depend for their survival and expansion on a committed workforce, thriving in a high-quality working environment, with safe and healthy working conditions.'*

Overall then, although the Europe 2020 strategic framework sees innovation as important for creating jobs and for keeping the European economy competitive, there is no policy direction making an explicit link between innovation policies, employment and working conditions. Consequently, in the design of the two major EU programmes promoting innovation - Horizon 2020 (European OJ L 347/104, 2013) and the Structural and Investment Funds (European Commission, 2015a) - the employment dimension is only partially represented.

The general objective of Horizon 2020 is to help build an economy based on knowledge and innovation across the EU, while contributing to sustainable development. The programme is expected to promote inclusive growth, fostering a high-employment economy delivering economic, social and territorial cohesion and employment impacts are expected:

> *'Research and innovation help deliver jobs, prosperity, quality of life and global public goods. They generate the scientific and technological breakthroughs needed to tackle the urgent challenges society faces. Investment in this area also leads to businesses opportunities by creating innovative products and services'.*

However, the specific objectives of the programme make no reference to employment and the creation of jobs, especially high quality jobs, is almost seen as a by-product of the process.

The situation for the ESIF is somewhat different. The Common Strategic Framework for the ESIF aims to maximise their contribution to achieving the Europe 2020 strategy and the core objective of the Funds for the 2014-2020 period is 'Investment for growth and jobs'. There are 11 Thematic Objectives, which include 'Strengthening research, technological development and innovation', but also 'Promoting sustainable and quality employment and supporting labour mobility' and 'Investing in education, training and vocational training for skills and lifelong learning'. At a more detailed level, there are clearly elements that relate both to the promotion of innovation and to creating and safeguarding employment, especially under the ERDF and the European Social Fund (ESF). Under the ESF, for instance, one of the objectives is the 'Adaptation of workers, enterprises and entrepreneurs to change' and an ex ante conditionality requires that Member States following this objective have active labour market policies in place that are designed and delivered in line with the employment guidelines. How the different objectives are pursued on the ground, however, depends on the Partnership Agreements that determine the national approach and the specific Operational Programmes that combine the overall objectives in different ways according to local circumstances. Although there is scope for a coordinated approach to innovation and employment objectives, the overall result of the analysis presented here is that the two policy objectives are pursued in parallel rather than in a coordinated way and that the opportunity to develop a more strategic approach has been lost.

And yet, there would appear to be a demand from enterprises for this link to be made. The 2016 Innobarometer (European Commission, 2016b) surveyed enterprises on the most effective types of public support for the commercialisation of innovative goods and services. Training of staff in how to promote and market innovative goods or services was signalled as the support that would have the most impact on an enterprise (29% of enterprises that have introduced innovation since 2013, and 21% of those which have not). Lesser considerations included other aspects requiring skills developments such as accessing or reinforcing online selling (26% of innovative enterprise, and 18% for non-innovative ones), assistance with regulations or standards (mentioned by 19% of innovative companies and 18% of non-innovative ones) and access/strengthening of the presence in export markets (14% of innovative companies, and 9% of non-innovative ones).

For the analysis of innovation measures at national level the question then is: Do national policies promoting innovation reflect those that have been developed at European level? Or are there initiatives that systematically pursue both growth and innovation and employment development at the same time? Answers to these questions will be apparent in the discussion of the findings on individual measures, but as at the European level, it can be expected that occasional links are made between the two kinds of policy objective.

In general, however, it appears that the indirect relationship between innovation and employment, suggested by the theoretical models of innovation referred to in the previous chapter, are carried through to policy thinking, certainly at an EU and probably at a national level.

Innovation and employment in practice - evidence from academic studies

The literature on innovation is vast and the study has focused on research specifically dealing with the relationship between the promotion of innovation and employment – in terms of the impact of innovation on employment levels and working conditions within firms. These tend to take the form of a comparison between the mean (conditional) growth of innovating and non-innovating enterprises, with innovation being measured by indicators such as the level of a firm's investment in R&D, the number of patent applications filed over a given period or other measures reported by the enterprises themselves. The results seem to differ significantly depending on factors such as the national context, the policy mix in place, the size of the organisations being analysed and the approach of management.

Vivarelli and Pianta (2003) carried out a broad macro-level review of the research evidence on the dynamics of employment through the lens of technological and structural change. They focused on the link between unemployment and structural factors, including technological change, globalisation and evolution of demand. State intervention is highlighted as an important tool for developing new macroeconomic, industrial and innovation policies which can address technological unemployment through the introduction of new learning policies and encourage a more equitable distribution of income through economic and social innovation. The scope of this review provides an interesting insight into the social and economic contexts in which innovation takes place, but is somewhat broader than that of this assignment, which focuses more closely on the mechanisms by which specific innovation support measures impact on employment.

In a smaller scale investigation carried out by the Centre for European Research (ZEW), Zimmerman (2008) looked at the effects of process and product innovation on employment in German SMEs with differing growth rates. This study analysed information on almost 2,000 firms drawn from the KfW Mittelstandspanel – a longitudinal database containing information drawn from annual surveys. Particular information regarding innovation activities was collected in 2003, 2005 and 2006. Using quantile regression, researchers concluded that overall the effects of innovation on employment growth are positive for both product and process innovations. This positive impact can be seen in both growing and shrinking SMEs, although it is much stronger in firms already experiencing strong growth. However, the research pointed to a more significant positive impact from process than product innovation, though this may have been due to the timeframe of the study and the effect could be less marked over a longer timeframe.

Ortega-Argilés et al (2015) provide an international dimension to the question of innovation and employment, combining several country specific and cross-country micro and industry data sets to explore the employment impacts of R&D expenditure and embodied technological change. Although the latter appears to have no significant effect on employment, R&D expenditure did produce some meaningful results. In contrast to the ZEW study, Ortega-Argilés et al (2015) found that R&D expenditure resulting in product innovation tended to be 'labour-friendly' in terms of creating new jobs and improving working conditions, whilst research expenditure which led to process innovation tended to be 'labour saving' (that is, leading to job loss). Importantly, however, 'any initial displacement of workers as a result of process innovation can be countered by indirect price, investment, and income compensation mechanisms that reduce the direct job-destroying impact of innovation' (2015, p. 1). Country specific employment effects were also noticeable, suggesting the importance of the economic structure and framework conditions.

A similar project led by Coad and Rao (2007) looked at 1,920 firms from four different sectors within the US high-tech manufacturing industry. Using semi-parametric quantile analysis to explore the relationship between innovation and employment growth, the researchers identified three types of firms. In average firms with a relatively stable employment rate, innovation did not have a significant impact on employment growth; in fast-growing firms, prior innovation appeared to have a strong positive impact on employment growth; and in firms that were experiencing negative growth, innovation appeared to be linked with job loss. In terms of firm size, larger firms appeared to have a more significant positive impact on job growth relative to initial employment than smaller firms.

Researchers considered that the results of this study were closely linked to the specific working conditions of the USA, which tends to have a more fluid labour market than countries in Europe. They also believed that the specificities of the high-tech manufacturing sector may have impacted on the results, pointing to an important sectoral dimension. This research provides an interesting counterpoint to the two European studies, highlighting the importance of local context in determining innovation impacts.

While offering useful insight into the effects of innovation on employment, the research described above was only concerned with the impacts of product and process innovation. In March 2014, the Simpatic project (2014) - funded through the EU's Framework Programme 7 (FP7) - published a working paper using data from the annual Community Innovation Survey - CIS in the Eurostat database to explore the impact of innovation both on employment and skill upgrading within firms. This is

particularly interesting because it looked beyond product and process innovation and also took marketing and organisational innovation into account. It provided a limited sectoral analysis, comparing innovation impacts in the textiles sector with those in the services sector. Final results pointed to a significant positive impact on job growth from product and marketing innovation particularly, such that increasing the share in the market of firms engaged in organisational and marketing innovation by 10% would lead to an overall increase of employment by 3 to 4.5%. Process innovation in contrast appeared to have no significant impact on job growth in this study. All four types of innovation, however, correlated positively with an increase in highly skilled jobs, so that increasing the share of firms engaged in organisational and marketing innovation by 10% would lead to an increase in the share of high skilled labour by 4% and in the share of scientific workers by 2%.

It would appear that in these studies a link has been established between innovation and job growth. Increasing turnover as a result of innovation can be accompanied by a growth in jobs, but at same time efficiency improves; that is, turnover increases more than employment. Furthermore, there are differences between the different types of innovation. Product, marketing and organisational innovation have more positive effects while process innovation, which often involves technology displacing labour, tends to have less positive effects. It would also seem that innovation has a positive impact on the type of jobs offered – with organisational and marketing innovation, in particular, leading to an increase in high-skilled jobs.

A final example of relevant academic studies is the evidence review carried out by the What Works Centre for Economic Growth (2015). This initially reviewed approximately 1,700 studies from the UK and other OECD countries covering all aspects of support for innovation. Out of the larger selection, the study chose a smaller sample which met the Centre's minimum standards. The final study provided an assessment of:

- 42 impact evaluations that covered programmes offering R&D grants, loans and subsidies; and
- 21 impact evaluations that covered programmes offering R&D tax credits.

It considered outcomes on R&D expenditure and innovation, as well as economic outcomes including employment, and observed that out of the 42 impact evaluations on R&D grants, loans and subsidies, around half found positive effects on R&D expenditure and innovation outputs, such as patents and improved process or product innovation. Seven out of 16 concluded positive effects on economic outcomes (productivity, employment or firm performance – profits, sales or turnover), while there is no information for the remaining 11.

For R&D tax credits, 10 out of 17 studies had positive programme impacts on R&D expenditure, but there is no evidence for the other seven. Out of the 10 studies that found positive impacts on R&D expenditure, only three assessed economic outcomes (productivity, employment or firm performance – profits, sales or turnover). Out of these three studies, only one study found consistently positive effects, while the other two did not find overall positive effects.

In terms of conclusions on employment effects, these were limited in scope (only 10 of the studies considering both types of support looked specifically at job creation), but the review concluded that 'there is some evidence' that R&D grants, loans and subsidies are more likely to increase employment than productivity. Although this assertion is not entirely explained, the study suggests that R&D grants, loans and subsidies create (more) knowledge spill-overs more broadly across the economy.

Overall, these studies only show that innovation is accompanied by employment growth. There is not much further light cast on the nature of the relationship.

Furthermore, another lesson to be drawn from the research discussed is the importance of geographical location, contextual factors such as working conditions and job security, and the sector in question in determining the impact of innovation on employment. This again points to the importance of the processes by which innovation takes place.

The nature of innovation support

Before looking at specific examples of measures to see how innovation support works in practice, it is important to address the nature of innovation and business support and how it has evolved. This helps to explain how initiatives are intended to work and the mechanisms by which they are implemented.

For the purposes of this study, innovation support measures are policy measures that support businesses in any way that helps them to become more innovative. They can focus on any part of the product or innovation cycle, but usually have an emphasis on the phases where ideas or the results of research are developed up to the point of commercial exploitation. They may be provided by public agencies, private individuals or organisations, or the social partners, but always with the aim of delivering a public good in the form of assistance to make the businesses more successful. They are made available either for enterprises in general or a specific subset of enterprises targeted by the measure. Because of state aid rules on the support of R&D, some assistance may be provided for larger organisations, but generally the same state aid rules mean that most assistance is directed to small and medium-sized enterprises (SMEs) (CSES, 2014).

The main defining characteristic of the examples of innovation support measures considered in this report is that the promotion of innovation is central to their objectives, in contrast to the many measures that stimulate innovation as a by-product of pursuing other objectives. Although there are examples of initiatives implemented by private sector associations, most of them are conceived and implemented by public authorities at all levels of government, often with support from the EU, principally through the ESIF. Most of the measures considered operate at national level, although frequently they have a regional or local dimension. In these cases, governance structures involve regional authorities and actors, implementation is tailored to local circumstances and the characteristics, approaches and structures of the regional or local agencies involved influence the particular form of service delivered. A couple of the measures in Austria (WAFF I&E subsidy) and the Netherlands (Start-up in Residence Amsterdam) relate to specific local areas.

The other category of innovation support measure identified in the initial searches was social partner-based measures - provided by industry or commerce associations, trade unions or voluntary associations. Several measures were identified, such as 'Meetovation' – promoted by the Danish Meeting Industry, an organisation with member enterprises from the meetings and hospitality sectors, together with the tourism agency VisitDenmark, with the aim of encouraging organisational innovation, particularly by improving the efficiency of business meetings. Other contributions by social partners include the publication by the Danish Confederation of Trade Unions (2007) on 'Employee-driven innovation'. However, in general social partner-based measures are not subject to the evaluation regimes that are commonplace in the public sector and, if evidence on performance exists, it tends to be confidential. As a result, none of the potential cases were selected for further investigation.

Usually, the measure is financed at least in part by public funds, but there are examples funded by subscriptions to a business membership organisation (including trade unions). In many cases, business support organisations provide the support measure and in others they facilitate access to it by providing information about its purpose, requirements and how to access it and encouraging participation.

Business support organisations have multiple forms, varying from the general support services provided by business membership organisations, such as Chambers of Commerce and industry associations, to public (sometimes regional or local) agencies established to provide information, advice and support. They include dedicated support organisations, such as incubators, science parks, technology or innovation centres, and organisations offering services in specialised areas, such as those providing finance or advice on the management and registration of Intellectual Property Rights (IPR). There are also more strategic organisations (often government agencies) encouraging, for instance, cluster development or better cooperation between enterprises and knowledge institutions. Most of these organisations are public or based on public law, but they also interact with private sector business consultancies, which can often be involved in the delivery of particular services. Traditionally, business support organisations operate from specific premises, located in a place where businesses can easily gain access. Increasingly, however, business support is provided online and, in some cases, this has replaced face-to-face provision.

Innovation support, or rather business support more generally, has evolved over a long period. However, the current support landscape owes a lot to developments in the last 30 years or so. Initially, support was often designed to respond to a particular perceived need and could be quite narrowly focused. There was a growth of agencies offering different types of support and even if new services

were provided by existing organisations, they were often not specifically designed to be integrated with other provisions. The growth in the types of support offered generated its own problems, since potential clients could be confused by the range of services provided by different agencies and often experienced difficulty in getting through to the appropriate organisation. This led in the 1990s to the growth of 'one-stop-shops', where services were co-located or at least coordinated and later to 'no-wrong-door' policies, designed to ensure that support organisations would take ownership of business enquiries even if they did not relate to the specific focus of the organisation approached.

These developments also had important implications for the conception and delivery of support services. There still remain important stand-alone measures that are not designed to relate to other measures. For some time, however, attention has been paid to the interaction between different elements of support as part of a more systematic approach that is in line with developing best practice in enterprise support, as identified for instance in the Commission Staff Working Paper on 'Creating top-class business support services' (European Commission, 2001). Building on the work of Porter (1998) and others in management theory, this approach encouraged support providers to see their services as part of a consistent process of building competitive advantage in firms by strengthening capacity across a range of management functions – finance, accounting, marketing, human resource management etc. In this context, measures designed to improve access to funding, for instance, or staff training came to be seen as instruments in a support toolbox that could be used to address whichever of the aspects of business management needed most attention. The capacity building approach therefore tried to encourage consistency across a range of measures that ostensibly had a focus on specific issues. Even specialist providers, such as financial organisations responsible for administering programmes designed to allow access to finance or Intellectual Property Offices assisting companies on intellectual property matters, have tended to offer broader business capability support as part of their services. They do not provide finance, for instance, without checking that other aspects of the business are sound or can be improved.

Furthermore, the services offered and the measures that support them have, increasingly, become more integrated. Business incubators, science and business parks and, even more so, innovation centres that have developed since the 1990s routinely offer integrated support to enterprises making use of their services and facilities. As the importance of networking for SMEs became more apparent, packages of services were developed to support enterprises working in business networks and allying with other firms with complementary capabilities and/or with other organisations such as knowledge institutions and public bodies, to address weaknesses in their competitive position. As a result, rather than directing support to individual enterprises, measures were developed to encourage interaction and cooperation. This is particularly the case with cluster support, where the central management can offer a range of support services to its members, with the aim of strengthening the network as a whole.

Additional momentum has been given to these developments in enterprise support in the last 15 years by new orientations in economic development strategies. The widespread adoption of the triple helix model has made a major difference, particularly in the innovation promotion area. It has led to a recognition of the interaction of universities, industry and government at both strategic and operational level and to a better understanding of the processes involved. The concept owes a lot to the work of Etzkowitz (1993a) and Etzkowitz and Leydesdorff (1995), although it built on earlier work by Lowe (1982) and Sábato and Mackenzi (1982) and has since led to an explosion of related studies. The triple helix model has played a significant part in shaping innovation strategies under the EU Structural Funds and in the national strategies of a number of countries. In recent years the tendency has been to talk of a 'quadruple helix' (Yawson, 2009; Carayannis and Campbell, 2010) acknowledging the input of consumers and civil society into the development of products, processes and business practice and organisational innovation, especially as 'open innovation' processes have increasingly been adopted.

Most recently, the EU's Common Provisions Regulation (OJ L 347/320, 2013) governing the ESIF incorporated a requirement for national and regional authorities making use of ERDF support for innovation, to develop a 'smart specialisation' strategy. This has strengthened the tendency towards more strategic approaches to innovation support. As a result, in Europe there is now a relatively complex set of implementation processes affecting innovation support. Most measures are still delivered ultimately at the level of the enterprise, research institution etc., their target beneficiaries.

Nonetheless, they frequently form part of a more complex strategy promoting the interaction of many agencies and involving multiple separately identifiable initiatives that nonetheless are coordinated and that have to be acknowledged in describing how any particular initiative operates. For instance, measures promoting clusters require a strategic analysis of relative competitive advantages, developments in technology and other business factors before their aims and orientations can be announced. They then design a series of mutually supporting initiatives that might include helping cluster members to develop joint product offerings, a joint marketing strategy, developing relationships with research institutes, strengthening the management capabilities or assisting individual cluster members to access finance and so on.

On occasions, too, certain measures are intended to operate at a more strategic level right from the start. Measures to raise awareness of the importance of innovation or to promote open innovation aim to change the approach of individual firms, but as part of a shift in the culture and ambitions of large sections of society. Alternatively, they might stem from a policy direction on the part of public authorities that attempts to take a consistent approach to encouraging innovation as part of a broader strategy. This could relate to urban development or using public purchasing and regulatory power to stimulate growth and innovation from the demand side, for instance in using procurement for innovation.

In order to help reflect this complexity and to provide a framework for research for the study on hand, a typology of support measures has been developed in which they are seen to operate primarily at one of three levels:

- Support at the enterprise level:
  - Stand-alone measures, and
  - Coordinated measures building capacity in enterprises;
- Building relations with partners; and
- Strategic measures.

Features of the measures at each level are indicated in the typology below (Table 4), which also refers to specific case descriptions where an example of the measure is considered in more detail.

Table 4: Typology of innovation support measures

Support at the enterprise level: *Assistance to individual enterprises*	
- **Stand-alone measures:** *Measures that generally leave it up to the individual enterprises to decide how to respond and usually do not require other measures to be accessed*	
Tax credits for research and innovation	FR Tax credit and NL
Research and development programmes	WBSO R&D tax credit
Encouraging entrepreneurship (grants, prizes, awards etc.)	AT WAFF I&E subsidy
Innovation vouchers	EE Innovation vouchers
- **Co-ordinated measures building capacity in enterprises:** *Support usually provided by dedicated business support organisations (such as Chambers of Commerce), aiming to assist the management and staff of individual enterprises to improve their capacity and performance in relation to one or more business functions (often sequentially)*	
Creation and development of innovative start-ups	IT Smart&Start
Incubators/facilities	PL Investment Incubators
Business advice and direct support: • Product development • Human resource development • Organisational development • Improving research capabilities	DK Growth Houses DE Enterprise value: people

• Managing of IPR • Finance for innovation • Marketing • Internationalisation • Sustainability promotion	
Building relations with partners: *Innovation usually requires enterprises to interact with other organisations and agencies. Encouraging interaction with key partners, such as research institutions and the public authorities, is at the heart of the widely applied 'triple helix' model*	
Networking/Industry-academic cooperation	UK KTP
Building innovation infrastructures and platforms Innovation centres	AT Laura Bassi Centres
Knowledge centres	FR Competitiveness poles
Support for participation in standardisation Supply-chain support Cluster promotion	DK Cluster Promotion
Strategic measures: *Public policy measures can be important in providing the framework conditions for individual enterprises to innovate and thrive*	
Promotion and awareness	
Measures that are part of other strategies, such as innovative approaches to local economic development	NL Start-up in ResidenceAmsterdam
Demand-side procurement for innovation	UK SBRI
Promotion of open innovation Smart specialisation	SE Winter Sport Strategy

Source: Authors

In terms of the illustrative cases, information on a larger number of measures (36 in total) than those referred to was collected. References to some of these are made, where relevant, in the analysis. The selection of the 15 measures for in-depth analysis was based on a combination of criteria, encompassing the country location, the measure typology, the availability of evaluation evidence and the relevance of the measure for the study – especially in terms of employment effects. As a general approach, for this explorative exercise it was preferred to ensure that a good variety of measure types and support levels were covered.

The following sections will describe the main features of the cases investigated in each of the categories listed.

Support at the enterprise level

Stand-alone measures

Stand-alone measures support individual enterprises, usually without recourse to other support services. They often leave a degree of flexibility in the hands of the beneficiaries in that these can choose to some extent how the support is used.

The first cases to consider are two examples of **tax credit schemes** (FR Tax credit and NL WBSO R&D tax incentives). These allow businesses to deduct all or part of their expenditure on R&D (but in some cases also additional activities relating to the exploitation of ideas or research results) from their tax liability. Schemes of this kind are fairly common across the EU Member States and the two analysed examples are longstanding. They can also represent a significant proportion of all the state resources devoted to the support of research and innovation (OFCE, 2016 and EIM, 2012). They have a direct impact on business funds and hence business behaviour and are thought to be a means of boosting business expenditure on R&D (BERD), a component of overall expenditure on R&D that can vary markedly from one country to another as a proportion of the total.

FR Tax credit is probably the most common case across Europe, where companies can deduct research expenses from their turnover figures and thus reduce their revenue tax (or, in some instances, tax on profits). Sole proprietors or businesses without corporate status can deduct these expenses from their income tax liability. An impact on employment arises in that firms can include the costs of employing staff to carry out the research and in this case deduct 100% of employment expenses, while only being able to deduct 50% of the expenses relating to facilities and materials. Furthermore, in this case, there is a special sub-scheme where extra incentives are provided for the employment of PhD graduates. The procedure is relatively simple in that it is just necessary to claim the expenses in a tax return, though the claim may be subject to a tax audit.

In the second example, NL WBSO R&D tax credit, the impact on employment is more direct since the tax allowance relates to the costs of certain types of employment, which are set against a payroll tax liability, thus reducing wage and salary costs for R&D. The scope of the measure is expenditure on R&D leading to technically new products, processes and components, including software or technical scientific research. There is special treatment for the support of start-ups undertaking innovation. The measure also differs from the French example in that, on top of complying with the measure's technical criteria, firms claiming the tax allowance have to obtain prior approval of the projects they propose, showing that they have developed a project plan and set up internal R&D records.

The evidence on the employment effects of the tax measures is not as clear as might be hoped. In the French case, the evaluations have tended to focus on the private sector R&D investment levels generated and, as explained in an interview with a Dutch official, the NL WBSO R&D tax credit sees employment as a means of delivering increased innovation rather than as an objective in itself.

The French evaluations report that, from 2007 onwards, the number of researchers in enterprises claiming the tax credit is approximately 11% higher than in those not subscribing, but further details are not provided. Evaluations of the WBSO, too, mainly concentrate on other aspects of the measure's implementation. The most recent evaluation of the WBSO, for the 2006–2010 period, found additionality of 55% overall for the measure, with 76% of the increased R&D activity going to salaries and wages. NEA (2016) also shows that, in 2016, 83,980 work years (based on a 1,400-hour work year) were awarded through the WBSO, a slight increase compared to 2015 (83,400). Given that firms can claim the allowance in any tax year, the effects can also be long-term, though in both cases the jobs created and sustained are for those engaging in research rather than those employed in the enterprise generally. The jobs are therefore relatively high-skilled.

Another instance of stand-alone measures is **research and development programmes**. R&D programmes have a relatively high profile, but the best-known examples (especially Horizon 2020) operate at a European level, while in a number of Member States funding for research programmes at a national level is relatively restricted. Moreover, although R&D can be regarded as an early stage in the overall innovation cycle, there is a tendency to consider 'innovation' as referring to the process of exploiting ideas and research results by developing them and launching products and services onto the market. This is how it is used, for instance, in the context of the EU's Horizon 2020 programme.

The third category of stand-alone measures relates to those **encouraging entrepreneurship through grants, prizes, awards etc**. The Austrian example (AT WAFF I&E subsidy) is one of the few that specifically refers to employment in its title - WAFF being an institution for active labour market policy and the promotion of employees in the City of Vienna. It is thus a local measure.

This measure explicitly aims to combine innovation support, including social innovation (since 2013), with job creation, job retention and/or the improvement of the quality of employment. It also promotes the inclusion of older employees, equal opportunities between men and women, and opportunities for employees with a migration background. This approach reflects the Austrian Strategy for Research, Technology and Innovation (Austrian Federal Government, 2017), which includes long-term employment and the creation of unlimited, high quality and future proof jobs as explicit goals.

A grant is provided to local SMEs to pursue an innovation project and this contributes to the long-term competitiveness of Vienna. The grant is for up to 50% of the gross salary of an innovation assistant for 12 months. Other social effects exist in that it is expected that the innovation assistant will help to

increase knowledge and skills in other employees. There is also an extra subsidy if the project contributes to gender equality.

Employment effects reported are not strong. A condition of the grant is that firms receiving assistance must have at least one extra employee at the end of the funding period, but evaluations suggest that this is not maintained in around a third of firms. The main effects appear to be on the innovation assistants, who improved their labour market position and saw their income rise by more than 50% between January 2002 and June 2007.

The final element in this sub-category is **innovation vouchers**, providing a subsidy in the form of a voucher which can be used to buy defined support services from among a series of providers. Innovation vouchers have been used in various countries (Estonia, the Netherlands, Ireland and the UK) and are a simple way of encouraging SMEs, in particular, to take up advice from consultants and/or build relationships with knowledge institutions (OECD, 2010b). It is up to the firm to choose where to 'spend' the voucher, usually within defined limits.

In EE Innovation vouchers, the maximum amount of support per project is €4,000, so the voucher scheme offers a relatively modest amount to Estonian enterprises to take the first steps in establishing a relationship with knowledge institutions and to become more conscious of how they can innovate in their business activities. Enterprises 'buy' a consultation from a university or research institution and, if this first step is successful, they can take advantage of a follow-up measure which supports activities in cooperation with research institutions and offers more substantial funding.

The measure is relatively restricted in terms of the financial support and it is not directly intended to have employment or employment-related effects, since the prime aim is to increase R&D activity. However, a recent evaluation has shown that turnover growth for the respondents was 153% (between the base and the evaluation year) and when this figure was adjusted for the growth of enterprises that did not receive support, turnover growth for enterprises that were supported by the innovation voucher grant was 22%. The corresponding figures for employment growth was 116%, which, when adjusted, amounted to 14%. Corrected growth of salaries paid to employees was 4%. Total employment as a result of the measure during the evaluation year (2017) was 359 employees in 83 enterprises. Information on other labour market outcomes is limited, but a learning effect in part of the measure design and is intended to lead to long-term changes in behaviour.

Coordinated measures building capacity in enterprises

In contrast to stand-alone measures, those under this sub-heading are more usually parts of a package, where different aspects of an enterprise's management are addressed together or in sequence. They are often inspired by the professional 'capacity building' approach, addressing the long-term building of the capabilities of an enterprise, even if for practical purposes this has to start with the most urgent problems.

Especially given the failure rate among SMEs, it is necessary to help new enterprises in the difficult early days. A particularly interesting case is the **creation and development of innovative start-ups**.

An example is the Italian Smart & Start initiative. It promotes research-driven innovation in a country where investment in research and technology is below the European average by assisting start-ups that are either in the digital economy or are using the results of the research system. In particular, it addresses the critical issues faced by new businesses (established in the last 12 months) by providing access to finance in the form of an interest-free loan of between €100,000 and €1.5 million, and business support that ensures that the new business is able to develop the business management processes that are necessary for success.

Applicants have to demonstrate that they comply with strict criteria, designed to test the viability of the proposal. Generally, the loan can cover up to 70% of eligible expenses, but additional assistance is provided for entrepreneurs/founders aged under 36 years, women and people creating start-ups in less developed regions.

The generation of employment as such is not an explicit objective of this measure. However, monitoring data show direct employment effects as of November 2017: the measure has created 3,925

new jobs across approximately 800 enterprises (an important contribution, especially considering the small average company size in Europe) and people aged under 36 represent almost 40% of the entrepreneurs supported. People aged between 36 and 50 constitute almost 45%. In terms of gender, less than 20% of entrepreneurs are women – a specific target group of the measure. Two-thirds of the start-ups funded are located in the Mezzogiorno, the least developed area of the country.

The second category of coordinated measures relates to **incubators and the provision of business facilities** to enterprises. Incubators assist enterprises to start-up and grow, which often involves innovation and its exploitation. Generally, they provide various services to support this process. In the past, this usually involved the provision of premises or facilities, often in a co-location with other start-up businesses, allowing the incubator to provide assistance in the form of common office facilities, such as meeting rooms, ICT back-up, even accounting services. But the significant element is the facilitation of development and growth (CSES, 2002).

With the growth of the service sector and especially ICT, where physical location can be less important, there has been an increasing tendency for the premises element to drop out of the incubator concept. Parallel to this has been the development of office space centres by commercial companies, meaning that the support for business development has become even more clearly the differentiating element in incubators. The two examples of incubators considered as possible cases for this study – one from Poland and one from Denmark – do not usually include the provision of premises in their offer, though they can assist with this in certain cases.

For these reasons, the PL Investment Incubators measure can be considered as representative of incubators in the current environment. Strictly, it relates to the establishment of 69 Investment Incubators across Poland, with support from the EU Structural Funds, thus creating an important institutional infrastructure for economic development and especially innovation promotion in the country. Each Investment Incubator provides access to finance for start-ups in the form of an equity investment (up to a maximum of PLN 800,000 or around €200,000) and helps with the launch and growth acceleration of new businesses. The finance element has been critical and indeed prompting the development of a venture capital market in Poland was one of the objectives of the initiative. The realisation of successful investments once the firms are established will lead to the creation of a revolving fund to finance further investments.

The measure is not designed to generate employment as such, but rather to create innovative start-ups. Nonetheless, since creating start-ups inevitably means the generation of new jobs, at least for many of the entrepreneurs setting up the business, employment outcomes are part of the success of the measure in incubating over a thousand enterprises. PAED's evaluation (2017) estimates that 1,404 new jobs were created in the form of permanent work contracts in the 1,226 start-ups launched between 2008 and 2017. Of these, 552 posts were occupied by women. In addition, around 1,991 temporary, task based jobs were created. These achievements considerably exceeded the targets set for the measure.

Business advice and direct support can involve various kinds of support organisations, ranging from Chambers of Commerce to more specialised innovation centres. They all provide information and advice to enterprises, not only in response to the particular issues that cause a business to approach them initially, but also to enable the business to address other weaknesses in its overall management capabilities. They thus offer programmes or direct clients to others who offer programmes or assistance, relating to all the main management functions. This typically covers aspects such as product, human resource and organisational development; improving research capabilities; managing of IPR; finance for innovation; marketing; internationalisation; and sustainability promotion.

Individual clients may make use of only one or a couple of the support services offered in the different areas, but in line with the 'one-stop-shop' principle and the 'capacity building' philosophy, the main business support organisations will attempt to give access to all of them, directly or indirectly. It is therefore common practice for business support organisations to offer initial diagnosis sessions, before directing the client to support in specific areas (European Commission, 2001).

The example of a measure relating to this type of organisation is 'Growth Houses' in Denmark. These offer support to enterprises with at least the aspiration to grow. They are established in each of

Denmark's five regions and work closely with other business support organisations, knowledge institutions and public authorities in the Danish innovation system.

Growth Houses do not promote innovation as such, but encourage economic growth - in turnover, employment and exports - especially among SMEs. Specific targets are agreed on an annual basis, the most recent of which are set out in a National Agreement for Measuring Growth Houses in 2017. This growth is assessed two years after an enterprise has taken advantage of the measure.

Growth Houses aim to be a reliable 'sparring partner', collaborating with enterprises and employers with an evident growth potential and ambition and providing a range of business support services that address identified weaknesses in the businesses' capabilities, in order to nurture future growth. The service begins with a free diagnostic session and those assessed as being able to benefit from further assistance are given subsidised access to a series of programmes (some of which are provided by private sector consultants) that implement a growth plan and address the most pressing needs of the client enterprise.

Assessments show that an investment of DKK 99,408,000 (€12,923,040) in 2014 led to an estimated net value creation (growth in turnover) in 2016 of DKK 560,702,000 (€7,289,126), giving a factor of 5.64 (against a target of 3). Turnover growth of supported enterprises was 19.27% from mid-2014 to mid-2016, as compared to 9.35% for the control group over the two years. Employment growth in client enterprises over the two years was 11.35% (2,255 jobs), compared with 8.23% in a control group. It is interesting that turnover grew more than employment, suggesting an increase in productivity.

There are also indications of a development of the levels of knowledge, skills and competences. Indeed, promoting developments of this kind is central to the process of delivering the enhanced growth in the enterprises consulted, though there is little formal assessment of these processes.

An example of a measure supporting a particular functional area of management, namely human resource development, is provided by the German initiative 'Enterprise value: People'. This measure explicitly addresses the issue of adapting the labour force to the effects of innovation and competition. It has been in operation across Germany after a pilot project since 2015 and is partially funded by the ESF. It is part of a wider 'New Quality in Work Initiative', which aims to promote a new work culture and personnel policy across the German economy, placing an emphasis on work quality as the basis for innovation and competitiveness. The measure should also be seen in the context of shortages of skilled labour in Germany's growing economy.

The measure supports the inclusion of employees in sustainable learning and change processes within enterprises, in order to address the impacts of changes in the economy, improve working conditions and promote growth and well-being. It thus helps SMEs (in line with the EU SME definition) retain skilled personnel and reinforces SMEs' position within Germany's economic system. The process begins with a firm visiting an approved advice agency for a free review of the firm's personnel needs and a check of its current situation, together with an assessment of eligibility for the second stage. This can take place in organisations such as Chambers of Commerce, business educational facilities or other organisations present across Germany. In a second phase, the firm's management and staff work in-house with an adviser chosen from an approved list (this service is subsidised). Together, they work out and implement a strategy for personnel development in four different areas: leadership, equality and diversity, health and well-being, and knowledge and competences. In the final phase, six months after the completion of the advice phase, the results of the process are reviewed and, if necessary, further advice inputs are arranged.

An evaluation of the pilot phase of the measure found that, between October 2012 und December 2014, 3,000 enterprises received the initial advice and around 95% of these proceeded to the next stage. The evaluation stressed that the expert consultations provided triggered further changes in participating firms and thus led to sustainable developments in procedures. As an example, 68% of respondents to a phone survey stated they were planning further developments within the firm over the next 12 months. The impacts on direct employment are difficult to assess and no hard data are available. The nature of the measure, however, suggests that impacts are likely to be longer-term, maintaining employment and retaining skilled labour in SMEs as much as contributing to further employment and to enhanced skills levels generally, along with greater flexibility.

Building relations with partners

A first type in this category is the general **promotion of networking and of industry-academic cooperation**.

Generally, promoting networking is one of the functions of business associations and Chambers of Commerce, but the aim here is to look at the support for more structured interactions, and particularly those between industry and knowledge institutions, especially universities. Other forms of interaction feature as part of the description of the support for clusters, considered below.

Exploiting the results of research carried out in knowledge institutions is a major issue in the innovation landscape. Europe is historically strong in basic research. It lags behind other developed global regions, however, in its commercialisation. According to OECD (2013), very few European universities are managing to successfully commercialise their patents. In fact, just 10% of universities in Europe account for 85% of the total income generated by inventions.

This is believed to be partly the result of cultural discrepancies between business and academia and a skills mismatch between academia and industry, which means that there is limited cooperation between industry and knowledge institutions. Moreover, a lower proportion of overall R&D is carried out in the private sector in Europe than in its major competitors. According to the 2014 EURAXESS (2015) Researchers report, just 46% of researchers in the EU are based in the business sector compared with 80% in the USA, 62% in China, and 75% in Japan.

This misalignment between research institutions and industry has become a clear issue for European strategies since 2000. The consultation to support the relaunch of the Lisbon Strategy (European Commission, 2005) highlighted the need for a better interaction between industry and knowledge institutions. Horizon 2020 focuses particularly on encouraging these relationships and an important component of the overall programme – the Marie-Skłodowska Curie Actions – aims to facilitate this by encouraging mobility schemes, in which students and academics can gain experience in industry and industry researchers can work in universities.

An example of a mobility scheme between industry and universities that is relatively simple in its design is the longstanding Knowledge Transfer Partnership (KTP) programme in the UK.

KTPs arrange for highly skilled personnel (new university graduates) to be placed in businesses in order to help increase the business' innovative capacity. In contrast to many mobility schemes, where graduates often pursue a higher degree and conduct a predefined research project, the KTP focuses primarily on developing skills in enterprise and innovation rather than furthering academic study, though the university partner gains by seeing research applied to practical problems.

A typical KTP is between 12 and 36 months in length, based on an agreement between the business and the knowledge institution. The costs of the project are supported by a grant - on average annually GBP 75,000 (€85,000). SMEs contribute one third of the costs and larger firms contribute up to one half.

Associates are provided with an intensive, high level training course in aspects such as business skills, project management, business strategy, budgeting and marketing before starting with the business. The measure allows knowledge, technology and skills to be embedded within the enterprise or rather its employees and promotes a change in the culture of the host business. The intention is that the business will continue to innovate beyond the period of the partnership.

From 1982 to 2014, there were 7,412 completed and ongoing projects, involving 5,559 businesses and 176 research organisations/universities. 74% of the associates were men with only one quarter being female.

Employment effects are recorded mainly at the level of the associate. The direct benefits are the experience they acquire by working in a commercial environment and the opportunity to gain additional business and project management experience and workplace skills and qualifications. 52% of respondents to the survey were employed by the KTP partner business immediately after the KTP had finished. Overall, 84% of associates were in employment immediately after completing their KTP. Associates also benefitted from enhanced employment and salary prospects. Generally, each KTP results in three new staff being employed over the project lifetime (an average time period of two years)

and beyond, including the associate, and 31 staff being trained. The skills enhancements are mainly at a high level.

The second category in this section is concerned with the **building of innovation infrastructures and platforms**. These days, these platforms are often online allowing an interaction between partners in an area of innovation to get in touch with each other, to share information and to work on joint projects. Developing new organisations, such as the PL Investment Incubators, or even establishing physical facilities can also be part of this. The category can therefore refer to another dimension of other measures that have been considered, rather than a separate kind of measure.

To a certain extent, this applies to the Laura Bassi Centres of Expertise in Austria, which might have been considered under the category of knowledge centre below, but whose emphasis on networking and building a special type of research environment make them appropriate for consideration under this category, too. The centres aim to create equal opportunities for men and women in scientific and technical work environments, by improving working conditions and promoting skills development and helping to explore and develop new career models and modern work environments.

The thinking behind the measure began in 2005 when it was noticed that hardly any research centres in Austria had female managers. To address this without introducing quotas, it was decided to focus on future potential rather than past professional performance in appointing managers and applicants were invited to present their plans for running a centre over 7-8 years. A condition for approving a centre is that it develops an adequate HR concept. Team orientation, project management and communication skills are important elements. Funding for each centre is up to €500,000, of which €320,000 per year is provided by the state and the balance by participating businesses and universities.

As a key feature, the measure supports centres which are led by excellent female scientists and are situated at the interface of science and the business world in the area of applied and basic research that is attractive to both men and women.

The evidence available on employment aspects is mainly of a qualitative nature. The creation or retention of jobs is not an explicit goal of the measure and this aspect is not monitored. There is no evidence as yet on the cost-effectiveness of the measure or on the impact of the programme on the visibility of female researchers in the science and business communities.

Innovation centres are business support organisations that specialise in the promotion of innovation. They usually have additional features such as workspace or testing facilities and sometimes they can be an alternative name for an incubation centre that promotes innovation, especially if they are offering interaction with knowledge institutions. On other occasions they are simply an entry point for enterprises by which knowledge institutions indicate their openness to working with industry. Many of the features of such centres are covered by other categories.

Knowledge centres are generally more substantial vehicles for joint research by industry and research institutes. In the past, they might have taken the form of Science Parks or Technology Centres, but developments in recent years have put more emphasis on bringing together knowledge and industrial or business capability in a particular location, usually concentrating on a particular sector or technology.

There are a number of initiatives that fit into the knowledge centre category, including Competence Centres in Sweden and the Catapults in the UK, but the example provided is FR Competitiveness poles. These bring together enterprises, research centres and educational institutions in a particular geographic area to develop synergies and cooperative efforts targeted at specific markets. They are thematic and with a geographical focus and from that point of view similar to clusters, but they have an intense research component, which drives them and defines their activity, in contrast to the clusters considered below that are more orientated to markets.

Those joining a competitiveness pole are expected to contribute to its development through participation in collaborative initiatives and innovation projects. By grouping together the different actors involved in research, development and innovation in a particular sector, the competitiveness pole facilitates the launch of joint research activity through access to various types of finance allocated by the French government. Next to money to help with administration of the centres, members have access to the activities of their competitiveness pole (for example, training and networking), funding for

partnership research projects and financing for collaborative R&D projects which bring together at least two enterprises, a public or private laboratory, a higher education institution or a technology transfer agency. All partners in the collaborative R&D projects must be registered as cluster members.

Competitiveness poles are expected to increase levels of R&D investment, which should lead to a direct increase in skilled research jobs. Furthermore, the opportunities for formal and informal networking, information exchange and training may be expected to increase job satisfaction levels. In the longer term, the competitive advantage which is expected to be generated by membership of a competitiveness pole should translate into firm growth, opportunities for entrepreneurship and the launch of new start-ups to commercialise research findings – thus leading to direct and indirect job creation.

Based on data covering the period from 2006 to 2012, an evaluation (Hassine and Mathieu, 2017) found that membership grew significantly over the period under consideration. In 2012, almost 9,000 enterprises were members of one of the 71 competitiveness poles on French territory, as opposed to 4,000 in 2006. The study also showed clear interactions between the poles and other innovation measures and a substantial investment in research and innovation, including an increase in investment in self-financed R&D from 2009 onwards, which amounted to net self-financing of €278,000 in 2009 and €413,163 in 2012. This increase is substantial since it represents on average 26.4% of annual net self-financing over the 2009-2012 period.

In terms of employment effects, the study found that firms belonging to a competitiveness pole hired 2.4 additional people in 2007 (15.5% of the average workforce) and nearly 6 additional people in 2012 (27.5% of the average workforce). This suggests quite a significant employment effect. Evidence of other downstream effects, such as increases in turnover, patent applications, exports or value added, was lacking.

Support for participation in standardisation and **supply chain support** are other categories of the measures which assist enterprises to work together. However, the number of such measures is relatively restricted and no examples are presented in this report.

Cluster promotion, on the other hand, is much more common. Industry clusters are groups of similar or related firms that share common interests in markets, technologies and labour requirements, usually within a defined geographic area, which work cooperatively, together with other interested bodies (especially knowledge institutions and the public authorities), to promote economic and commercial developments. Notably SMEs can find that participation in organised clusters is to their advantage, since they can combine with similar firms with complementary interests and others to undertake research, engage in joint marketing initiatives, develop new markets and jointly invest in training and knowledge creation.

Encouraging clusters is a common feature of modern innovation policy and in the example of Danish Cluster policy (DK Cluster Promotion) there is a consistent approach that not only helps with direct support for 42 clusters across Denmark, but also promotes the improvement of cluster management.

Cluster promotion has been longstanding in Denmark, but the first cluster strategy as such was developed in 2013, when the relevant national ministries, the regional growth forums and Local Government Denmark (LGDK) were brought together in the Danish Cluster Forum. This aimed to provide coherence and coordination in the development of Danish clusters, with the support of a dedicated organisation, Cluster Excellence Denmark.

The aim of the policy is to promote the growth of Danish enterprises and the development of high quality, knowledge-based jobs and, since participation in clusters is promoted across all the regions of Denmark, to encourage a broadly-based improvement of productivity and capacities.

Assistance is given to cluster members and associated enterprises to improve their competencies, interact with knowledge institutions and engage in research and innovation projects, develop their network of existing and new partners, improve their profile and branding and compete internationally.

Support to cluster managers stimulates cross-cluster knowledge and experience exchange, provides thematic workshops on themes like internationalisation, branding and matchmaking and online support tools for learning with case study examples, develops new tools of general interest for clusters and helps with access to finance.

Cluster Excellence Denmark also provides certified benchmark experts and trained assessors to help clusters achieve bronze, silver and gold status in cluster excellence under the European Cluster Excellence Initiative – ECEI, which enables clusters to benchmark their performance against that of other clusters across Europe.

Developing clusters is a relatively long-term process. Impacts on growth, including growth in employment, are an important overall aim, but the key focus in cluster promotion is on strengthening the capabilities of cluster members, so that the cluster as a whole can compete successfully, ultimately in global markets.

Targets are established in a three-year cluster strategy, which currently (2016-2018) includes having at least 2,000 enterprises annually develop new innovations, at least 2,500 enterprises participate annually in partnership projects with knowledge institutions and at least 1,500 enterprises participate annually in international activities.

No information is available on enterprise growth or numbers of persons employed, but interview evidence indicates that in general terms most activities help cluster members to grow, including from an employment perspective.

The final objectives can be seen to be achieved through a systematic development of skills and competencies.

Strategic measures

Strategic innovation measures aim to change the general economic and business circumstances - the context - in which innovation is promoted or to change the innovation behaviour of large numbers of enterprises.

The first type of measure considered under this heading is concerned with **promotion and awareness.** Some campaigns directed at enterprises and/or other partners involved in the innovation process try to raise awareness of the need to be innovative or of the introduction or existence of measures that promote innovation. An example of the latter is the publicity that accompanies the German measure that aims to adapt the labour force to the effects of innovation and competition – DE Enterprise value: People. No other examples are cited, however, mainly because it is very difficult to attribute impacts to such measures, other than assessing how many people have received the message.

The second type are **measures that are part of other strategies,** but nonetheless promote innovation. A prime instance of this is innovative approaches to local economic development, which is illustrated by NL Start-up in Residence Amsterdam. This follows an approach adopted in various Dutch cities, promoting innovation, and especially social innovation. The WAFF innovation and employment subsidy (AT WAFF I&E subsidy) has elements of this, too. Social innovation is defined by the European Commission (2013) as 'new ideas that meet social needs, create social relationships and form new collaborations'. It frequently involves communities seeking new solutions to issues that they face locally, for instance in the delivery of social services.

NL Start-up in Residence Amsterdam contributes to the city's ambition to become one of the top three cities for innovation in the EU. Amsterdam aims to get its inhabitants to contribute to this by collaborating to make the city function better. This strategy has different elements, including social entrepreneurship and social innovation as ways to meet the challenges for which market solutions have not been developed yet.

Start-up in Residence Amsterdam aims to drive and support innovative start-ups, including social enterprises, in the city. It is intended, however, to be a low cost solution with no direct funding available from the scheme, at least initially. Use is made of other available resources, including entrepreneurship prizes and awards, an open approach to engaging with its citizens, mentoring and training, building and leveraging linkages with other delivery partners and the use of the city's procurement powers to promote innovation and new solutions. Links are made with networks of older start-ups who can act as ambassadors, with co-working spaces, business incubators, and the innovation ecosystem generally.

Other Dutch measures, such as NL WBSO R&D Tax credit, are used along with resources, often in kind, from organisations acting as good corporate citizens of Amsterdam, who often provide support in kind (for example, business spaces or mentoring) on the basis of good will towards the city.

The city identifies the key social challenges it wishes to address through the programme and then makes a call for applicants who put forward proposals for solving those challenges. As a project develops, some funding may become available from the department that is interested in buying the planned products or services and, if the innovation is successful, the city will either become a launch customer or invest in and co-fund the venture. Additional funding may then become available to help the beneficiary scale up the solution, so that it can be delivered to the government purchaser.

Success stories to date include interconnected technology to deal with traffic on the Amsterdam canals; using waste plastic as building material for 3D printers and influencing the behaviour of residents in their interaction with other residents, by doing this in a playful way.

While not the main aim, the measure should provide employment for successful start-ups and the employees recruited if the business grows.

For the first two calls, out of some 90 applications each year, 7 enterprises were selected (each year). During the latest call (2017), out of approximately 90 applications, 13 were selected for the programme. Thought has only recently been given to collecting data on performance with regard to employment.

Other strategic measures include the results of new approaches to stimulating innovation, such as 'demand-side' instruments (OECD, 2011). Amongst these is **demand-side procurement for innovation**, where public authorities can use procurement actions to stimulate innovation.

An example is the Small Business Research Initiative (SBRI) in the UK, aiming to use public expenditure in the procurement of goods and services to drive innovation. This enables public sector bodies and departments to receive products and services that better serve their requirements and at the same time promotes innovation and economic growth by stimulating the development of new and innovative solutions.

The SBRI was inspired by a successful 35 year old Small Business Innovation Research (SBIR) programme in the USA, although its implementation after it was announced in 2008 did not progress as smoothly as intended. Responsibility for making use of the programme was devolved to the government departments that were thought to be most able to benefit from it. Nonetheless, the fragmentation of budgets and innovation management responsibilities within individual spending departments meant that the take-up across government and the value of SBRI competitions announced fell well behind the commitment originally made. As a result, although it was not intended that there should be a particular sectoral focus, the SBRI has in practice been applied in specific areas, predominantly the healthcare and defence sectors and, to a minor extent, in home affairs, transport and in energy and climate change.

The thinking behind the measure is that small and medium-sized science and innovation businesses often lack the investment they need to develop new innovations and markets speculatively, and the scale to be able to access the purchasing of government departments. By identifying very specific needs-orientated public sector challenges in government departments and seeking and funding research-based solutions rather than an existing 'off-the-shelf' product, the measure stimulates innovation, which ultimately leads both to better solutions to public sector challenges that improve effectiveness and provide efficiency savings and to the growth of promising innovative businesses.

Funding is in the form of a public sector contract, rather than a grant, which removes restrictions on cofunding and allows for the full costs of development to be covered by the SBRI. It is available in two phases:

- Phase one – with a duration of six months, where feasibility is demonstrated – typically worth between GBP 50,000 (€56,800) and GBP 100,000 (€113,500); and
- Phase two – with a duration of up to two years, where prototypes are developed – typically worth from GBP 250,000 (€284,000) to GBP 1 million (€1,135 million).

If the solution created shows promise, with significant potential cost savings, the government will procure the innovation through a separate public sector contract. The enterprise retains intellectual property and is free to sell elsewhere to government or the private sector.

Between 2009 and 2014, SBRI delivered 215 competitions from 70 public bodies, notably the Department of Health and the Home Office and resulted in 1,850 contracts worth GBP 210 million (€239 million).

Employment effects are not intended, but can be an indirect consequence of the measure. The metrics and indicators of the SBRI programme do not, for the most part, extend to employment and related effects in either the government body administering the scheme or the enterprises that have been awarded contracts. However, SBRI Healthcare, as one of the most successful and researched SBRI programmes in the country, has generated some data on these areas:

- SBRI Healthcare funding enabled the 68 enterprises who responded to the survey to hire 181 full-time equivalent (FTE) staff and to retain another 275 FTE posts;
- In 2015, those 68 enterprises, subsequent to receiving the SBRI Healthcare award, obtained a total of GBP 36.7 million (€41.7 million) in additional investment funding from other sources; and
- The latest SBRI Healthcare Annual Review (2017) puts the number of jobs created or safeguarded at 788 in the first five years.

A range of expected impacts were reported by awardees, including potential National Health Service (NHS) cost savings, valued in the tens of millions of euros.

An interesting employment-related effect of the programme is that innovations developed have not taken sufficient account of the skills and capacity of the NHS staff who implement them. Lichten et al (2017) noted that NHS respondents identified clinical barriers to uptake, including a difficulty in integrating innovations into existing practices and a shortage among NHS staff of the skills required to take up the innovation. This shows that successful innovation not only requires highly skilled staff in the development stage, but also an upgrading of the skills of the staff who implement and make use of the innovation.

Influenced initially by the work of Chesbrough (2003), increasing attention has been paid to the concept of open innovation as a feature of modern innovation processes. In contrast to the secrecy and exclusiveness of traditional corporate research, it is argued that in the information age, openness, external cooperation and interaction with clients and users are more effective in generating new thinking and responding to changing client requirements. As a result, the **promotion of open innovation** has become an element in public strategy, either as part of new thinking on innovation policy generally, for instance as part of the promotion of a quadruple helix innovation system or, as in the case of Austria, by launching an explicit Open Innovation Strategy. However, identifying the employment effects of such policy measures is particularly challenging, precisely because of the openness of the processes promoted.

In contrast, another recent strategic development in innovation policy is **the promotion of smart specialisation**. A smart specialisation strategy is a requirement for receiving innovation funding under the ERDF, but the idea has extended beyond that framework. Essentially, regions need to focus attention on the sectors and areas where they enjoy a relative competitive advantage and seek to build their competitiveness by extensive cooperation between stakeholders, by allowing the natural talents of entrepreneurs to flourish in a process of entrepreneurial discovery and by supporting focused programmes of research and innovation.

This type of measure is illustrated by the Swedish Winter Sports Research Centre (SWSRC) in the Jämtland region of Sweden (SE Winter Sport Strategy). The SWSRC is a competence centre based at the Mid Sweden University. It builds on a strong research base in the field of winter sport and health to develop a competence cluster in the regional economy, but equally with the potential to work internationally. In this case, the region is exploiting factors relating to climate and terrain.

A SWOT analysis developed as part of the innovation strategy lists the geographical remoteness of the region, a low BERD, a lack of regional private R&I capital investment as weaknesses, and a lack of collaboration among regional actors, a diminishing number of student places at the Mid Sweden University (the key higher education institution in the region) and depopulation as threats.

The SWSRC measure uses the competence centre model that is well-established in Sweden as a mechanism for building up regional competence and creating regional knowledge economies. It is a central part of the regional innovation strategy that has been developed in response to the weaknesses and threats identified. The two counties Jämtland and Härjedalen are covered and the innovation strategy has been formalised in the 2014-2020 ERDF programming period as a winter sport-based smart specialisation strategy, in which sport, physical (outdoor) activity and tourism are all high priorities, along with developing a strong human capital potential.

The centre works with local and regional authorities including the regional health authority, sport organisations and local businesses to strengthen the links between academy and industry. The Östersund region (within the larger Mellersta Norrland area) attracts many athletes – most Swedish cross-country skiing and biathlon squads live and train in the town. This development thus had a positive impact on job creation. The aim is to establish and further develop support functions for professional sport in Sweden relating to winter sports and physical activity and health, undertake internationally recognised R&D and strengthen the sport sciences infrastructure at the Mid Sweden University.

The region also hosts a large incubator operating in the same fields as SWSRC and a test laboratory for Olympic winter sports. These assist the process of networking with industry, which is actively promoted by dedicated staff in the centre, who had some success with companies relocating to the region. The centre also established a field station in the skiing town of Åre, which is undertaking R&D in the areas of skiing, cycling and disability sport.

There are no explicit employment goals for the Centre, though contributions are expected in terms of new employment opportunities and a consolidation of the position of staff at Mid Sweden University.

Monitoring, associated with earlier ERDF funding, shows that these projects created six new full-time equivalent jobs by 2013. Two of the new employees were women and four male. In addition, the centre created eight employment opportunities for researchers in a mix of academic and technical (lab) positions. These figures, however, only give an indication of the employment potential.

Reflections on the configuration of innovation support The 15 examples presented cover a broad range of innovation support measures and illustrate the main forms of such measures across Europe.

The categories under which innovation measures have been organised are not totally separated and indeed a number of the measures cited have aspects that might have seen them listed under other headings. This is inevitable, since as measures are developed there is a natural tendency for them to make use of lessons learned elsewhere and both to include elements of other interventions and generally to be integrated into a more consistent and effective overall approach.

It is also interesting to note the dynamic development of some measures over time, according to a changing policy emphasis. For instance, incubators have traditionally provided premises for start-ups as a major feature of their services, but both the Polish Investment Incubators and another Danish Innovation Incubator scheme not considered here for in-depth analysis operate as virtual incubators and have a much stronger emphasis on finance provision than has traditionally been the case. Thus, the distinction between what they do and the services of other measures providing access to finance is less clear cut, especially since most finance measures offered by support organisations now tend to be accompanied by business advice and the encouragement of networking. Apart from the stand-alone measures, even support to individual enterprises can make use of services provided by other agencies. DK Growth Houses, for instance, aim to provide a comprehensive service, either directly or by coordinating input from other specialised advisers (for example on IPR matters) and to coordinate provision at a regional level. This indicates an integration of services, in line with the one-stop-shop objective and is a positive feature of current innovation support policy, adding to its overall coherence.

Another area of development relates to the conception of the centres providing innovation support, where the rationale and practices have changed over time. In the case of incubators there is a clear focus on support for start-ups or enterprises in the early stage of their development, even if the nature of the service has changed. However, the differences between Innovation Centres, Technology Centres, Knowledge Centres and Competence Centres are not so clear. It seems to be a matter of scale to some

extent. Innovation Centres tend to be smaller and aim to facilitate innovation rather than actively pursuing it directly. Some act as a 'shop front' for universities or other research institutes helping enterprises to establish the right contacts within the parent institution. In contrast, Technology, Knowledge and Competence Centres tend to involve a more systematic engagement of industry and researchers through a centre with a physical location, often undertaking research directly focusing on a particular sector or technology. This more active and focused research function may also differentiate these centres from Science Parks, which benefit from close proximity to knowledge institutions, though often with less of a focus on a particular area of expertise or technology. In contrast, there are usually all sorts of virtual connections with other organisations, so that the specific physical location of a centre is probably becoming less important, although it is too soon to say this definitively.

In addition, cultural nuances make the designations of these centres subtly different from one country to another and the desire to keep up with developments can have an impact as particular names seem no longer to reflect recent conceptions. Current conceptions of innovation may make the term 'Technology Centre' seem out of date and 'Knowledge Centre' more appropriate, but there are still a number of such centres that really do focus on the development of a particular technology. A similar dynamic interaction seems to be taking place between the idea of research centres and clusters.

The overall conclusion of this reflection is that there is certain fluidity in the conception and configuration of innovation support. Although this makes categorisation somewhat provisional, in practice it shows that positive experience from elsewhere is being incorporated and innovation support is itself innovative.

In spite of this degree of flexibility, the overall categorisation is useful in indicating different approaches to innovation support. At this stage, this already allows an overview to be achieved of the types of measure that are commonly included in innovation promotion policy. Individual enterprises are supported in distinctive ways but, in many cases, SMEs especially are also encouraged to work with other enterprises and knowledge institutions, public authorities and other partners. In addition, strategic measures guide the direction of development and help to engage all stakeholders in efficient processes leading to innovation.

Comparative analysis of innovation support and its employment effects

The application of the CMO model of realist evaluation allowed the analysis to go beyond the identification of declared outcomes, to consider the context in which measures originated and were implemented and the processes and mechanisms through which this took place. This has revealed important considerations, in relation to the employment effects generated by the measures and the extent to which measures could be adopted more widely. The following table presents an overview of these elements of the findings, followed by more detailed considerations in the rest of the chapter.

Table 5: Summary of findings on each measure examined

Measure	Instrument	Context	Mechanism	Outcomes
		Key CMO characteristics which interact with the instruments deployed but which may also act as drivers or barriers to employment effects		
FR Tax credit	Tax credit	• France is considered to be a strong innovator but has faced some long-standing challenges and economic growth is still below pre-2008 levels. • The Tax credit is one of a number of measures implemented by the French government to bring down firm costs of investment in R&D. • A further contextual difficulty is a high level of unemployment amongst academic researchers following completion of their PhDs.	• The Tax credit is a broad-based measure, aimed at all commercial enterprises, which pay corporation or income tax. • It is a stand-alone measure implemented to help promote an innovation-friendly business environment. It is also one of a series of initiatives aiming to increase private sector innovation, by reducing tax liability. • The ultimate beneficiaries are recent graduates, who should find work more easily as a result of the beneficial conditions provided to enterprises employing them.	• The measure is credited with having increased the number of researchers working in the private sector, although overall evidence on employment is limited. • Weaknesses of the measure include its high cost, and the difficulty of ascertaining a clear link to the impacts (due largely to its broad application and interaction with other measures to promote innovation). • There is also some evidence of displacement (PhD graduates replacing engineering graduates).
NL WBSO tax credit	Tax credit	• The Netherlands is an innovation leader. The measure was designed as part of a policy shift away from relatively ad hoc industrial policy interventions, towards a technology policy to support innovation, R&D and technological change to create an innovation-driven economy. • When the measure was implemented, much R&D was being done by a handful of multinationals. The measure wants more SMEs to carry out R&D.	• The measure was designed to make a direct impact on beneficiaries' activities. It is simple to administer and monitor. • The measure is a particular type of tax credit affecting employment directly, since it offers reductions in payroll taxes. • The measure is the major tax credit instrument in the Netherlands. Other tax measures allow deductions against corporate income tax rather than payroll taxes.	• Positive quantitative evidence on employment (in terms of additional hours spent on R&D). • Evidence also suggests outcomes are sustainable (long-term). • The measure results in users being able to reward researchers better and retain them longer. The measure has also supported the development of capability within enterprises to better absorb knowledge, thereby creating a better working milieu for knowledge workers.
AT WAFF I&E subsidy	Encouraging entrepreneurship	• Instrument specific to Vienna city and the post 2008 environment. • In general, Austrian framework conditions are very supportive of business R&I. • As part of its innovation strategy, Austria has put in place numerous measures in order to encourage enterprises to strengthen the basic conditions fostering innovation.	• Funding is provided to SMEs for training of staff, consultancy, and to pay for 'innovation assistants' needed to develop the projects. • Social innovation was introduced as a criterion in 2013. It was hoped to create more jobs for older employees, temporary workers, and improve gender equality. • Applicants are selected on a first come first served basis.	• Limited effects, with fewer than 100 new jobs created per year (reasonable, given the annual budget of €2.5 million). • The wide range of innovation projects eligible is a positive aspect of the measure, whereas the limitation to firms based in Vienna will necessarily limit any economies of scale and spill-over effects to rural or less innovative regions of the country.
EE Innovation voucher	Innovation voucher	• Estonia is a Moderate innovator but with proven potential in R&I. • A main weakness in the Estonian business	• Small instrument providing for initial cooperation but with potential to change perceptions.	• The measure develops collaboration between enterprises and research institutions. • Enterprises that have received grants through

Measure	Instrument	Context	Mechanism	Outcomes
		Key CMO characteristics which interact with the instruments deployed but which may also act as drivers or barriers to employment effects		
		landscape has been the relative lack of investment in R&D by enterprises and a lack of cooperation between enterprises and innovation service providers, such as research institutions. • The need to offer the kind of services offered by this measure is set out in government strategies.	• The mechanisms for implementing the measure are relatively straightforward. Once the application is approved, the enterprise approaches the research partner and requests the agreed service, which is then delivered. • The long-term aim is to promote a certain behavioural change, which results in the transformation of the partners' existing development processes.	this measure showed greater increases in revenue, exports, the number of employees and higher remuneration levels and R&D investment. • The measure has increased the willingness of enterprises to invest in R&D by changing their attitudes. • The measure could have a detrimental effect on universities' essential purpose, however the monetary value that the research institutes receive is very small.
IT Smart&Start	Creation and development of innovative start-ups	• Moderate innovator with high regional disparities. • National measures, but with priority given to less developed regions. • Legislation on innovative start-ups providing overall framework.	• Funding provided through a simple delivery mechanism and on a first come first served basis. • Targeting very young start-ups.	• Positive impact on direct job creation. • Indications that the measure is having a specific positive outcome on direct employment in less developed regions (but less so with regards to supporting female-led start-ups).
PL Innovation Incubators	Incubators/ facilities	• Poland is a moderate innovator dominated by heavy industries. • Considerable spending on R&I infrastructure in the last decade. The instrument was developed along the lines envisaged in 'Dynamic Poland 2020'. • Recipient of considerable ESIF funds.	• The measure combines advice and business development with access to finance. The idea was to create a whole path of public support at the various development stages of a business venture. • The measure intended to increase the number of innovative businesses in the Polish economy and counteract the lack of institutional arrangements that could support start-ups.	• Positive employment effects in the short-term, but the longer-term employment impacts depend on how the supported companies develop. • Contribution to the creation of the Polish start-up ecosystem. • There may be labour market constraints on the future development of the enterprises concerned, since there is a lack of highly skilled employees.
DK Growth Houses	Business advice and direct support	• Denmark is considered to be a strong innovator and has developed a series of strategies for growth, research and innovation, participation in the knowledge economy and globalisation in the past decade. • The establishment of the Growth Houses in 2007 as a regional system of business support coincided, and was partially inspired by, a reorganisation of local government in Denmark	• The Growth Houses were established to provide a reliable 'sparring partner' to collaborate with enterprises and employers with an evident growth potential and ambition. • Growth Houses also help with awareness raising and business information, specialised sectoral support or help with addressing particular business issues, including a special	• The full range of employment outcomes includes absolute increases in employment and growth in productivity. Growth over a longer period may also be anticipated. • Some displacement effects are anticipated, arising from the increased competitiveness of the firms assisted. • The effects on working conditions are less visible, yet the measure depends on the

Measure	Instrument	Context	Mechanism	Outcomes
		Key CMO characteristics which interact with the instruments deployed but which may also act as drivers or barriers to employment effects		
		and the creation of five new regions.	'early warning' programme to assist enterprises that have run into problems.	enhancement of the skills and capacities of the enterprises involved.
DE Enterprise value	Business advice and direct support	• Germany is a strong innovator. The measure aimed to improve skills levels and promote a new work culture in Germany, as a basis for innovation and competitiveness. The measure was motivated by the threat posed by low levels of unemployment to German SMEs' ability to retain skilled staff, who are crucial for innovation.	• The measure should help SMEs retain skilled personnel. • The instrument is designed as an SME subsidy to carry out consultations to improve firm internal processes with the ultimate goal of retaining skilled personnel.	• The programme adopts a long-term perspective, to transform beneficiary firms' thinking and organisational management. • The impacts on employment are largely indirect, but there is a direct impact from the measure on skills levels and on working conditions.
UK KTP	Networking/ Industry-academic cooperation	• The UK is an innovation leader in the latest Innovation Scoreboard. The KTP programme is based on a longstanding aim of innovation policy to improve the links between research institutions and industry and particularly to encourage knowledge transfer. • The programme first existed as a stand-alone programme, but recently there has been increased integration of it as a central part of UK innovation policy.	• The measure takes the form of a mobility scheme, which involves an associate coming from one type of organisation (usually a research institution) working in another (for example, a business). • The measure is designed to be a mutually beneficial and structured partnership between an academic institution and a business with a need for an innovation input. The active support of the research institution is important.	• The measure enhances the employability and career progression of the associate over the longer term. • The purpose of the measure is also to enhance both the skills and experience of the associate and the capabilities of the host. • The measure also promotes a change in the culture of the host business, including the working conditions of the firm.
AT Laura Bassi Centres of Expertise	Building innovation infrastructures and platforms	• Austria has invested in improving innovation in the last decade. As a small country, encouraging women R&I centre leaders would improve overall capacity and competitiveness. • An important high-level goal is to improve working conditions and create equal opportunities for men and women in leadership roles in research and industry.	• The measure supports the creation of research centres focusing on the promotion of female research excellence by supporting female centre leaders and the generation of innovation through linking these centres to businesses interested in applied research.	• The centres play a useful role in enhancing cooperation and bridging cultural and communication gaps between the business and science communities. • The measure is small in scale, and does not have a great impact on employment locally. • The key strength of the programme is that it tries out new approaches to research management.
FR Competitiveness poles	Knowledge centres	• France is a strong innovator but has faced some long-standing challenges and economic growth is still below pre-2008 levels. • Innovation is seen as a way of future-proofing the economy and ensuring growth.	• Active encouragement of collaborations between businesses, start-ups, universities and public research laboratories present on the same territory. • High regional relevance, with each territory specialising in a different area. • Focus mainly on collaborative R&D projects,	• Direct effects on job creation, including a higher rate of personnel growth compared to other (non-participating) firms.

Measure	Instrument	Context	Mechanism	Outcomes
		Key CMO characteristics which interact with the instruments deployed but which may also act as drivers or barriers to employment effects		
			providing training, equipment and physical premises as well as financing opportunities.	
DK Cluster Promotion	Cluster promotion	• Denmark has a long history of encouraging cooperation between enterprises in clusters. • A joint ambition of the Danish government and regions is to strengthen growth and knowledge-based development through clusters and networks. • In 2013, the Cluster Forum was established with the aim of supporting cluster development across Denmark.	• The aim is to help enterprises to speed up their innovation processes and to achieve commercial success, by working in clusters. • There are two target groups: the enterprises that can increase their competitiveness and grow through cluster involvement and networks, and the cluster managers, who can help their members to benefit from the support.	• Although the Danish cluster policy is assumed to be creating jobs, its main focus is on the development and competitiveness of the Danish economy and particularly its small firm sector. • There is therefore little information on growth and employment outcomes, although information from interviews suggests that they may be substantial.
NL Start-up in residence Amsterdam	Measures that are part of other strategies, such as local economic development	• The measure is included in Amsterdam's local strategy to strengthen social innovation in the city, as part of its local development strategy. • Low cost measure which aims to transform the bureaucratic nature of city purchasing activities which are often closed to SMEs and innovation, a result of which is that new products and services are not always being acquired by the city government.	• Using demand side (public sector procurement) stimulation as well as training etc., the measure aims to (re)vitalise the city and its buying processes, while supporting the entrepreneurial culture. • The main support provided by the measure is training of entrepreneurs – there is no funding attached. • The city identifies the key social challenges it wishes to address and then does a call for proposals.	• It appears that small but sustainable employment has been created. • The scheme can stimulate innovation because it is based on an identified procurement need and the requirement for a solution for that need. • The scheme provides the opportunity for social innovation initiatives for local people who might not otherwise be employed.
UK SBRI	Demand-side procurement for innovation	• The UK suffers from long-term low productivity. The measure aims to boost productivity and competitiveness of businesses. • The UK has been slow to develop demand side measures. • The SBRI is a replication of a successful 35-year programme in the USA.	• The measure assists in the development of products and services with the potential to become solutions to public sector problems. • The main mechanism for implementation is the funding of contracts through open procurement processes, involving a two-stage process – development of an innovative solution and procurement.	• Employment effects are an indirect impact of the measure. • However, some evidence shows important impacts on job creation and an increase in investment from external sources leveraged by the SBRI.
SE Winter Sport Strategy	Smart specialisation	• Sweden is an innovation leader but the region deploying the measure has a small population, is remote and dominated by traditional industry, but with growing 'knowledge industries'. • The region hosts one university, which is a former polytechnic.	• The measure is a long-standing (proven effective) instrument used across Sweden but redesigned to fit the Regional Innovation Strategy and forthcoming smart specialisation strategy. • Instrument provides 5-10 year support but	• Outcomes observed in the university as well as in participating industries. • Outcomes positive but incremental and not well documented. • Range of outcomes on skills development and employment.

Measure	Instrument	Context	Mechanism	Outcomes
		Key CMO characteristics which interact with the instruments deployed but which may also act as drivers or barriers to employment effects		
		• Human resources (local population) are a recognised strength.	requires collaboration to build long-term/sustainable relationships across sectors. • Long-term strategy required but also ability to maintain flexibility.	• Outcomes likely to be sustainable as the higher education element helps to create long-term interest in the area (graduates with directly applicable skills).

Source: Authors

The policy and institutional context

There are two significant factors in the policy context of the measures considered, in terms of determining the type of measure that can be adopted elsewhere and the ways that they can be implemented. The first is the state of development of the innovation culture across the countries and regions of the EU and the way that this is reflected in institutional arrangements and the second is the overall orientation of the policies that have given rise to the measures, in terms of their objectives.

The countries' innovation culture and institutions

Significant differences might be expected between the measures adopted in countries at the different levels of innovation performance as indicated by the Innovation Union Scoreboard. However, in terms of the types of support actually analysed there was little to choose between the innovation leaders and strong innovators. Nearly all the measures considered could easily have been adopted in countries in the other category of innovator, although similar measures are sometimes operated more effectively in some countries than others. The real contrast was between the countries in the first two innovator categories and moderate innovators, which face substantially different issues. As illustrated by the examples from Poland and Estonia, for moderate innovators it is still a matter of building innovation support infrastructures and access to finance, of having an impact on the expectations of enterprises, and generally of building an innovation culture. With the other groups, it is more a question of developing existing structures and engaging a wider group of enterprises. It is also the case that all three countries in the moderate innovator group rely quite significantly on ESIF funding for their support measures and this introduces other factors in terms of the measure design, administration and assessment of achievements. The experience of the three moderate innovator countries could be more immediately relevant for other countries in this group than some of the more complex measures among the innovation leaders that in some cases have taken a long time to develop. However, this is not to say that all the measures highlighted from countries in the first two groups would be irrelevant for moderate innovators, as long as they have the enterprise culture and the required institutional arrangements. A tax credit incentive, designed to stimulate BERD, could easily be as applicable for moderate innovators and lessons from the operation of DK Growth Houses could easily be applied across all EU Member States.

Differences in innovation culture and performance exist between and within Member States. Certain regions within countries are clearly more innovative than others, as indicated by the Regional Innovation Scoreboard (European Commission, 2014). These differences should be taken into account when implementing new measures. Yet, transferring measures from one environment to another can sometimes take advantage of common institutional and cultural features and ease the process.

Differences in innovation culture and in institutional arrangements relating to the number and nature of support organisations, the accessibility of finance etc. do affect transferability, but the assessment of the adaptability of the measures considered is that in general it is more a matter of appropriately modifying or fine-tuning a measure in response to these differences rather than of encountering insurmountable barriers.

Similarly, other differences in institutional and legal frameworks across Europe and business culture have not been seen to affect the transferability of measures greatly, when compared to their appropriateness in terms of a country's innovator status.

The policy objectives of the Member States

Perhaps of greater significance are the differing objectives of policymakers responding to varying levels of unemployment. Where unemployment levels remain high, there is a tendency to focus on measures that promote economic growth and corresponding employment growth as such, but in countries where unemployment has come to levels that have started to reveal labour shortages in some sectors, measures promoting skills development or dealing with gender balance or combatting exclusion will have a higher profile.

DE Enterprise value: People, which aims to improve skills levels and promote a new work culture in German SMEs as a basis for innovation and competitiveness, was motivated by the threat posed by low levels of unemployment to SMEs' skilled workforce in a competitive labour market. This arises

because larger firms are better able to pay more in a tight labour market. IT Smart&Start, in contrast, attempts, at least in part, to create opportunities for young graduates starting up in business, especially in the south of Italy, where there are difficulties even for well-qualified young people.

More generally, the policy orientation that gives rise to innovation measures in the respective countries can be seen to have a major effect on the extent to which employment issues are part of the design of the measures adopted. Where, as is generally the case, policy focuses on the promotion of innovation as such or economic growth, employment is a welcome by-product or, at best, a parallel objective. This can be reinforced by institutional arrangements, where the government departments responsible for innovation are not those responsible for employment or education and training. The individual measures examined appear to confirm the situation observed at European level, where in spite of general declarations of an intention to create jobs, actual innovation policy design tends to neglect employment and related considerations.

This can be observed in the case of DK Growth Houses, whose policy objectives are to promote growth and improvements in productivity in the Danish economy. Applying in effect the production function model, innovation is seen as an input into the growth process, which is then measured in terms of growth in turnover, employment and exports. However, it is also implicit in the measures making use of knowledge or competence centres, such as FR Competitiveness poles and SE Winter Sport Strategy, which are orientated to generating innovation, as part of more general growth and competitiveness policies. Again employment is expected to result, but it is not a primary objective.

Even in the cases where measures focus on the employment of graduates, such as UK KTP or IT Smart&Start, the policy objective is to improve innovation in SMEs rather than to create employment as such, though especially in the Italian case the employment outcomes are regarded as an indicator of success and are monitored as such.

While all the measures considered focus on growth and competitiveness as policy objectives, the extent to which other objectives are built into the design of the measures, and the corresponding outcomes are monitored, varies considerably. Some of the measures, such as the DK Growth Houses and DK Cluster Promotion, have very specific growth or innovation targets. Others have a broader range of objectives, sometimes including employment - such as the creation of employment in AT WAFF I&E subsidy - and the promotion of employment conditions that are more conducive to generating innovation or more specifically to pursuing better gender balance - such as in AT Laura Bassi Centres and IT Smart&Start.

The Laura Bassi Centres have a major objective of promoting female contributions to knowledge creation and innovation and have consequently modified the way that the knowledge centres set up under the scheme operate. Here, the policy is a way of improving the effectiveness of innovation processes, as much as achieving social outcomes. Better engagement by women in research and innovation processes will lead to a broader base for innovations. In the case of IT Smart&Start, the measure itself has not been specifically designed to encourage more female participation, but at least this aspect is monitored and action is taken to try to improve the gender balance.

Implementation processes and mechanisms

Many of the evaluations considered in this study failed to give an account of the processes and mechanisms employed in the measures they were evaluating. This is a common problem in evaluations, where the tendency is to focus on the outcomes that correspond to the main objectives of a measure, without much attention to how they have been generated. The theory-based realist approach adopted for this study emphasises the need to fill this gap while examining the selected measures. Evidence was sought on the nature of implementation mechanisms from interviews and published reports and, in some instances, through a re-interpretation of evidence available in evaluations of particular measures.

This approach to assessing the measures has revealed employment effects that are generally not taken into account in the published evaluations. This is an important finding of the study that has major implications for the future modelling of innovation measures that pay greater attention to the

employment dimension of innovation processes. However, it is first necessary to describe some of the other aspects of implementation processes that will help clarify the overall picture.

The targets of the measures

The measures described operated at three different levels, with correspondingly different target groups. The **main explicit target for measures** directed at individual enterprises are private sector SMEs, though measures are often open to larger enterprises and other organisations that cooperate with enterprises, particularly in research activities. A broad distinction can be made between measures that support start-ups and those that offer support to more established enterprises. IT Smart&Start encourages young people to start their own businesses, while PL Innovation Incubators ultimately aims to promote start-ups across Poland in a series of advanced sectors. NL Start-up in residence Amsterdam also promotes start-ups, including social enterprises. Most of the others, by the nature of the processes they support, are directed at already established enterprises, although some, such as DK Growth Houses, can support enterprises at both stages of their life cycle.

DK Growth Houses is also an example of a more selective measure, in this case by restricting assistance to enterprises with the potential to grow by 20% in the three years, after an initial diagnostic assessment.

Both measures that encourage interaction between enterprises and other organisations and the more strategic measures generally make provision for involvement of knowledge institutions and public authorities. For instance, in the case of DK Cluster Promotion, these organisations can become members of the cluster and benefit from cluster support. Smart specialisation (SE Winter Sport Strategy) requires interaction between all the key players, especially if there is to be support from the ESIF.

Some measures, such as PL Innovation incubators, are directed at organisations that can provide support to SMEs, so that SMEs are the indirect or ultimate beneficiary.

Overall, given the focus of the study, enterprises are the main beneficiaries in the measures considered. However, the analysis of the measures' mechanisms and processes showed a more nuanced picture of the beneficiaries. In all analysed measures, enterprises benefit, but also their employees, although to a varying degree. From examining how the processes actually work, measures appear to require inputs, mainly from highly-educated or skilled workers, as in the tax credit schemes (FR Tax credit and NL WBSO R&D tax credit), in IT Smart&Start, in UK KTP and in SE Winter Sport Strategy. Alternatively, the skills development, competence enhancement and institutional learning that result from participating in the measure are mainly at the level of management or staff involved in the innovative developments, as in both Danish examples. In the case of the KTP programme, the measure had a direct effect on the employment prospects and subsequent salaries of associates involved in the scheme. These are graduates with transferable skills. It may be supposed that this happens with other schemes too, though there is no specific related evidence available.

Some better and more interesting jobs, therefore, are definitely either created or result from innovation and innovation support – although some jobs are also displaced (as indicated by FR Tax credit), but it is often not clear what happens to other employees in the firm. The KTP programme has evidence that, on average, another three jobs in the firm result from the placement of a graduate associate. There may also be a leavening effect within the firm from participating in innovative processes, due to the deriving changes in the dynamics within the firm. Skills may be passed on to other employees and attitudes and approaches may evolve, so that the enterprise as a whole is affected. The DE Enterprise value: People measure specifically aims to change employment relations in firms as part of the creation of a workforce ready to contribute to innovation and this is also part of the Austrian WAFF innovation and employment measure. But generally, this is a neglected side of the process. The focus is all on generating the innovative product or process, with little attention to the people who will have to create and deliver the new good or service, and also sell it, if the innovation is to be successful commercially.

A final element concerning the individual beneficiaries of the measures relates to specific groups, and especially to gender aspects. The AT Laura Bassi Centres of Expertise stand out in making the promotion of gender equality in research and innovation an explicit objective of the measure, though

there were elements of this in the IT Smart&Start measure, where female entrepreneurs can receive additional assistance, and in the UK KTP programme, where gender participation is monitored, but it turns out that only 25% of associates are female. The AT WAFF innovation and employment measure also seeks to involve other excluded groups.

Organisations delivering support

The measures considered were all supported by public funds and were delivered mainly by public agencies initially, though often in the form of funding for private sector or voluntary not-for-profit organisations. In these cases, the inputs of the two sides are integrated and there is nothing in the evidence that would allow the effectiveness of one part to be distinguished from that of the other. Moreover, the initial intention of the study was to include initiatives from social partner-based organisations as well and some interesting measures were identified. However, generally, these initiatives have not been subject to formal evaluation and they were excluded from the study.

The two tax measures in France and the Netherlands (FR Tax credit and NL WBSO R&D tax credit) were provided directly by the state taxation authorities and the SBRI procurement of innovation measure in the UK was also administered directly by government departments and the National Health Service. Generally too, ministries or state agencies have ultimate responsibility for implementing measures. In the case of measures with support from the ESIF, this happens through the designated management authorities. Frequently, however, measures are handed over to other organisations for day-to-day implementation. These may be more operational public organisations, such as the Growth Houses in Denmark or Innovate UK administering KTP or the Austrian Research Promotion Agency (FFG) which administers the Laura Bassi Centres. Or they may be regional or local organisations, such as the Vienna Employment Promotion Fund in the case of the WAFF I&E subsidy or the City of Amsterdam supporting Start-up in Residence Amsterdam. In other cases, bodies or individual organisations may be appointed to administer measures, usually after an open call for proposals. This is the case with bodies running knowledge centres, such as those in the Austrian, French and Swedish examples (AT Laura Bassi Centres of Expertise, FR Competitiveness poles and SE Winter Sport Strategy) and the Polish Innovation Incubators, but an open call has also been made for individuals or organisations to implement the DE Enterprise value: People measure. The people appointed range from individual consultants to Chambers of Commerce. Other measures also involve a range of actors in the final delivery process. DK Growth Houses use private consultants to provide some advice and related services and the Knowledge Centres and the DK Cluster Promotion measure also have staff and external consultants providing services to enterprises.

Overall the measures selected reflect a trend away from providing direct financial support to enterprises in the form of grants, especially in relation to support for innovation. The AT WAFF I&E subsidy provides a subsidy and EE Innovation vouchers is another where firms are given grants, though they are fairly constrained in terms of the advice services they can purchase with them. Obviously, tax credit systems leave more money in the hands of enterprises, but may also be seen as subsidising specific activities (especially the recruitment of skilled researchers). IT Smart&Start provides loans to enterprises supported and PL Innovation Incubators provides equity investment. Funding in the form of contracts for innovative developments is available under the SBRI procurement of innovation in the UK and NL Start-up in Residence Amsterdam. Otherwise, the support is in the form of facilitation services, some of which the enterprises have to pay for, although at a subsidised rate.

The types of support provided

Some of the measures provide financial assistance, but all of them support beneficiaries to go through a learning process and usually to develop skills and competences.

All of the measures prompt enterprises to change their behaviour and often their attitudes. This is a characteristic of even the simplest measure considered – EE Innovation vouchers, but almost all of them, including the Estonian case, also go on to offer some form of guidance or advice. With DK Growth Houses, IT Smart&Start, PL Innovation Incubators, DK Cluster Promotion and arguably others, the process involves identifying the weaknesses in the management or other activities of the beneficiary enterprises and then assisting the enterprises to address them, with tailored advice or

training. Sometimes, the learning process can be relatively informal, such as when measures put enterprises in contact with other firms, knowledge institutions or other organisations from whom they can learn or when they are assisted in making applications for research and innovation projects. On other occasions, it can be more formally structured, either through tailored training courses or as in the UK KTP scheme by bringing external expertise into the firm.

These processes may identify new opportunities for the beneficiary enterprises, which is itself a kind of learning and, more generally, aim to build the capacity of the firm over the longer term, increasing its effectiveness and efficiency. Most measures involve processes that improve the skills and competences of the enterprises with which they work. This inevitably means building the skills and competences of people who work in these enterprises - an important labour market development having an impact on aspects such as subsequent earning capacity. Nonetheless, this major employment-related effect is largely hidden and generally remains unquantified.

The effects of processes that give rise to more general changes in the orientation and culture of the enterprises receiving support and change the environment in which they operate are also largely hidden and unquantified. Some measures, such as PL Innovation Incubators and NL Start-up in Residence Amsterdam, aim to change the institutional arrangements that are available for enterprises, in that they set out to develop new institutional forms of support and finance. Others, such as EE Innovation vouchers and UK KTP, explicitly aim to change attitudes and perspectives in enterprise management or more generally within the enterprise. Others again, such as both DK Growth Houses and DK Cluster Promotion, and the measures that are focused on research collaboration (AT Laura Bassi Centres of expertise, FR Competitiveness poles and SE Winter Sport Strategy) change the relationships between beneficiaries and other enterprises and organisations with which they collaborate. All these changes in the way that enterprises work often involve new learning and new skills development, and more broadly they also impact on the way that enterprises operate in an innovation economy, notably by encouraging them to work cooperatively with other enterprises and organisations active in the innovation landscape.

The types of innovation supported

The findings of the Simpatic project (2014), referred to in the literature section, provided evidence of a significant positive impact on job growth from marketing and organisational innovation as well as from product innovation. It also showed that process innovation had no significant impact on job growth. In view of these findings, there has been interest in which types of innovation the measures under consideration in the study focused on and the extent to which this was the case.

DE Enterprise Value: People is a clear example of promoting organisational innovation; it does so by concentrating on adapting skills and competences to meet the changes that arise from innovation and competition. NL Start-up in Residence Amsterdam stimulates social innovation, not least through the use of procurement of innovation, and AT WAFF I&E subsidy also encourages social innovation. But the predominant forms of innovation supported by other measures considered are product and process innovation. In some cases, such as the two tax credit measures, this is as a result of eligibility conditions, although the criteria have been relaxed to some extent in more recent years. In other cases, even if the measure is open to marketing or organisational innovation in principle, in practice most of the support goes to product and process innovations. None of the measures are able to quantify the distribution between the various innovation types and their relative impacts on growth and employment. In view, however, of the restricted number of cases involving marketing and organisational innovation, to the extent that the study has been able to identify employment effects, these should mainly be attributed to product and process innovation.

It also has to be said that a lack of evidence on performance in general inhibited the study in looking at other specific examples of marketing or organisational measures. For instance, the measure '[Meetovation]' promotes pure organisational innovation in that it aims to make business meetings more efficient, but there are no evaluations and the evidence primarily relates to analyses of the Return on Investment (RoI) of the participating firms.

A significant question is whether the preponderance of innovation support going to product and process innovation reflects a bias against marketing and organisational innovation or is in the nature

of things. It could be that the opportunities for product and process innovation, and their impacts on productivity and hence competitiveness, are still greater than those for productive marketing and organisational innovation, even in an economy dominated by the service sector. Alternatively, the situation found could reflect a continuing bias derived from persisting notions of technological determinism, which is part of a more general neglect of the employment dimension, in that the focus on technical change diverts attention from the human dimension.

Employment and employment-related outcomes

Direct employment effects

The most general finding of the study is that many of the innovation support measures analysed do not explicitly aim to promote employment or employment-related effects, although these are often assumed to accompany the measures. The most widespread employment impact among the measures considered, both in terms of measure design and evidence on outcomes, is **direct employment**. This usually arises because a frequent objective of measures is economic growth and this is assessed in terms of turnover growth, but also in terms of employment creation and sometimes exports. Evaluations then devote a good part of their analysis to establish the extent of the growth achieved, of which employment creation can be an indicator.

The PL Investment Incubators and the DK Growth Houses are examples where the employment effects are evident because **enterprise growth** is measured in employment terms (as well as growth in turnover). In contrast, assessments of other measures - especially of those that involve complex interactions to generate their effects - do not attempt to estimate growth effects, including employment, mainly because the time period over which these effects are felt is too lengthy. DK Cluster Promotion is an example.

This employment growth, in fact, is measured over different periods. Some of the measures that have been in place over a long period, such as the tax measures, can have data that allow for time series studies. However, employment growth is mostly referred to over a year or the length of the programme. In the case of DK Growth Houses, it is measured over two years after the beginning of the assistance provided and compared with the growth of a matched control group of enterprises. This means that only limited evidence exists on the longer-term effects of the measures.

Some projects, such as the AT WAFF I&E subsidy, explicitly aim to stimulate both innovation and employment - although, in this specific case, the relatively small budget of the project also means that the effects reported are relatively small-scale (fewer than 100 jobs created). This case also aims to improve **job quality and social inclusion**.

Employment of specific groups

Some measures demonstrate a consciousness of the range of effects behind an overall figure on employment creation and have a focus on specific target groups/beneficiaries or employees' characteristics. First, there is an apparent difference between measures that support start-ups and those that support more established enterprises. The former appear initially to have a greater impact on employment than the latter. IT Smart&Start had generated nearly five jobs per enterprise supported by 2017. The PL Innovation Incubators also had a positive impact. In the 1,226 companies in which the incubators invested, 1,404 permanent positions and 1,991 temporary posts were created. Equally, the growth rate of start-up enterprises supported by the DK Growth Houses was 18.6% (over a two-year period) as opposed to a growth of established enterprises of 11%. However, a series of considerations qualify this conclusion. The resources made available in the Italian and Polish measures were much greater than in measures that support established enterprises, such as the AT WAFF I&E subsidy and the EE Innovation vouchers. The PL Innovation Incubators' cost per permanent post was approximately €138,000 in the period up to mid-2017, whereas the cost per job of the AT WAFF I&E subsidy was approximately €25,000. Using percentages can also be misleading when start-ups generally start at a lower base. Start-ups supported by the DK Growth Houses created 231 jobs (an average of 0.9 jobs per firm supported) but established enterprises created 2,024 jobs (an average of 1.8 jobs per firm) over the two years to mid-2016. The impacts of start-up schemes also relate mainly

to a short time period of around two years. Assessment of the longer-term impacts should take into account the relatively high failure rate among start-up enterprises. Eurostat (2018) reports that less than half of the enterprises born in 2010 were still active in 2015.

There can also be differential effects in terms of the characteristics of people employed (such as age and gender) and some evidence was found on these issues, particularly where addressing them had been built into the measure's design, as in IT Smart&Start or in the AT Laura Bassi Centres of Expertise. The latter supports the creation of centres of innovation and knowledge where scientists work with SMEs and large firms, universities and other organisations to research innovative ideas. However, the centres also put an emphasis on equal opportunities for both men and women in scientific and technical work environments and aim to attract female scientists as part of a modern research culture that is appealing both to men and women. Similarly, AT WAFF I&E subsidy aims to combine innovation support, including social innovation, with the creation of jobs and/or the improvement of the quality of jobs and sees this as including developing opportunities for older employees and employees with a migration background and promoting equal opportunities between men and women. There is no evidence provided, however, on the extent of these effects. Data are also very limited or non-existent on other employment circumstances relating to ethnicity, sexual orientation or social status, disabilities or other physical or mental handicaps or to discrimination that can arise from social stigma.

Employment of skilled staff

The measures that most directly target employment are those that aim to promote the **employment of specialised staff**, usually researchers. Most of these measures set out to encourage a transfer of knowledge from universities or research institutions to enterprises and see this happening either by the exchange of staff for a certain period or the direct recruitment of researchers. UK KTPs aim to link innovative businesses with research organisations and academic institutions and provide and build highly skilled personnel. SE Winter Sport Strategy encourages collaboration between the university, firms and public actors, which is assumed to lead to increased mobility within the region as a whole. The tax credit measures (FR Tax credit and NL WBSO R&D Tax credit) both encourage the employment of researchers and the French scheme has a specific element known as the Young PhDs initiative. Interestingly, the UK KTP programme is a mechanism that is seen to be better suited to businesses with a degree of existing innovative capacity and the resources to commit themselves to research and innovation, while a notable development with the Dutch WSBO scheme is that in recent years it has been taken up by a growing number of micro enterprises, suggesting that tax credit schemes may be more appropriate for the smallest businesses.

The measures that promote **mobility** between enterprises and knowledge institutions are also (not surprisingly) the main ones, among those examined, that support labour market mobility as such. IT Smart&Start, which encourages start-ups, also promotes an element of mobility by bringing staff into new employment positions, but otherwise this theme is not evident beyond the measures concerned with knowledge transfer that typically involve people moving their work location from a knowledge institution to an enterprise, along with a corresponding change in role, usually in the direction of more applied research and development.

More generally, the promotion of the **up-take of skilled staff** is in line with the policy theme that innovation promotion is associated with the creation of high-quality jobs. There is an issue in relation to the FR Tax credit scheme of whether the new positions are substituting post-doc staff for qualified engineers, and displacement is a possibility in relation to many of the other measures, though no evidence is provided in these cases. Overall, however, the evidence cited seems to confirm that there is a significant net creation of high quality jobs associated with several of the measures under consideration in this study.

Another important aspect to consider is the impact of measures on the **existing workforce**, especially those envisaging the recruitment or bringing in of specialised staff from outside the enterprise or schemes promoting the transfer of knowledge from research institutions. In these cases there is an assumption of a spill-over or leavening effect, whereby the existing workforce learns from new skilled workers by a process of osmosis, but in general little or, more usually, no evidence is provided on this

effect. There is evidence in relation to the NL WBSO R&D Tax credit scheme that some of the expenditure is on existing staff rather than on recruiting new staff and a number of measures aim to improve the skills and competences of the workforce, by developing existing staff (especially managers) at the same time as bringing in more qualified staff members. Furthermore, the description above of those implementation mechanisms that help to develop a more entrepreneurial culture among managers and employees suggests that there are also changes taking place in the general entrepreneurial environment, even if it is difficult to assess them.

Development of skills and competences and broader impacts

There are also a series of measures that see the **development of skills and competences** more explicitly as the means by which to deliver other economic and social objectives. In AT Laura Bassi Centres of Expertise, developing the skills of women researchers is seen as a way of broadening the input into research and innovation, while addressing gender imbalances. For other measures, as explained above, the development of skills and competences is part of the mechanism for delivering other goals rather than as an objective in itself, even though such developments can have long-term effects on the capacity and productivity of an economy. In the DK Growth Houses, developing skills, knowledge and competences is a central activity that defines the measure, despite not being stated as an objective nor assessed in evaluations, even as an intermediate output.

In one instance however, skills development is the central focus. DE Enterprise value: People explicitly aims to address the skills side of innovation and economic change as part of a national strategy. This is done through a systematic approach to developing innovative human resource policies in enterprises, enabling them to retain skilled workers, transfer knowledge to a younger generation and recruit additional staff. The programme also adopts a long-term perspective, aiming to transform beneficiary firms' thinking and organisational management. Moreover, the conditions of production and work within the enterprise are intended to be designed in a way that fosters employee's health and innovation and facilitates the hiring and retention of skilled personnel. Unfortunately, although there is evidence that participants in the measure are positive about the way that it has been implemented, there has been no assessment yet of the measure's effects.

UK SBRI provides interesting information on what happens when the human resource element of innovation is not given sufficient attention. For this procurement for innovation measure it is reported that problems have arisen in implementing innovations in the healthcare system, because of a shortage among medical staff of the **skills required to take up the innovation**. Similarly, the availability of appropriately qualified staff may be a constraint on the development of firms supported by the PL Innovation Incubators measure.

NL Start-up in Residence Amsterdam, a procurement of innovation measure that promotes social innovation as a way of addressing social challenges in an urban community, clearly intends to promote **social welfare,** though again the results are not yet known.

Sustainability of the measures

In terms of the sustainability, several of the measures considered - including the tax measures and UK KTP - have been in place for many years already. They have proved their worth in the eyes of the policymakers and have become a regular feature of the innovation support system in the country concerned. At the other extreme, some measures or aspects of them are supported by programmes of a restricted duration, notably when the ESIF provide a significant part of the funding. Consequently, they are designed to come to an end, unless other sources of funding can be found. Some of them, however, have features that contribute to their sustainability over a longer period, especially where the available funds can be re-cycled. IT Smart&Start makes loans, which when repaid can be used to support other start-ups. Similarly, the PL Innovation Incubators make investments in company equity, which will be realised at some point and re-invested.

Otherwise, most of the measures selected are generally sustainable in policy terms. The evidence cited either indicates a performance that is better than the targets set or else shows a positive appreciation by users. Better evidence on longer-term effects, which is generally missing even for measures that have been in place for some time, would usually strengthen their case for a continuation of funding and hence longer-term sustainability.

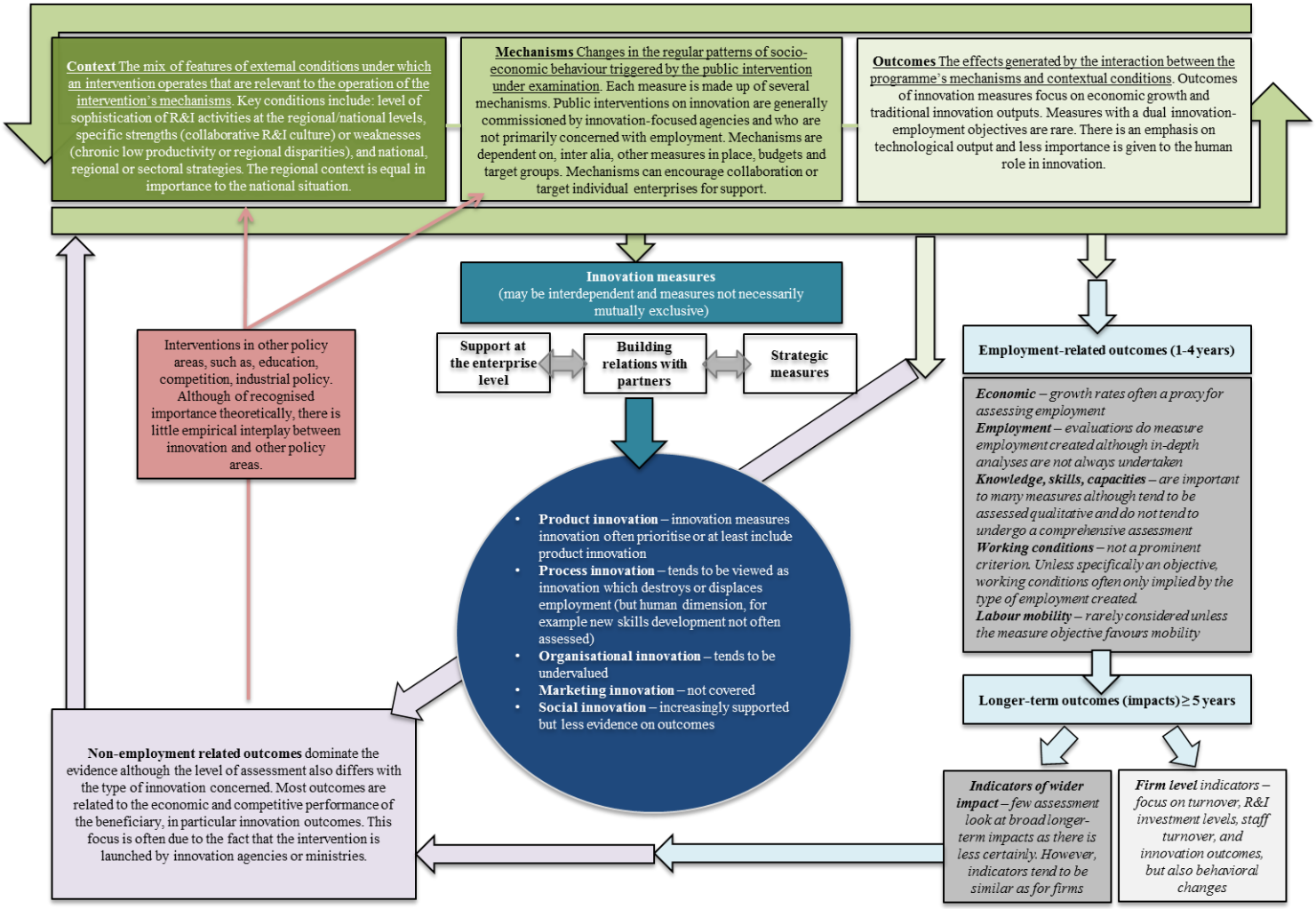
Conclusions

The study set out to identify the employment and employment-related effects of innovation support measures. Analysis of the relationship between innovation and employment showed that it is indirect and that the two elements should more properly be regarded as major inputs into the generation of economic growth. This is confirmed in that innovation measures generally are not designed to promote employment as such. Employment-related outcomes are at best a welcome by-product in many cases.

Reflecting these perceptions, evaluations of innovation support measures do not generally generate clear evidence on employment and employment-related effects. They tend to focus on the core objectives of the measure, which often do not include employment creation, and rarely consider the delivery mechanisms, which can involve changing employment relations and the development of skills and competences.

The initial characterisation of the intervention logic of innovation support measures had to be updated and modified to show that there is less evidence than might have been anticipated, but also a more complex set of relationships in the design of specific measures.

Figure 2: Revised theoretical framework diagram



Source: Authors

In relation to outcomes, the picture is slightly confused in that growth in employment is often taken as an indicator of economic growth in output, especially, but not exclusively, when it is difficult to obtain data on turnover growth. This ignores the methodological problem that it treats labour as both an input and an output of the growth system.

Generally, however, the more direct relationship between innovation and economic output leads most analysis, and also policy measures, to focus on innovation (usually technological) as the major input into the growth process and, forgetting that this is only a partial analysis, to neglect the consideration that the labour input is also a significant factor.

The bulk of the innovation support measures considered in the study focus either explicitly or in practice on promoting product and process innovation, in spite of policy pronouncements that have pointed to marketing, organisational and social innovation as significant considerations in the contemporary economy. This applies at all levels of innovation support, from relatively small and focused measures helping individual enterprises to much more complex measures, involving interactions with numerous partners or forming part of strategic approaches to economic development.

The observed emphasis of product and process innovation in support measures in turn reflects the persistence in practice of a sort of technological determinism or the application of implicit technology-push models of innovation. Possibly, this is because technological inputs are perceived to be easier to monitor and manage, but for whatever reason, there is a lack of attention to the more human considerations that are important in the other forms of innovation. The greater attention in recent years to demand-side factors and organisational and marketing innovation should have prompted a more nuanced approach and led to the development of measures to complement the encouragement of product and process innovation with innovative marketing and organisational elements. This would imply a better development of the human dimension of innovation in all related policies.

In fact, human resource development is actually a major part of many of the measures considered. The transfer of knowledge and the development of skills and competences are very significant for DK Growth Houses, UK KTP and for the cases involving clusters or competence centres (AT Laura Bassi Centres of Expertise, FR Competitiveness poles, DK Cluster Promotion and SE Winter Sport Strategy), and even the rather small-scale Estonian Innovation voucher attempts to change attitudes and perceptions. What is interesting is that, in most cases, these forms of human resource development are not seen as an objective of the measure and this is a major reason why the evidence on their form and extent is not readily available. Rather, they are unarticulated or implicit parts of the processes or mechanisms that deliver the explicit objectives of the measures. So, in the case of the DK Growth Houses, for example, the aim is to make enterprises grow (quite substantially over two or more years), but the means by which this is achieved is primarily by strengthening the competences of the enterprise's management.

The methodology adopted for the study, with its reference to the Context-Mechanisms-Outcomes model and its insistence that consideration of mechanisms is a necessary component of evaluations of policy, has revealed a neglected side of innovation support processes that needs to be brought more fully into the picture.

In terms of the lessons to be derived from specific cases and especially aspects that might contribute to an enhancement of employment and working conditions, if adopted more widely, the previous analysis suggests that it is not possible in any straightforward way to recommend the replication of particular measures with a view to creating better employment outcomes. None of the measures have integrated the human dimension fully into their design and delivery. Nonetheless, there are lessons to be learned from aspects of a number of the measures considered.

First, though, it is necessary to recall that measures operate at different levels and that an array of measures is needed to cover all areas of innovation policy, from those that are targeted at individual enterprises, to those that provide framework strategies. The lessons to be learned therefore apply at different levels of intervention and this needs to be taken into account in the design of an overall package of support.

In addition, it is necessary to consider the existing innovation landscape in a country and build on the assets already available. Moderate innovators are often still strengthening basic innovation infrastructure that needs to be in place before more complex measures can succeed. Addressing structural features of the innovation landscape in the design of measures has important longer-term implications for the innovation performance, especially of moderate innovators. Equally however, for countries and regions at this stage of their development especially, the development of a sufficient number of entrepreneurs that are innovative and of a broader innovation culture is often a major challenge. The EE Innovation voucher, in spite of its modest scale, is an interesting example of steps that can be taken to change attitudes and behaviours, an important element in an approach that takes the human dimension of innovation into account. Although a separate measure, the innovation vouchers are linked to a series of follow-up measures, where enterprises that take the initial steps can receive more substantial support to follow them through. There are therefore elements of a more integrated approach to innovation support that include paying attention to human interaction, which could be developed further and used elsewhere.

In spite of their acknowledged relative strength in terms of innovation performance, countries in the innovation leaders and strong innovators categories can still learn from others and, indeed, one of their strengths is that they often do so. The Danish Cluster Promotion measure, for instance, encourages particular clusters to adopt European good practice in cluster management by seeking certification under the European Cluster Excellence Initiative.

The review of the implementation mechanisms revealed that there are many instances in the measures examined where there are 'hidden' contributions to both employment and employment-related developments, such as the improvements in skills and competences, as part of the processes delivering the measures. Given their importance in creating the desired effects of the measures, these implementation mechanisms could easily have a higher profile in the measure's initial design, implementation guidelines, monitoring processes and reporting. In many cases it would be a matter of explicitly considering elements that are already present, in others certain elements could be strengthened.

Both NL WBSO R&D Tax credit and DK Growth Houses require those making use of the measure to develop a type of business plan stating how they propose to take advantage of the support offered. These plans already have to include human resources elements, specifying additional employment of specialists, for instance. They could easily be developed further to add a wider assessment of the impact of participation on all of the staff employed by the enterprise or by including a definition of anticipated learning outcomes of the firm and its staff.

More generally, greater attention could be paid to the human elements in existing implementation mechanisms. Sometimes, these processes are relatively complex. In Knowledge Centres and in clusters, the interaction between enterprises and between enterprises and knowledge institutions and other parties leads to an accumulation of experience and knowledge over time. In many cases it might be difficult to say what exactly has been learned. However, there are observable consequences for the productivity of the firms over time and on the career progression and salary of those who participate. In other cases, the outcomes in terms of numbers employed and the learning effects can already be more easily determined. The UK KTP measure already monitors the employment effects on the associate placed in a firm and, to some extent, other employment effects associated with the measure in the participating enterprises. It also monitors subsequent impacts on earnings. With DK Growth Houses, the identification of the skills development needs of enterprises is built into the initial diagnosis of clients. Monitoring of the skills and competence outcomes could be built into the measure assessment. In all these cases, therefore, giving a higher profile to the human dimension of innovation could be a matter of strengthening and developing elements that are already present in their current design and assessment processes.

Other measures examined already have some human resources elements, at least in their monitoring systems. IT Smart&Start encourages women to apply for start-up support and subsequently monitors the profile of successful applicants, including their age and gender. WAFF I&E subsidy provides funding for Viennese SMEs for the training of staff, consultancy, and to pay for 'innovation assistants' who bring the knowledge and skills needed to develop innovation projects into the

business. The measure reflects the commitment of WAFF (the Vienna Employment Promotion Fund) to promote improvements in the quality of employment through its actions. It collects information on the innovation assistant employed, including gender, and on other employment created and also on who is being trained. Such approaches could be more widely adopted.

The other Austrian measure, the Laura Bassi Centres of Expertise, has an even more intensive human resource element. An overall aim of the measure is to improve gender balance among those working at the interface between research and industry. However, in order to achieve this, consideration has been given to a series of working conditions that were seen to discourage female leadership in competence centres. These included examining the processes of research management, team work, work-life balance, mobility, career models, remuneration and financing. The centres have been adjusted in their recruitment and management practices to take account of these factors, enabling them to deliver a richer and more varied contribution to research and innovation that takes advantage of a bigger pool of diverse talents. Assessments of the measure are mainly still to come, but a mid-term evaluation has produced evidence on the research results obtained, including the effects of continuous competence development and the impacts on team members' career paths. Clearly, it is not only possible to address gender balance, human relations and working conditions as part of the design of an innovation support measure, but also to assess the outcomes. The practices of the Laura Bassi centres consequently have broader implications for the design and implementation of measures with a more pronounced human dimension.

The German Enterprise value: People measure recognises that a human resource response is a necessary policy development in current circumstances. However, this is a generic initiative that operates in addition to existing measures and does not, as such, prompt the development of the latter so that they all deal more explicitly with the human dimension. But it is a very welcome acknowledgement of the need for the human side of innovation to be addressed and as such serves to advance the more general argument. Furthermore, since it attempts to take a forward looking view by anticipating future skills needs, it offers a useful corrective to the tendency in policy to base the design of measures on the analysis of current or past problems.

In contrast, the UK's SBRI procurement for innovation measure shows what happens if the human resource dimension is left out of measure planning. Here, some of the innovations generated by the measure could not be implemented, because there was no budget for training the staff needed to do the implementation.

There are therefore elements in a number of the measures considered that have wider lessons especially if they can be developed further.

Policy pointers

At the most general level, a major policy implication of the study is as follows:

- It is necessary for innovation policy to develop a more holistic approach, taking all the inputs into economic growth and their interaction more explicitly into account.
- In particular the human dimension of innovation needs to be given more prominence in policy and the design of support measures.
- This human dimension starts with the knowledge input into product and process innovation, but also includes the development of skills and competences, both to further develop ideas and to implement them and achieve commercial success. At its most general level, it involves encouraging the interaction of enterprises and their staff with other enterprises and other players in the innovation system and creating a more entrepreneurial culture.
- The aim should be to mobilise a much broader range of those employed in the innovation process in target enterprises, those delivering the results of innovation in day-to-day work processes, and those contributing to the research and development of new products and processes.
- As a start, a higher profile for the human dimension could involve a greater emphasis on organisation, marketing and social innovation within existing measures.
- Over the longer term, it has to be more explicit in the stated objectives of measures, in the design of implementation processes, in reporting regimes and in the issues covered by monitoring regimes and considered in evaluations.
- This approach is necessary for measures at all levels, for those designed to assist individual enterprises as much as those improving the interaction between enterprises, knowledge institutions and other parties and in promoting strategic developments. Due regard is necessary for the interaction of measures at different levels and for the development of combinations or packages of measures appropriate to the innovation infrastructure and culture of particular countries and regions.
- A change in thinking is required rather than significant extra expenditure to bring this more comprehensive approach to innovation support as interesting results can be obtained on relatively modest additional budgets.

With regards to the evaluation of innovation measures:

- Policymakers should be encouraged to explore employment-related outcomes of innovation measures. This may initially involve improving policymakers' understanding of the relationship between employment and innovation and the role of the human dimension in innovation.
- Policymakers should be encouraged to collaborate across relevant political remits. For example, officials responsible for employment policies could be invited to steering groups for innovation measure evaluations and/or co-author terms of references for innovation measure evaluations to ensure the employment perspective is better taken into account.
- Policymakers should be supported through training on monitoring and evaluation. Monitoring data collection procedures to support both employment and innovation outcomes need to be in place at the start of the programme design cycle.
- Policymakers and evaluators should be encouraged to use (on appropriate occasions) other methods to improve our understanding of the wider context and the implementation mechanisms that steer employment and innovation outcomes and to support more longitudinal studies which are particularly good at observing and describing behavioural and outcome changes, over a longer time period.
- More attention should be paid to the employment-related effects of implementation mechanisms, especially the development of skills and competences, in order to make these

processes more efficient and effective. They need to be built explicitly into the design of measures and they should be monitored and be the subject of evaluation research.

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Annex I The evidence on employment effects of innovation support measures

This section provides a synthesis of the findings on the evaluation evidence, as well as an assessment of the quality of this evidence. In addition to studies specifically commissioned to assess one or more evaluation criteria (relevance, effectiveness, efficiency, coherence, sustainability and outcomes/impact), this analysis will also discuss the extent to which other evidence and data have been produced across the 15 cases, and what they can tell about employment and other outcomes.

Extent of the evidence available

The nature of the assessment evidence varies quite considerably and often has significant features that mean that only a partial picture is presented. First of all, there are differences in the evaluation culture of different Member States, even if there is a general tendency to improve the assessment of policies. Some assessments are carried out as part of a more general assessment of a range of policies, such as those supported by ESIF Operational Programmes. Although these can provide good insights into larger contextual issues, this clearly provides less detailed evidence than an evaluation specifically focused on the measure in question.

However, even when rigorous evaluations are taking place, their design can have significant implications for the type of information that is (made) available. For instance, the ongoing evaluation of the SE Winter Sport Research Centre is intended to be a process evaluation contributing to an ongoing strengthening of the measure. These rolling evaluations provide evidence especially about processes and mechanisms that are absent from periodic evaluations. This is particularly the case if there is a strong target culture associated with the measure, that is, when programme owners are focused on measuring achievements for specific objectives set while designing the measure. Targets are a powerful means of focusing attention on what is important and improving performance in relation to critical variables. However, the assessments made in this environment inevitably focus on performance in relation to the targets and often neglect other aspects of the overall picture.

In the case of DK Growth Houses, for instance, there is an annual assessment of how they perform in relation to specific targets that include the growth of their clients as compared with a control group in terms of employment, turnover and exports over a two-year period. However, because of this focus, little is said about the extent to which Growth House clients have been able to develop their skills and competences, which is a major operational objective of the measure.

Naturally, measures tend to accumulate more evaluation evidence over time. For example, the two tax credit measures (FR Tax credit and NL Tax incentives) are both longstanding measures and have been evaluated multiple times. This has brought up more evidence but also raised new issues, as the evaluations have tended to focus on different criteria or research questions. Therefore, more evaluations means more evidence but does not necessarily give a comprehensive longitudinal perspective because of the shift in focus from study to study.

Ultimately, the decisions around how and when to commission evaluations also has an impact on the results. Evaluations are typically (but not exclusively) commissioned by the implementing or managing agency, or by the parent ministry, whose main policy remits concern innovation and economic growth. The Terms of References for evaluations will also reflect this orientation by proposing an overall evaluation framework (and often the research questions). Other potential reasons for not including employment-related questions in the terms of references may be related to the fear of uncovering job losses.

In terms of monitoring data, these are collected for each of the 15 measures albeit to a varying extent. It is possible that differences in evaluation culture also apply to the collection and analysis of monitoring data. Measures that are implemented under ESIF follow the European Commission's DG Regio and DG Employment guidelines on data monitoring. Although indicators vary from

measure to measure (and not all monitoring data have been made available to the study team), they predominantly aim to measure innovation performance, including employment creation. However, their sophistication in measuring employment-related outcomes is mostly limited. A comparatively good example of data monitoring output is shown in the box below and covers indicators such as number of jobs created, gender and age of new employees, geographical location and industry sector. These are useful data as a basis for further analysis.

Box 1. IT Smart&Start – Example of monitoring data collected

The monitoring data available show the direct employment effects of the Smart&Start measure: as of November 2017, the instrument created 3,925 new jobs in 818 firms in the period 2014-2017. People aged under 36 represent almost 40% of the start-up founders supported, just below people aged between 36 and 50 years that represent almost 45%. In terms of gender, less than 20% of start-up founders are women – a specific target group of the measure. In addition, almost two-thirds of the start-ups funded are located in the Mezzogiorno, the least developed area of Italy. Overall, the highest number of start-ups supported is located in Campania (249), Sicily (130), Apulia (88) and Calabria (57). The total number of start-ups supported equalled 818.
In terms of sectoral focus, the highest number of start-ups supported by the measure is in the web technology sector (357), followed by life science (83) and the hi-tech industry (82). A good number of start-ups have been created also in other sectors: IT and infrastructure (81), environment and energy (73), smart cities and services (72), tourism and cultural heritage (53).

Source: Data collated by study authors

Monitoring data can provide strong contextual information on the performance of beneficiary firms and outputs produced with the help of the measure. Clearly they are an important information source for the implementation agency and are a key aid in overseeing implementation. The monitoring data are published in annual reports and similar stand-alone publications and used as underlying evidence in evaluations when assessing if the measure has achieved its (ex ante) objectives. Overall, the purpose of the monitoring data is to support achievements of objectives, that is, the indicators have been designed to measure the targets set by the programme owner. These data are made available to evaluators for specific studies commissioned, for instance to learn about the effects of the measures. Nonetheless, although monitoring data can – and are for some measures used to – quantify employment creation (in Austria, Estonia, Italy and Poland for example), no monitoring data examined contribute to explaining how the results came about (that is, the mechanisms behind the numbers). Monitoring data are not generally analysed in-depth and certainly not in a way conducive to an investigative CMO approach. There is no evidence to suggest that there is any particular immediate learning (with regards to understanding the drivers behind employment creation – or the lack thereof) derived from the data collected.

As a result of the focus on a small number of measures, this study will not comment in detail on the monitoring and evaluation culture of innovation measures, however a couple of points can be raised in this regard.

Innovation measures that are implemented under ESIF tend to have the most consistent evaluation culture. Moreover, ERDF support often involves real-time evaluations (for example SE Winter Sport Research Centre), which primarily looks at effectiveness, efficiency, and implementation processes as these develop over time, although they may also address shorter-term outcomes and sustainability.

Although there appears to be little consistency in the specific evaluation approaches – as described above, these will largely depend on the instructions provided in the terms of references – it is obvious that the studies commissioned do not in any sense focus on assessing employment related outcomes. With a few exceptions (for example case AT I&E subsidy, where the measure has an articulated dual innovation-employment objective), the innovation support measures are designed to

increase the quality and quantity of R&D activities – often taken to be technological R&D – through a variety of support services. This gives the sense that innovation support measure design largely, although not exclusively, tends to be based on the liner model of innovation; if a measure supports increased R&D activities, these will eventually translate into an invention, then an innovation, which is subsequently commercialised.

Evidence also indicates that innovation support measures tend to favour instrument designs that promote new technologies and processes rather than human competences or the human factor in innovation. In this, the evaluations reflect the stated objectives of measures, articulated during the elaboration of the measure design.

Consequently, the focus of studies is on assessing the effectiveness and efficiency of the measures, often focusing on targets based on classic innovation outputs and outcomes (typically EUR turnover, R&D&I outputs, value added). This specific focus is also likely the result of the fact that evaluations tend to be commissioned by the implementing managing authority or its parent ministry, which in practice also means that these agencies will produce the Terms of References underwriting the evaluation and thus focus on performance and effectiveness aspects rather than more systemic or holistic evaluation questions, such as assessing packages of innovation support and their interplay, or assessing the role of the human factors in innovation.

Having said this, it should be underlined that some evaluations do provide some wider context analysis. Particular examples are the case FR Competitiveness poles' evaluations which include a meta-analysis of previously produced evidence and the two real-time evaluations produced for SE Winter Sport Research Centre, which attempt to put the activities funded by the measure into the wider concept of smart specialisation.

The main methodological and data collection tools in the evaluations are:

- **Analysis of monitoring data** – quantitative descriptions covering implementation data and outputs;
- **Interviews** with implementation agency staff, beneficiary firms, end users etc.;
- **Self-completing survey questionnaires** with direct beneficiaries and/or other users (indirect beneficiaries); and
- **Econometric analysis**.

Other tools include evidence reviews assessing similar measures, benchmarking exercises (based on desk research) and case studies which tend to demonstrate impact at the beneficiary level.

A breakdown of the tools used in each of the 15 measures' evaluation is provided in the table below.

Table 6: Overview of tools used in the evaluations of the 15 measures

Measure	Single/multiple evaluations	**Main tools deployed** (in addition to any desk based research involving the programme/measure documentation)				
		Analysis of monitoring data	**Interviews with stakeholders, users, etc.**	**Survey questionnaires**	**Econometric analysis**	**Other tools**
FR Tax credit	Multiple	Multiple	Evaluation 1: No Evaluation 2: Yes	No	No	Evaluation 1: No Evaluation 2: Yes
NL WBSO Tax credit	Multiple	Evaluation 1: Yes Evaluation 2: Yes	Evaluation 1: Yes Evaluation 2: Yes	Evaluation 1: Yes Evaluation 2: Yes	Evaluation 1: Yes Evaluation 2: Yes	Evaluation 2: Literature review Analysis of datasets (wider statistics) Target group analysis Measurement of administrative burden
AT WAFF I&E subsidy	Multiple	Yes	Yes	Evaluation 1: No Evaluation 2: Yes, including a control group	No	No
EE Innovation vouchers	Single (assessing a portfolio of measures)	Yes	Yes	Yes, including a control group	Yes	No
IT Smart&Start	No evaluation to date	N/A (no evaluation)	N/A (no evaluation)	N/A (no evaluation)	N/A (no evaluation)	N/A (no evaluation)
PL Innovation incubators	Single	Yes	Yes	Yes, including a benchmarking survey of existing public support systems supporting the development and acceleration of start-ups (Poland vs. selected EU countries)	No	No
DK Growth Houses	Multiple	Evaluation 1: Yes Evaluation 2: Yes	Evaluation 1: Yes Evaluation 2: No	Evaluation 1: Yes Evaluation 2: Yes	Evaluation 1: Yes Evaluation 2: No	Both evaluations: Analysis of data from client management system
DE Enterprise value: People	Single	Yes	Yes	Yes	Yes	Case studies
UK KTP	Multiple (single evaluation reviewed by authors)	Yes	Yes	Yes	Yes	Case studies Workshop Reconstruction of the KTP logic models Self-assessment of the programme's added value for participants

						Extensive desk-based review including of Labour Force data
AT Laura Bassi Centres of Expertise	Multiple (internal and external)	Yes	Yes	Yes	No	Focus groups Workshops
FR Competitiveness poles	Multiple	Yes	Yes	Yes	Yes	Literature review
DK Cluster Promotion	Multiple	Evaluation 1: Yes Evaluation 2: Yes Evaluation 3: No	Evaluation 1: No Evaluation 2: No Evaluation 3: No	Evaluation 1: No Evaluation 2: Yes Evaluation 3: No	Evaluation 1: No Evaluation 2: No Evaluation 3: Yes	Evaluation 1: brief case studies
NL Start-up in Residence Amsterdam	No evaluation to date	N/A (no evaluation)	N/A (no evaluation)	N/A (no evaluation)	N/A (no evaluation)	N/A (no evaluation)
UK SBRI	Multiple (single evaluation reviewed by authors)	Yes	Yes	Yes (successful and unsuccessful applicants)	No	No
SE Winter Sport Research Centre	Multiple (both real time evaluations)	Descriptive analysis (ERDF standard monitoring data)	Yes	Yes	No	Reconstruction of the intervention logic Observation (attending Centre Steering Group meetings)

Source: Data compiled and analysed by study authors

This study has not identified any evaluations which have made extensive use of case studies (in-depth studies) nor any network analysis of beneficiary firms and other users (for example to map collaborations between firms and universities).

With regards to evidencing employment-related outcomes, these are in some cases treated as a proxy indicator for economic growth performance or other outcomes from innovation measures. A typical example can be illustrated with the findings from PL Incubators, where the evaluation only covered employment-outcomes indirectly since its main focus was on the effectiveness of the measure in creating start-ups. The evaluation thus considers positive employment outcomes to be part of the success of the measure of which the primary activity has been to incubate over a thousand enterprises. The longer-term employment impacts of the measure also strongly depend on how the supported firms develop their business. Many of the newly created enterprises supported are likely to go bankrupt or will continue, but without substantial development. In both cases quantitative employment outcomes will be neutral or even negative. In the case of the firms that expand, however, the outcome can be substantial, both within and outside of the enterprise.

Similarly, the two real-time evaluations of SE Winter Sport Research Centre describe in detail the development of new R&D collaborations between public and private actors supported by the measure, but say very little of the employment-related outcomes derived. In contrast, anecdotal evidence from stakeholder interviews paints a very positive picture about job creation stemming from the same collaborative activities but which go undocumented in the evaluations.

Out of the 15 measures that have been studied, the evaluations that assess employment related outcomes address:

- **New direct or indirect jobs** created as a result of the measure, either in the individual firms or (if applicable) in a coordinating centre or incubator, which in turn supports individual firms;
- **Jobs retained** in individual firms as a result of the measure;
- **Skills development** among staff in beneficiary firms, although these are qualitative assessments rather than assessment of official or certified skills gained; and
- **Change in individual firm R&I investment and/or turnover**, which are – in combination with other indicators – assumed to lead to employment creation.

Unsurprisingly, given the focus on 'pure' innovation performance and output, there is much less evidence available concerning wider working conditions, wages, work-life balance, skills development in terms of concrete certifiable skills or sustainability of the employment created.

With a few exceptions (see example in Box 2 below), the evidence on employment does not provide data related to long or short-term employment, other than that for the duration of the measure in question. In the case where employment sustainability is considered, the assessments are based on self-reporting data from the beneficiary firms. Although this is a legitimate and logistically feasible source, it does nevertheless raise some issues around response bias.

Box 2. AT WAFF I&E subsidy – Evaluation employment related evidence

The first evaluation of WAFF (the innovation and employment subsidy) was carried out in 2003. The innovation measure is one of the (seemingly) few that explicitly aim to combine innovation support, including social innovation, with job creation, job retention and/or the improvement of the quality of employment. The measure also promotes the inclusion of older employees, equal opportunities between men and women, and opportunities for employees with a migration background.

The evaluation findings provide comparatively good data on employment related outcomes, concluding that from 2000 until 2003 87 projects were approved with a total funding sum of €4 million. Most beneficiaries were found to operate in the IT and business services sectors which are under particular pressure to innovate. 40% of beneficiaries had previous experience of public

support. More than half of innovation projects concerned product innovation whereas social innovation seemed to play a marginal role. The support measure seemed to have good additionality in that 27% of beneficiaries state they would not have carried out the innovation project without it, and 61% state they would have carried it out in a reduced form. More than three-quarters of respondents maintained that the support had a long-term positive effect on their firms' capacity to innovate. 91% maintained that the support led to the creation or the retention of jobs. On average, firms estimate that they will create 5-6 additional jobs in the 'long-term' (the time horizon is not specified).

Three-quarters also believed that the support increased the skills level and employability of their staff. The large majority of innovation assistants accompanying projects also saw positive effects in terms of their skills and personal development.

Source: Authors

In parallel to undertaking the research on the 15 individual innovation measures, this study has produced a stand-alone paper on the quality of evidence. This was done in order to support the review of the measure evaluations. In short, this concluded that:

1. There are several approaches to hierarchies of evidence. Although the Maryland Scientific Methods Scale is one of the most well-known evidence scales, it has traditionally been associated with evaluations and assessments in the areas of health and medicine. The Maryland scale (Sherman et al, 1979) ranks RCT as the gold standard. But there are inherent difficulties in applying a RCT to innovation support, although it can be used successfully in the area of innovation – often in tandem with other approaches as demonstrated by Nesta for example. Moreover, even if RCTs are used in an innovation context, they predominately address the effectiveness criteria, which means other approaches are needed to respond to evaluation criteria such as relevance, coherence and even impact.
2. When looking at a range of hierarchies of evidence produced, scales consistently rate systematic evidence reviews and RCTs as being the 'best available'. With the development and spread of realist evaluation, there are also emerging assessments on the use of the realist approach originally developed by Pawson and Tilley (2004), including making use of the realist approach when undertaking systematic reviews.
3. However, the literature equally suggests that there is no 'one-size-fits-all' in terms of evidence, as evaluations and data collection tools need to be designed bearing in mind the kinds of questions one wishes to address. Whereas RCTs are ideal for assessing effectiveness, systematic reviews are better at gauging the relevance or impact of interventions. Thus rather than constructing hierarchies, evaluators and policymakers may be wiser to work to combine different approaches in order to undertake more 'holistic research' that is able to address a wider set of questions more robustly.

Bearing these points in mind, the following observations can be made.

Overall, the country researchers who assessed each of the 15 measures consider the evaluations undertaken to be at least fairly robust (see Table 5 - overview of employment related outcomes and strength of evidence). Granted, any evaluation results considered to be insufficiently robust are unlikely to have been published and made available in the public domain in the first place.

Although there are nevertheless some recurring issues around data transparency and an overreliance on self-reporting data, the general quality of the studies, including their rationale, tends to be good. That is, the data are triangulated and presented in a transparent manner, and conclusions and recommendations are based on the findings derived from the data. Limitations, be they data or time constraints, are generally outlined and explained.

But as implied elsewhere in this report, the heavy focus on assessing the effectiveness and efficiency of a measure, while paying less attention to wider aspects, such as the coherence of the

measure with other policies and its relevance to the needs of enterprises and the overall policy agenda, risks skewing the overall picture, including that of employment and displacement of jobs.

For instance, only one evaluation, undertaken for FR Tax credit, appears to provide an overview of displacement from one sector to another. The study suggests that although the intervention increased the overall number of jobs as well as the employment chances of young PhDs, these positive effects appeared to come at the expense of jobs for young engineers without PhDs. Yet, the measure did appear to have a positive impact on job creation overall.

Moreover, despite the emphasis on effectiveness, if one makes use of a quality of evidence scale, most of the evaluations assessed would score rather comparatively low on the Maryland Scale (Level 2-3) as the majority of the studies lack an external control group. If control groups are used, they are defined in a very wide sense as these mostly refer to a before-and-after-treatment groups, that is, data are collected from beneficiary firms before and after having benefitted from the measure – although often these data are self-reported, which is another methodological weakness, risking introducing bias into the analysis.

Nonetheless, there are some legitimate reasons why there are so few external control groups.

In at least once instance (PL Incubators), the measure is a first of its kind, which of course makes it rather difficult – if not impossible – to create a credible external control group unless preparatory measures are taken at an ex ante stage to support an allocation of funding that would allow for a comparison between successful applicants and non-successful applicants.

Secondly, external control groups are difficult (and costly) to match. In this regard, the ability of researchers to reconstruct control groups is partly dependent on the availability of administrative data. Consequently, in countries like Denmark the use of external control groups appears to be more common in evaluations thanks to the Danish Tax Office methodology when collecting data from firms.

Thirdly, there are some inherent challenges in matching beneficiary firms with a control group to assess innovation support in particular. As raised in the case of EE Innovation voucher, there is a risk that this approach may introduce a selection bias in the analysis since growth-focused enterprises are more likely to seek additional funding compared to control group members.[2]

A final challenge of using RCTs is that effects observed in trials conducted soon after the treatment have a tendency to diminish over time.

This somewhat prescriptive and monotonous approach to evaluation risks to make evaluators and policymakers focus too much on quantitative targets and thereby overlook exploring contextual issues. The focus on effectiveness - measured (soon) after the treatment - also tends to distract resources from longitudinal explorations, which can for example track behavioural changes in firms and other beneficiaries over time.

Indeed, none of the evaluations assessed made use of the realist theory or spent considerable resources exploring, questioning or mapping mechanisms within the intervention logic.

From an employment policy perspective, more can be done to develop evaluative approaches which take due consideration of:

- The relationship between labour and innovation. This is difficult to analyse because it is ambiguous and also depends on external factors such as skills levels and technological sophistication, the industrial sectors concerned and the regional location.
- The innovation measure(s) and how it/they interact(s) with other measures. The type of innovation measure deployed also varies significantly and there is little point in trying to benchmark measures against each other.

[2] Perhaps the most ideal measure to which to apply a control group – or even a RCT – is IT Smart&Start as the selection criteria is largely that of the first-come-first-served approach (some other administrative criteria apply). Thus, evaluators would be able to use unsuccessful firms in a control group as the main difference between these and successful firms is bad luck/timing.

The table below provides an overview of the 15 measures' employment related outcomes and strength of evidence. As the table suggests, almost all of the measures studied have been evaluated (13 out of 15), and evaluations are also expected to be commissioned for the two measures which have not yet been assessed (IT Smart&Start and NL Start-up Amsterdam). However, this figure should not be extrapolated and used to suggest that the majority of innovation measures that are implemented in European countries are (systematically) evaluated. Rather, the high number of evaluations stems from the fact that the study team was actively looking to include evaluated measures in the analysis as to ensure there was sufficient evidence to assess innovation and employment outcomes in the first place. The study team also focused on identifying interim and ex-post evaluations and avoided choosing any measures where only ex-ante evaluations were available. Interim and ex-post evaluations are therefore overrepresented in the sample of the 15 and the study is not able to comment on the quality of evidence presented in ex-ante assessments.

Table 7: Overview of employment related outcomes and strength of evidence

Measure	Evaluation carried out	Other data	Overview of evaluation (s)	Extent of evidence for employment related outcomes	Author assessment of the quality of the evidence
FR Tax credit	Yes	Numerous evaluations have been carried out since 1983	Mix of meta, impact and process evaluations	• So far, evidence directly linking the measure to employment effects has been weak. This may in part result from the fact that the measure can be combined with other government support measures, making it difficult to isolate its effects. There is a clear positive correlation between the number of beneficiaries claiming the measure and the number of researchers employed, but the impact on overall employee numbers is less clear. • A major finding is that, whilst the intervention did appear to increase the number of jobs and the employment chances of young PhDs (particularly following the simplifications of 2008), this came to some extent at the expense of jobs for young engineers without PhDs, thus creating a significant displacement effect.	The two evaluations are relevant for the purposes of this study because they both consider employment effects, in terms of job creation and – to some extent – job quality. However the evidence of the link between the measure and broader employment effects is weak.
NL WBSO Tax credit	Yes	Monitoring data	Focus on effectiveness, uptake and impact	• The measure focuses on employment as a means of delivering increased innovation rather than as an objective in itself. Research by the public sector related specifically to the employment effects of the measure has not been published. • The most recent evaluation of the measure, for the 2006–2010 period, found an overall additionality of 55% for the measure, with 76% of the increased R&D activity going to salaries and wages. • From a qualitative point of view, the evidence indicates that use of the measure results in beneficiaries being able to reward researchers better and retain them longer.	The three official evaluations completed to date show a strong similarity in scope and aims, looking at first, second, third, fourth order as well as other wider effects. They deal with the analysis of efficiency robustly and calculate cost estimates of the implementation. More emphasis on the relevance of the measure would have enriched the analysis. Similarly, the analysis of the value-added of the measure is limited.
AT WAFF I&E subsidy	Yes	Monitoring data	Ex-post evaluations covering effectiveness and effects	The first evaluation presented the following results: • In 2016, the measure supported 63 SMEs, creating 76 new jobs. • In 2015, it supported 74 SMEs creating 88 new jobs. • In total, 356 positions for innovation assistants were created. In addition, 212 new jobs were created over the same period. • More than three-quarters of respondents maintain that the support had a long-term positive effect on their firms' capacity to innovate. 91% maintained that the support led to the creation or the retention of jobs. On average, firms estimate that they will create 5-6 additional jobs. • Three-quarters also believe that the support increased the skills level and employability of their staff. The large majority of innovation assistants accompanying projects also see positive	Both evaluations rest on opinion surveys, meaning the evidence is relatively weak in absence of a proper control group. Neither evaluation report yields any insights as to the measure's overall coherence, its value added and efficiency, or its sustainability. The focus of the two evaluations is on the effectiveness criterion.

Measure	Evaluation carried out	Other data	Overview of evaluation (s)	Extent of evidence for employment related outcomes	Author assessment of the quality of the evidence
				effects in terms of their skills and personal development. • The second evaluation presents evidence on the innovation assistants (240 in total) accompanying projects between January 2002 and June 2007. The majority of assistants remain employed in the beneficiary enterprise after the end of the funding period. After three years, 22% were still employed there. The great majority of those not continuing to be employed by the firm found other employment within 90 days of the end of the funding period. Assistants saw their income rise by more than 50%. • However, according to the second evaluation, there is no clear effect of job creation of the measure, with 41% of firms enlarging their workforce, and 37.5% shrinking it in the year after the end of the funding period. The implementation agency commented on this saying that firms must have a workforce larger by at least one employee at the end of the funding period but do not track the workforce size of beneficiaries after this point. This may explain the discrepancy in numbers.	
EE Innovation vouchers	Yes	Monitoring data and analysis (Innovation Studies. Innovation and innovation support for Estonian companies 2015)	Impact of innovation support measures on competitiveness of companies' report by the National Audit Office (2014) The report on 'EU support funding for entrepreneurship and regional development' by the National Audit Office (2017)	• The 2017 evaluation report establishes that direct and positive impacts are created over a two-year period. The impacts are on enterprise turnover, employment, exports and investment in innovation. The report establishes results by a comparison of the performance of enterprises receiving support with that of a control group. It also shows that there are changes in the attitude of enterprise managers to R&D. However, the report doubts that these changes are mainly attributable to the grant and the additionality of the measure is brought into question, in that 48% of those surveyed said that they would have carried out the planned activities even without the grant.	The evidence produced on the basis of a counterfactual analysis using a control group is strong, but the contextual analysis is not sufficient to draw firm conclusions on whether the measure is playing its part in achieving Estonian policy objectives in relation to building links between enterprises and research communities.
IT Smart&Start	No	Monitoring data The performance of	N/a	• The data available show the direct employment effects of the measure: as of November 2017, the instrument has created 3,925 new jobs. • People aged under 36 represent almost 40% of the start-uppers	At project level, the evidence is collected through a number of quantitative indicators only partly publicly available. The quantitative indicators are reliable. However, the quantitative information provided is not part of a wider evaluation

Measure	Evaluation carried out	Other data	Overview of evaluation (s)	Extent of evidence for employment related outcomes	Author assessment of the quality of the evidence
		the measure is monitored and assessed in quarterly reports		supported, just below people aged between 36 and 50 years that represent almost 45%. In terms of gender, only less than 20% of start-uppers are women – a specific target group of the measure. In addition, almost two-thirds of the start-ups funded are located in the Mezzogiorno, the least developed area of Italy. • Overall, the highest number of start-ups supported is located in Campania (249), Sicily (130), Apulia (88) and Calabria (57). • In terms of sectoral focus, the highest number of start-ups supported by the measure is in the web-technology sector (357), followed by life science (83) and the hi-tech industry (82). A good number of start-ups have been created also in other sectors: IT and infrastructure (81), environment and energy (73), smart cities and services (72), tourism and cultural heritage (53). • Given the nature of support provided, firms awarded generally require highly qualified and specialised workforce. As a result the measure can also add value to local ecosystems, perhaps leading to productivity and growth regionally.	framework. More generally, the lack of SMART objectives, as well as an unclear evaluation framework, makes it difficult to evaluate the measure in terms of its effectiveness and relevance.
PL Innovation incubators	Yes	Monitoring data	Ex-post evaluation completed in 2017	• The evaluation considered employment effects only to a very minor extent. The empirical surveys did not cover this issue directly and consequently the subject was omitted from the analysis. The main focus was on the effectiveness of the measure in creating start-ups and a viable market for start-up financing, as a significant contribution to encouraging a greater degree of innovation in the national economy. • Data on the employment effects of the measure have nonetheless been collected through interviews.	The ex-post evaluation was prepared by independent evaluators and is based on empirical evidence gathered. The main focus of the evaluation was on the effectiveness. In addition, the evaluation commented on the relevance, coherence, value-added and sustainability of the intervention and was generally of a high standard. There was no counter-factual element in the evaluation.
DK Growth Houses	Yes	Monitoring data and stand-alone analysis on effects	Impact evaluation	• The 2016 overall report establishes that a direct and positive impact on employment is created over a two-year period in the enterprises that are supported by the beneficiary Growth Houses. Enterprises which had undertaken a growth assessment in 2014 had created 2,255 jobs by mid-2016, an increase of 11.35%. This performance is clearly better than that of the control group of similar enterprises that had not made use of the services of the Growth House (8.23%). • The growth in turnover and exports was even more marked and the difference between participants and the control group greater. This would suggest that participation contributed to an increase in productivity, although this is not certain since conceivably the	There is good evidence, which is updated each year, on the effectiveness of the measure, namely on the principal effects of the measure in the form of positive impacts on growth of turnover, employment and exports. There is also an overall measurement of the efficiency of the measure in the form of a positive return on public investment that is well above the target level, plus indications that the measure delivers services that are perceived to be relevant by its users.

Measure	Evaluation carried out	Other data	Overview of evaluation (s)	Extent of evidence for employment related outcomes	Author assessment of the quality of the evidence
				increased output might have been achieved by increases in other factor inputs and the report does not comment on this consideration. • The report establishes these results by a robust comparison of the employment performance of enterprises receiving support with that of a matched control group, with similar characteristics that had not made use of the services of the Growth Houses.	
DE Enterprise value: People	An external evaluation of the pilot phase	Monitoring data as per ESF rules	Evaluation of the pilot stage, which aimed to assess implementation, effectiveness and efficiency	• Around two-thirds of the companies who were consulted by the evaluation stated that they have initiated or were planning to initiate human resource measures, in order to consolidate the process and generate lasting changes in their HR management policies. • The evaluation concluded that the programme triggers knock-on effects in that firms make increased use of consultation after they participated in the programme. The main benefits identified include improved work processes, training and sustainable HR policies.	The evaluation of the pilot phase is very detailed and uses a robust methodology. It provides some useful data on outcomes and is strengthened by the fact that it draws on multiple data sources and a combination of interviews, an online survey, explorative case studies, and a cost effectiveness estimate. The high response rate to the survey and interview programme means that results should be fairly representative of the global population of beneficiaries. The evaluation included a cost-effectiveness analysis with a qualitative assessment building on an opinion survey, an interview programme and case studies. It focuses on the programme's effectiveness, sustainability and efficiency, but does not explicitly consider its relevance, added value or coherence.
UK KTP	Yes	Monitoring data	Focus on effectiveness and efficiency, with limited analysis on impact	There are three types of beneficiary of the measure: the business, the associate and the knowledge base organisation. • For the business, the intended benefits of the programme centre on the contribution of the partnership and the role of the associate to increasing the productivity of the business demonstrated by the increase in sales, GVA, job creation and the salary of the associate in place. • Employment effects are recorded mainly at the level of the associate beneficiary. The direct benefits are their experience of working in a commercial environment and the opportunity to gain additional business and project management experience and workplace skills and qualifications. An intensive eight-day high quality business-training course contributed to this.	Overall the studies undertaken are robust with regard to effectiveness and efficiency. The focus of the investigations, however, implies that they are not able to shed light on some of the broader aspects that would be revealed by a systematic review. For instance, issues such as the coherence of the measure with other innovation promotion measures and in particular with the need to address a range of human resource constraints on innovation within a commercial setting are not considered. Although there is evidence on the effectiveness, efficiency and sustainability of the measure and, to some extent, its transferability, there is little information on the coherence of the measure. The whole study has a major element missing, in that the impacts on the participating businesses are not directly considered.
AT Laura Bassi Centres of	Yes	Monitoring at the level of the measure and of	Interim process evaluation	• The creation or retention of jobs is not monitored, since this is not an objective of the measure. • Employment outcomes relate to improvement of working	The study has a less robust methodology than might be expected in a country which undertakes many R&I evaluations, although it is transparent about how it arrived at

Measure	Evaluation carried out	Other data	Overview of evaluation (s)	Extent of evidence for employment related outcomes	Author assessment of the quality of the evidence
Expertise		the individual Centres		conditions, equal opportunities for men and women, and skills development. These are partly short-term effects in that they could already be observed in the interim evaluation, and long-term effects in that it can be expected that participants' career paths are affected even after they may leave the research centres after the funding period.	its results. However, the evidence could have been stronger if stakeholder feedback had been triangulated by other data sources. A counter-factual analysis is lacking, but this is understandable in a process evaluation.
FR Competitiveness poles	Yes	Numerous evaluations since 2004	Mix of evaluations, including impact evaluations	• In terms of employment effects, the latest evaluation found that firms benefitting from the measure hired 2.4 additional people in 2007 and nearly 6 additional people in 2012 compared to the control group.	The evaluation focuses primarily on relevance, effectiveness and added value. The use of an econometric analysis with a counterfactual is rated very highly in the weight of evidence analysis used in this assignment. A significant weakness of the evaluation is that its reliance on an econometric evaluation leaves little space for contextual analysis.
DK Cluster Promotion	Yes	Monitoring of all cluster organisation members	Various evaluation reports relevant to this measure, although none specifically on the measure itself	• There is little direct evidence on employment outcomes of cluster development, although information from interviews suggests that they may be substantial. The aim of all clusters is to assist their members to grow, especially through innovation of various kinds, and this generally implies growth in employment. Moreover, since many of the clusters are involved in new technologies and markets, there is a reduced risk of displacing other firms and their employees. However, most of these effects are likely to become apparent only over the medium to long-term when innovations are exploited.	The results of the econometric studies are generally based on rigorous analysis, with an exemplary selection of a control group based on propensity score matching, using the nearest neighbour matching method. The restricted range of impacts considered, however, makes commenting on the efficiency of the measure difficult, since this relates to the cost and effort required to achieve the results and in this case information on important aspects is missing. It should be noted in this context that even the targets set for 2018 are framed in terms of more immediate outcomes – referring to the number of enterprises that develop new innovations or participate in partnership projects with knowledge institutions or engage in international activities. The assessment of the effectiveness of Danish cluster support policy, therefore, has a major element missing, though there are other indicators relating to intermediate outcomes, including the probability of being innovative (as recorded in innovation surveys), where it was shown that innovation network members outperformed similar enterprises.
NL Start-up in Residence Amsterdam	No	Limited monitoring data	N/a	No data on actual employment outcomes is available (from documentation or interviewees).	At the moment no data is publicly available other than some details about the companies who were successful in their application. However, the implementation agency advised that the data being collected every year is improving, and it is planning an impact assessment to capture qualitative factors.
UK SBRI	Yes	Stand-alone analysis,	Activities, outcomes and	• Job creation and job retention are the main indicators of employment effects collected by both internal and external	The studies in general have used a variety of methods. However, most studies have only used a small sample of

Measure	Evaluation carried out	Other data	Overview of evaluation (s)	Extent of evidence for employment related outcomes	Author assessment of the quality of the evidence
		monitoring data, academic papers	impacts	evaluations. An impact evaluation carried out in 2014 found that between 2009 and 2014 the measure had led to the creation of at least 89 full-time equivalent (FTE) jobs in 68 surveyed companies, which had been successful in receiving SBRI contracts. • An update of this evaluation undertaken in 2016 found that the funding enabled this figure to double from 2014 to 2016 to 181 FTE staff in 68 companies and to retain another 275 FTE posts. • The SBRI Healthcare Annual Reviews similarly show a gradual increase in the number of jobs created or safeguarded, the latest Review putting the figure for 2017 as 788. It is not clear whether these jobs are highly skilled or unskilled, or whether job creation takes into consideration those created in other companies along the supply chain.	respondents with fairly low response rates suggesting that generalising beyond the sample should be cautioned against.
SE Winter Sport Research Centre	Yes	Self monitoring data (ERDF rules)	Two real-time evaluations focusing on efficiency and management but also some shorter-term outcomes	Mainly qualitative employment-related results including: • The first evaluation (2010) suggested that the core staff employed by the measure beneficiary (at the time, 10 FTE) could be expanded and strongly recommended the beneficiary to recruit as well as train existing staff to improve on the current division of responsibilities. According to the evaluation, the beneficiary struggled to keep up with demand for its services; partly as a result of understaffing and partly as a result of a lack of organisation. The key challenge was to access and hire qualified staff in the region. However, according to the monitoring data, as of 2013, the beneficiary had created six new full-time equivalent jobs. Two of the new employees were women and four male. In addition, the Centre had created eight employment opportunities for researchers (who may be existing employees). These have been a mix of academic and technical (lab) positions. • Anecdotal evidence from the evaluation points to more productive interaction within the key public and private actors of the Centre. This has resulted in several commercial activities; including the set-up of R&I networks and contract research with industry.	The author's assessment of the quality of the evidence is that it is fairly high albeit focused – as real-time evaluations are – on operational implementation and on immediate or short-term results. The reports available are transparent and clear in their structure, aim and limitations. The main weakness with regards to the quality of the evidence is that the 'evaluation perspective' is skewed by the fact that both evaluations were real-time assessments. Although it should be stressed that real-time evaluations per se are not of lower quality than other studies, they do focus on processes and organisational aspects, thus giving less attention to outcomes. Nor has either of the studies focused on employment aspects.

Source: Data compiled and analysed by study authors

Annex II Individual measures' analyses

Research Tax Credit – France

Research Tax Credit – France	
Measure identification	**FR Tax credit**
Name of the instrument	Research tax credit, crédit d'impôt recherche (CIR)
Web link	https://www.economie.gouv.fr/entreprises/credit-impot-recherche
Location	France, all regions
Starting year and duration	The measure has been in place since 1983 and is claimed by eligible enterprises on an annual basis. The measure is ongoing.
Name of the organisation providing measure	Ministry of Higher Education, Research and Innovation (MESRI), administered by the Ministry of Finance (through the tax system)
Type of organisation providing measure	National Government Ministry
Other contributions	-
Total budget for the measure	The exact budget for the CIR varies, since it depends on claims made by enterprises. The CIR is estimated to have cost around €5 billion per year between 2009 and 2014 in tax revenue forgone (OFCE, 2016).

Reason for highlighting this measure

The research tax credit is one of France's headline measures for promoting innovation within the country. It is very well established, having been in place since 1983. However, recent changes (particularly in 2008) are believed to have had quite a significant impact on levels of uptake. With regard to employment effects, the measure is credited with having increased the numbers of researchers working in the private sector. Furthermore, the 'dispositif jeunes docteurs' (DJD) – a sub-measure which provides higher levels of reimbursement for companies employing young PhDs – is specifically aimed at decreasing unemployment amongst those who have recently completed doctoral studies.

There is a strong body of evidence examining the impact of the CIR. A number of evaluations have been carried out over the years, both undertaken by external bodies and commissioned by the French Government. These have focused primarily on the economic impacts of the CIR and its role in driving research and development (R&D) investment in the private sector, but most do consider employment effects, even if to a limited extent.

It is believed that this measure is representative of a number of similar measures that are in place across Europe.

The policy context for this measure

The French government is very keen to promote research and innovation, particularly in the private sector, in order to ensure a thriving and robust economy which can withstand the rapid technological advances of the twenty first century.

France is the second largest EU Member State after Germany with a population of 66.1 million. In 2015, the country's per capita GDP stood at €33,990 compared to an EU-28 average of €27,300 (2014). The French economy was badly affected by the 2008 economic and financial crisis and the growth rate in GDP fell from 2.4% in 2007 to 0.2% in 2008 and

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-2.9% in 2009. Although there has been some recovery since then, growth in recent years has been relatively stagnant and has still not reached the pre-crisis levels (0.8% in 2013, 0.2% in 2014 and 1.2% in 2015).

France's expenditure on R&D has however been growing since 2006 and, with a GERD (Gross Expenditure on R&D) of €48.1 billion in 2014 (EU average €10.1 billion), French investment in R&D represents 17% of total EU28 expenditure. This places France as the second largest investor in R&D in the EU28 after Germany. France's R&D intensity in 2014 was 2.26% (GERD as a percentage of GDP) which given France's relative stagnation in GDP in recent years, places France 8th in Europe (EU average 2.03% in 2014).

The CIR is one of a number of measures implemented by the French government to bring down the costs of investment in R&D by French enterprises and to improve their competitiveness internationally. This forms part of broader national research strategies, the most recent of which - France Europe 2020 - was published in 2015.

The National Research Strategy is organised around 10 societal challenges, three of which are particularly pertinent to the CIR. These are: the need for industrial renewal; embracing information and communication based society; and promoting an innovative, integrative and adaptive society. The CIR is deliberately broad and accessible, with low barriers to entry, to try and attract innovative enterprises to France, promote innovation within French enterprises, and ultimately achieve the vision of France Europe 2020.

A further difficulty which is specific to the French context is a high level of unemployment amongst academic researchers following completion of their PhDs. The French government has been attempting to address this through policy measures since the 1980s. One of these measures is the Young PhD Scheme – 'dispositif jeunes docteurs' (DJD) – which became part of the CIR in 1999.

Aims and objectives of the measure

Rationale, objectives and main elements of the support

In order to achieve its broad strategic goals as outlined in the policy context section above, the government has three main objectives which relate to the CIR:

1. To increase R&D activity in firms based in France;
2. To promote the creation of new R&D centres in France and the growth of existing centres; and
3. To support the increase of public-private partnerships, and the hiring of young post-docs.

The CIR is an indirect support measure that contributes to a business environment that is conducive to innovation. The CIR aims to reduce the real and perceived risks of investment in innovation and to provide financial incentives for individual enterprises investing in R&D. This is expected to bring benefits on a macro-economic level, in terms of improved growth and productivity, particularly in high-value sectors where margins can be preserved from downwards pressure on prices. There are no specific quantifiable targets associated with the research tax credit with regard to these objectives.

Target groups and intended beneficiaries

The CIR is a broad-based measure, which is aimed at all commercial entities (enterprises) which pay corporation tax or income tax. In more recent years, there has been some focus on measuring the impact of the CIR on SMEs but they are not identified as a specific target group of the measure,

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although since 2008 SMEs are able to benefit from a specific innovation tax credit as part of the CIR (20% of SME expenses on innovation can also be claimed).

Most organisations which do not pay tax are excluded, except for 'young innovating enterprises' (JEIs), those situated in assisted zones (those eligible to receive European Structural and Investment Funds - ESIF - funding) and enterprises which have been created to take over an enterprise in crisis.

The ultimate intended beneficiaries of the tax credit are recent graduates (and with regard to the DJD, young PhDs specifically), who should find work more easily as a result of the beneficial conditions provided to enterprises employing them.

Characteristics of the measure

Instrument type

The CIR is a tax credit – a reduction of tax liability - which aims to increase private sector R&D investment, improve research capabilities and enhance innovation activity.

Relation of the measure to other measures

The CIR is a stand-alone measure implemented by the French government to help promote an innovation-friendly business environment within France. It is, however, one of a series of initiatives aiming to increase private sector innovation, including the provision of financial support (through tax credits, but also in the form of subsidies and other financial aid), technical support (through the development of clusters), awareness raising (through, for example, a series of prize-giving schemes) and inter-sectoral mobility measures (such as industrial research contracts for academics). Whilst many enterprises that claim the CIR also engage with other measures aiming to promote innovation, these measures do not interact with each other directly.

Type(s) of innovation supported

The tax credit is broad and, in principle, could be used to support any type of R&D within enterprises, particularly product and process innovation. However, its objective of increasing levels of R&D within firms can also lead to organisational changes and can therefore contribute to organisational innovation.

Sectoral focus

There is no specific sectoral focus for the CIR – it is available to all enterprises involved in industrial, commercial, artisanal or agricultural activities.

Regional specificities

The CIR is a national measure and is available in all French territories, including overseas departments. In zones which are eligible for ESIF Funds, entities which do not pay corporation tax or income tax may also be eligible for the CIR, in the form of a grant.

Funding available for applicants

Funding levels are set at 30% of R&D expenditure up to a ceiling of €100 million, with any expenditure over €100 million receiving a reimbursement of 5%.

The details of the eligibility of spending for the tax credit have changed significantly over time, with a general trend towards simplification. Currently, 100% of salaries for research staff (researchers and research assistants) can be claimed when carrying out eligible activities (staff costs related to training, travel, recruitment and purchasing of materials are explicitly excluded), as well

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as up to 50% of R&D operating costs (a number of costs are defined on the government website including fees for taking and maintaining patents and plant breeders' certificates (VOCs); patent and VOC defence fees; depreciation allowances for patents acquired for research and VOCs; standardisation expenditures; premiums and contributions or share of premiums and contributions to legal protection insurance contracts providing for the payment of expenses incurred in litigation relating to a patent or plant breeders' certificate held by the enterprise to a limit of €60,000) and 75% of investments in conducting R&D. 20% of SME expenses on innovation (development of prototypes and piloting of new products) can also be claimed (up to €400,000 per annum). While there is no maximum duration period or number of staff, personnel expenses cannot exceed the 30% ceiling imposed on the CIR as a whole.

For enterprises which are new to the scheme, 50% of expenses can be claimed in the first year and 40% in the second year. Furthermore, enterprises can benefit from 200% of salary costs and related administration costs for 24 months if they employ a post-doctoral researcher (see section on 'The instrument design' for more information).

Total innovation support in France is 0.36% of GDP, of which 0.26 percentage points are related to the CIR. This is relatively expensive – total innovation support in Germany costs 0.08% of GDP, for example (OFCE, 2016).

Time period over which the effects are expected to be felt

The time frame for impacts of the CIR, particularly employment-related ones, is relatively long-term. The effects of the 2008 reform, for instance, were expected to be felt within 2 years in terms of the number of enterprises taking advantage of the measure, but the impacts on firm-level innovation and on employment were not expected to be measurable before 2013 (IGF, 2010). In reality, the timeframe has been even longer.

How the measure is implemented

The instrument design

The research tax credit is a fiscal support measure, which offers a tax refund against corporation or income tax. In effect, it is a subsidy of up to 30% of all R&D expenditure up to a total of €100 million and 5% for any expenditure above €100 million.

A number of notable reforms have taken place since the introduction of the CIR in 1983. In 1999, the Young PhDs initiative was introduced, which allowed 100% of expenses laid out on a post-doctoral or post-graduate researcher to be claimed in the first 12 months of their employment.

In 2004, the way the tax credit was calculated was changed slightly, which led to an increase in the amount claimed from €6.1 million to €8 million.

In 2006, the Young PhDs initiative was made more generous – allowing for personnel expenses related to these recruits to be double-counted (compared to other tax credit expenses) and for administrative costs to be claimed at 200%. This was allowable only if the person in question was employed on an unlimited contract and if the number of employees was no less than the preceding year.

Finally, in 2008 the CIR was somewhat simplified so that the expenses claimed could be for all R&D, rather than just additional R&D. With regard to the Young PhDs scheme, the period of time for which extra tax credits could be claimed was extended from 12 to 24 months.

In 2014, the 2006 reform was slightly refined. Rather than considering the number of employees in the entire business, it took into account only the number of researchers employed. This change was expected to help larger businesses, but no evaluations have yet been carried out on the effects of

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this change.

The intervention logic of the CIR is based on the need to address market failure. As well as the well-known problems of information asymmetry in financing innovation, according to the 2016 OFCE meta-evaluation of the CIR, there are two particular obstacles to R&D investment at firm level in France, both of which are related to the high costs of basic research. Firstly, in spite of intellectual property protection, it is perceived by private sector firms and entrepreneurs as being better value for money to be an imitator building on the discoveries of others rather than an innovator, or driver of change. This is linked both to the high risk associated with R&D activities and with the belief that, no matter how tightly protected new discoveries are, there is bound to be spill-over to other enterprises in the sector which is perceived as limiting the rewards for innovation. The second obstacle is linked to the risk of failure, which may constrain access to finance for R&D activities.

Eligibility criteria and restrictions

The intention of French policy makers is to make the CIR as broad and as accessible as possible, so there is no restriction on sector or size. It is available to all commercial entities (enterprises) which pay corporation tax or income tax and are engaged in industrial, commercial, artisanal or agricultural activities. The CIR applies regardless of the mode of operation of these entities (individual entrepreneurs, a craft enterprise, a limited company, public limited company, etc.). Associations for non-profit purposes, governed by the 1901 law, may also benefit from the CIR if they are participating in revenue-generating activities.

R&D activities eligible for CIR are basic research, applied research and experimental development (using the definitions found in the Frascati manual). Furthermore, SMEs with less than 250 salaried employees whose annual sales revenue is less than €50 million and who have innovation-related expenses linked to the creation of prototypes and the piloting of new products can also benefit from the CIR. These are different from the R&D expenses mentioned above, which are applicable to all enterprises.

Most organisations which do not usually pay tax are excluded, except for 'young innovating enterprises' (JEIs) and enterprises which have been created to take over a firm in crisis.

Initially, the CIR could only be claimed for additional R&D expenditure. However, following a sweeping reform to the measure in 2008, it is now applicable to all R&D expenditure (up to €100 million).

The CIR is one of the most significant innovation support measures in France, with an estimated 85% of eligible organisations now claiming tax credits. This estimation comes from the latest evaluation, due to be published in 2018, and represents a significant increase from previous estimations of 51%. There is no competition between applicants as any organisation which meets the criteria is eligible for the CIR, meaning that there is no maximum ceiling for the total annual overall cost of the measure.

How the measure is accessed and delivered

The CIR can be claimed against all R&D expenditure carried out within a financial year. Funding is available in the form of a tax credit, which is claimed back from the government annually against expenditure on R&D. It is discounted directly from corporation tax or income tax. If the tax credit exceeds the tax due for any given year, the excess credit can be applied to taxes paid for up to three years following the claim. If the CIR remains higher than the tax paid at the end of three years, the remaining amount will be paid directly to the company. SMEs, micro-SMEs, young innovating enterprises and companies being taken over are eligible to be reimbursed immediately.

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The 2008 tax reform simplified the procedure considerably, as well as allowed firms to claim a tax credit on all R&D expenditure, with the intention of boosting firm-level R&D.

The mechanisms used for the implementation

The measure is implemented through the French tax system, via an online or paper declaration. It has a direct effect on a firm's finances, reducing the costs of investment in R&D and in certain circumstances (explained above) providing additional funds. There is thus a direct effect on R&D expenditure and/or, in the case of SMEs, on the creation of prototypes and the piloting of new products.

How the measure is expected to generate its intended effects

The principal objective of the CIR is to create an atmosphere conducive to research, innovation and development within France. The French government takes great pride in the CIR having being named the leading innovation support measure for businesses by the 9th EU Innovation Barometer. This helps to support the vision of a forward-looking economy which the government is aiming to portray. The CIR is intended to encourage innovation within French enterprises, as well as encouraging innovative enterprises to set up in France as a significant contribution to economic growth. This is expected to have both direct and indirect employment effects, since enterprises can include 100% of salary costs in their CIR claim and it is expected that enterprises choosing to base themselves in France to take advantage of the tax provisions would become important employers locally.

The intended general and employment effects of the measure

By reducing the cost of R&D investment and thus boosting firm-level investment in innovation, the CIR is intended to generate direct employment effects through the recruitment of more researchers, although there are no specific targets associated with this broad aim. These direct effects are expected to be further enhanced by the specific sub measure related to recruiting PhDs, which provides particularly generous conditions for firms employing them – thus making their recruitment much more cost-effective than it would otherwise be. Originally, there was a requirement not to reduce the number of staff employed, which was intended to counteract any tendency to displacement (replacing existing staff with researchers). However, this was thought to have introduced unnecessary restrictions on enterprises and the requirement now is not to reduce the number of researchers.

The introduction of skilled researchers into firms could also be expected to have spillover effects for other employees, increasing firm-level knowledge and providing informal learning opportunities for other staff, thus increasing job quality.

The measure may also be expected to generate indirect employment effects on a broader macro-economic level. The creation of an innovative private sector can be expected to promote growth through the development of new products and services and the creation of new markets and hence both to secure existing jobs and to create new ones. The economic growth can be expected to have impacts on national employment levels, as more jobs are created.

Summary of the main evidence available

Numerous evaluations of the CIR have been carried out since 1983. These evaluations have been used by the government to tweak the CIR and render it more effective, with reforms carried out in 2004, 2006 and – most notably – 2008.

For the purposes of this study, we shall focus on two evaluations carried out since the reform of 2008. The first is a meta evaluation, which surveys the evidence of previous evaluations. This gives a good overview of the evidence gathered to date. The second evaluation is targeted at a specific

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sub-measure of the research tax credit, which was specifically designed to combat unemployment amongst PhD graduates. This has been chosen because, whilst most of the other evaluations focus primarily on R&D investment levels, this study looks explicitly at employment effects. A new evaluation has been commissioned, the terms of reference for which include the employment impacts of the research tax credit. However, at the moment of writing this has yet to be completed and published so it cannot be used for the purposes of the current study. However, an interview with one of the authors of this evaluation has been conducted to clarify and update some of the findings of the evaluations examined here.

'Studies on the impact of the CIR – a review of the literature' (Etudes d'impact du crédit d'impôt recherche (CIR) – une révue de la littérature), OFCE 2016

Although the purpose of this evaluation is not explicitly detailed, it was produced by the publicly funded French Economic Observatory (L'observatoire francais des conjonctures economiques (OFCE) and is addressed to the Secretary of State for Tertiary Education. Its timing suggests that its aim may be to feed into the upcoming review of the CIR, by providing a synthesised analysis of the existing evidence. This potential explanation is supported by the key finding that evaluations of the CIR to date 'suffer from the lack of a clearly defined objective' and the development of a series of research questions for a future evaluation based on the findings of the study (OFCE, 2016).

The literature review represents a meta-evaluation of 12 previous evaluations carried out on the CIR, both before and after the 2008 reform. The evaluations are complemented by data analysis based on the Eurostat database. It aims to draw a long-term picture of subscription rates to the measure, the effects of the CIR on R&D investment, its impact on innovation (measured here by number of patents filed), economic activity, and employment of researchers. It also includes a review of the 2008 reform, the impacts of the 2007 economic crisis, and an attempt to differentiate substitution effects from additional R&D investment due to the CIR. It also provides a brief analysis of the methodologies used in each of the evaluations treated by the study.

The study mentions an estimated total of 190 million claims being filed (official figures from the government website state that there were 16,000 beneficiaries in 2013), but there is no discussion of the evolution in beneficiary numbers. The expenditure on R&D and the total cost of the CIR from 1990-2014 is measured, with important reforms such as the introduction of the DJD noted to see what effect these may have had. The evaluation also considers the breakdown of enterprises claiming the CIR, according to number of employees and overall R&D expenditure.

Results show a clear increase both in the total amount of R&D expenditure and in the cost of the CIR over the period 1990-2014 – with overall R&D expenditure rising in line with business expenditure on R&D (BERD). According to the statistics reported, the CIR costs approximately €5 billion per year – an amount that has remained relatively stable since the reform of 2008 (prior to this it was much lower, but increasing gradually each year).

The CIR is found to be relatively popular; with a subscription rate of 51% (interview feedback suggests that this figure has now increased to 85%). The study also shows an increase in R&D activity in firms subscribing to the CIR, with a rate of increase of approximately 17% over the period. There is evidence of some additionality in terms of private sector R&D spending, with €1.1 being spent for every €1 of government investment. Furthermore, prior to 2003, firms claiming the CIR employed approximately 11.1% more researchers than firms not claiming the CIR. Between 2007 and 2025, the number of researchers employed is predicted to rise by 25% nationally – much of which is credited to the 2008 reform. Furthermore, the 2008 reform was found to have a significant effect on the likelihood of a PhD graduate finding a job. Membership of an innovation cluster was found to have an influencing effect on the decision to claim CIR, with elevated levels of claims amongst firms operating within these clusters.

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There is a lack of compelling evidence establishing a link between the CIR and innovation (measured here by number of patents published). While there appears to be a small increase in terms of patents registered by enterprises which have just begun to claim the CIR, there was no evidence of an increase in patents registered by enterprises which were already claiming the tax credit. While the method for calculating innovation impacts is provided in an annex, there are no raw data provided on the number of patents claims submitted.

'Evaluation of the impact of the 'young doctors' measure in the CIR' (Évaluation de l'impact du dispositif «jeunes docteurs» du crédit d'impôt recherche), commissioned by Ministry of national education, higher education and research (now Ministry of Higher Education, Research and Innovation (MESRI) , 2015

This evaluation was carried out by David Margolis and Luis Miotti on behalf of the Ministry of national education, higher education and research. The decision to evaluate the DJD specifically followed a 2013 evaluation of the CIR which found that the DJD is damaging to the simplicity of the CIR. Specifically, it suggested that the DJD renders the CIR too complicated, doubles up with other public supports (most notably the CIFRE, which provides subsidies for technical contracts made between researchers and industry) and leads to excessive levels of support for PhD graduates.

The evaluation investigates a specific sub-measure of the CIR introduced in 1999 to help combat unemployment amongst PhD graduates, whereby enterprises receiving a 30% CIR can benefit from an extra 60% of salary costs for 24 months if they employ a post-doctoral researcher (and the same amount towards administrative costs). It should be noted that the government website currently allows for a doubling of claims for PhD researchers, namely 200% of salary costs, suggesting a change in policy since this evaluation was carried out.

The evaluation aims to measure the effectiveness of the DJD in increasing the employment of PhDs in the private sector, particularly in the first three years following completion of their study. It includes an econometric analysis of employment effects, looking at the impacts particularly on PhD graduates and engineers. These two groups are chosen for comparison because engineers tend to have better employment rates than PhDs (due largely to their choice of subject, which tends to be more directly applicable to industry).

The evaluation was carried out in two parts: firstly, an analysis was conducted to better understand the socio-demographic characteristics of PhDs, their degree choice and their specialisations. This analysis focused on looking at how this combination of factors impacted the likelihood of unemployment.

Secondly, an econometric analysis was undertaken to evaluate the impact of the CIR on the employment of young PhDs. A duration model was used for this analysis, to allow for flexibility and to try and control for bias.

The evaluators finished by recommending a study into the links between the DJD and the CIFRE – government supported contracts used to provide academics with the opportunity to work in industry for short period of time as a method of promoting intersectoral mobility. It was argued that a joint evaluation of the DJD and the CIFRE would allow to gather a better picture of the success of government policy in overcoming post-doctoral unemployment.

The first part of the study found no substantive bias against PhDs in the private sector – rather their low employment rate appeared to be linked to a preference for work in the public sector and a choice of specialisms which were not well suited to private sector R&D. The unemployment periods noticed were found to be the result of multiple attempts at finding work in the public sector, after which they might turn to the private sector.

The econometric analysis did find a significant increase in employment amongst PhD graduates

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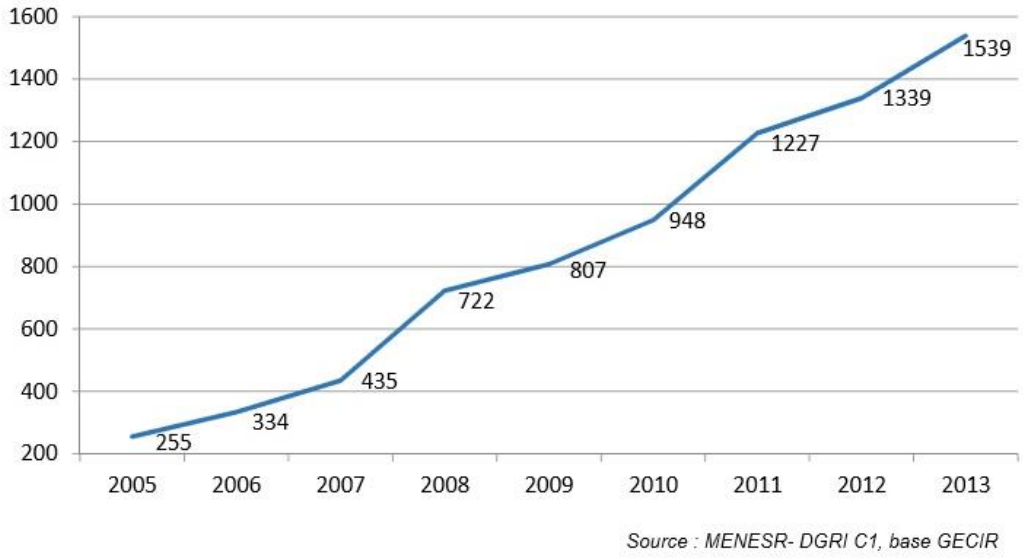
related to the measure, as shown by a dramatic increase in DJD claims. As this particularly sub-measure can only be claimed to cover employment of young PhD graduates in research posts, this suggests an increase in employment for this category of workers.

Figure 1: Number of enterprising claiming DJD expenses 2005-2013



A major finding of the study was that, whilst the intervention did appear to increase the number of jobs and the employment chances of all young PhDs. Particularly following the simplifications of 2008, this came to some extent at the expense of jobs for young engineers without PhDs – thus creating a limited displacement effect between engineers and engineers with PhDs or PhDs with some engineering expertise (it appears that there is a negative effect of around 10% on jobs for engineers without a PhD, while engineers with PhDs and PhDs with engineering specialisations benefit from a combined positive effect of approximately 30% on employment). The broader CIR, however, did appear to have a positive impact on job creation overall. This finding has policy implications for the Ministry, who will need to consider whether the incentives provided by the DJD are misdirected.

Quality of the evidence base

'Studies on the impact of the CIR – a review of the literature'

This study reviews the evidence provided by 12 previous evaluations of the CIR. The use of a meta-analysis ranks highly in most strength of evidence assessments with regard to standard interventions, since it allows for a more informed gauging of effectiveness. The ability to compare findings across a range of evaluations allows the findings of one study to be verified or brought into question by the findings of other evaluations.

The study was carried out by an independent organisation with no links to the administration of the CIR, so it may be judged as being independent. Furthermore, it draws together evidence from multiple evaluations – all of which were carried out by independent experts, although some were

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commissioned by the French government.

In order to ensure a like for like comparison, the evidence is divided into two groups, with econometric analyses being treated separately from impact assessments. There is also an attempt to analyse the techniques used and draw out their strengths and weaknesses. For example, the authors distinguish between ex-ante and ex-post evaluations and the effects the moment of the evaluation with respect to the intervention may have on findings (for example, with regard to selection bias or an over-reliance on theoretical models). The ability to compare evaluations, which took place at specific points in the evolution of the measure, enables the authors to draw out explicitly the impacts of specific reforms. In terms of employment effects, for example, all of the evaluations included in this meta-analysis showed a clear positive correlation between each Euro of CIR claimed and the number of researchers employed, an effect that has been strengthened by the 2008 reform. Furthermore, the impact of the 2008 reform in this regard was more effective than the preceding 2004 and 2006 reforms combined. It is hard to identify a specific line of causation for this impact, but those interviewed believed that the increased impact of the 2008 reform is due to the significant simplifications introduced, which made claiming the CIR much easier.

The main evaluation criteria examined in this evaluation are effectiveness, efficiency, value-added (additionality) and relevance. The CIR is found to be expensive but effective as a measure to promote R&D, with clear additionality. Its effectiveness in promoting innovation is less clear, however, as measured by number of patents filed. Employment effects can be seen, but these are limited to employment of researchers and there is some risk of substitution effects. The measure's efficiency is brought into question, with a concluding remark that its ever increasing cost is a major consideration in terms of return on investment. As there is no upper ceiling on the measure, it will become increasingly expensive for the government as more firms claim back taxes meaning that their tax intake will diminish. When questioned about this aspect, the interviewees explained that this increased cost is somewhat offset by the increased growth that is expected from the additional R&D investment associated with the measure. This has potential impacts on the CIR's long-term sustainability, as it involves a high up-front investment from the government (in terms of reduced taxes received) with impacts (in terms of increased growth and therefore increased tax revenue) which will only be realised in the long-term, and possibly not at all. Coherence is also considered, both internally (regarding the interaction of the various reforms) and externally (the CIR's interaction with other measures – specifically the competitiveness clusters on uptake of the CIR).

In addition to the evaluation evidence, the authors draw on data from the Eurostat database and French government websites in order to track the trajectory of CIR costs and R&D expenditure, and map this against key reforms in the measure (such as the introduction of the DJD in 1990). This does provide an interesting longitudinal insight, which shows more explicitly the impacts of key reforms.

The most notable omission in this study is a lack of contextual analysis – largely explained by the dominance of econometric evaluations in the literature reviewed. Furthermore, recent changes which may impact on the measure's effectiveness, such as the 2014 reform introducing the new requirement whereby the number of researchers may not be reduced rather than the overall number of staff, have not yet been evaluated.

One of the major downfalls of the evaluation is its brevity, leaving little space for critiquing the evaluations which form its evidence base. For example, whilst it appears that most studies use the 49% of businesses who have not subscribed as their control group, little information is available on how extenuating factors are controlled for. One salient point which emerges is the focus on econometric evaluations to assess the impact of the CIR to date, which leads to a lack of qualitative data to explain, for example, the reasons why an enterprise may choose (or not) to claim the CIR.

In summary, this evaluation provides a valuable contribution to the discussion and is able to build

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on the work of previous authors to draw out long-term trends and confirm findings. Nonetheless, more information would be useful regarding the evaluation's objectives and the reasons for commissioning it in order to better understand the purpose of the evaluation and recognise any potential bias.

'Evaluation of the impact of the 'young doctors' measure in the CIR'

The study is based on an econometric analysis, which breaks down the beneficiaries according to the subject they studied, and uses young engineers as a control group in order to allow for a more nuanced understanding of the outcomes and impacts of the DJD, which might otherwise be lost. It was commissioned by the Ministry of National Education but carried out by independent evaluators. The evaluation is relevant and well-focused, looking largely at questions of effectiveness, efficiency and value-added, with the major finding that the added value of the DJD in terms of additional job creation is limited by a substitution effect with regard to engineers.

The evaluation uses a broad base of data drawn from the 'Génération 2004' survey (which surveyed those leaving education between November 2003 and July 2009), which can then be used to analyse the subject choices and socio-economic status of the individuals concerned. Although the dataset is relatively old, the authors explain that there was little significant change in terms of unemployment rates for post-graduates in 2003, 2007 and 2010. The major problem that may be identified with regard to the data used is that they mainly predate the changes brought in in 2008, which had a significant impact on the CIR (as explained above). This means that it may be hard to gauge how effective these changes have been.

The dataset used is well respected and allows researchers to control for certain factors of interest. The purpose, criteria, design and potential difficulties with the evaluation methodology are clear and transparently stated in the evaluation. The methodology takes into account and tries to correct problems identified in previous surveys, notably by drilling down further into the subject choices and socio-economic background of the affected group. Nonetheless, there is room for improvement – notably with the age of the data used. Furthermore, the analysis lacks a counterfactual (although it does provide a comparison of the impacts of the reforms on PhDs and engineers without a PhD, which allows for a useful point of comparison) and only takes a relatively shallow look at the motivations of the post-doctoral researchers being studied, despite identifying this as a potential reason for them not moving into industry (it takes into account which sector researchers were hoping to enter but does not investigate the reasons for this). Nor is there any real attempt to differentiate between long and shorter term impacts of the intervention and the research questions are relatively narrow in scope.

An overall assessment of the two evaluations treated here shows them to be relevant for the purposes of the current study because they both consider employment effects, in terms of job creation and – to some extent – job quality. The evaluation of the DJD scheme, particularly, is highly relevant because it clearly demonstrates that a scheme which is too narrowly targeted may risk providing misleading incentives, in this case the displacement of engineers by PhD graduates (especially those with a PhD in engineering).

The approach taken to evaluation also appears to be relatively efficient. The use of a meta-analysis, for example, is a cost-effective method of drawing out overall conclusions and identifying gaps for future investigation. This is complemented by the use of a highly targeted evaluation to fully understand the implications of a specific sub-measure, the findings of which could have an impact on how public spending is allocated in future.

The evaluations are somewhat effective in demonstrating the link between the measure and broader employment effects, because they provide some evidence of job creation and improved job quality (the jobs being created are research posts, which tend to be of better quality than lower-paid

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administrative or sales type jobs), at least at the level of researchers. The primary aim of the evaluations, however, is to measure the impact of the government intervention on R&D investment, so employment considerations tend to be used as an intermediary indicator rather than a measure of impact. Furthermore, data are lacking regarding company growth – as measured by the number of employees overall. There is coherence between the two evaluations in that their findings reinforce each other (in fact, the evaluation of the DJD is one of the 12 evaluations included in the 2015 evaluation).

A problem faced by both evaluations is the difficulty of isolating the effects of the CIR from other government interventions. Indeed, evaluations of other measures often include references to the level of CIR claimed, since this appears to correlate with the readiness of organisations to apply for other measures. This correlation suggests that there may be spill over effects from or to the CIR which are hard to quantify.

Actual employment outcomes

So far, in spite of the intention to generate employment for researchers, evidence directly linking the CIR to employment effects has been weak. This may in part result from the fact that the measure can be combined with other government support measures, making it difficult to isolate its effects. There is a clear positive correlation between the number of enterprises claiming the CIR and the number of researchers employed, but the impact on overall employee numbers is less clear. When considering measures specifically aimed at employment (in this case, the DJD), there is nonetheless some evidence that the discounts available for recruitment of PhDs have had a positive impact on recruitment (Margolis and Miotti, 2015). It is hard to provide exact figures; however, this is believed to be somewhere in the region of 15% overall.

Although the focus of CIR evaluations has tended to be on private sector R&D investment levels rather than employment, some conclusions can nevertheless be drawn regarding job creation and job quality (namely the types of jobs being created). Interview evidence from a researcher working on the evaluation commissioned by CNEPI (mentioned in the summary of evidence section and due to be published in 2018) suggests that there is evidence linking the CIR to increases in employment – although this has only been measured as an indicator of 'true' R&D additionality (that is, the recruitment of additional researchers is used as an indicator for an increased R&D expenditure by the affected enterprises) and has still not been investigated in any depth as an impact in its own right.

As discussed in the summary of the main evidence available, the number of researchers in enterprises claiming the CIR is approximately 11% higher than in those not subscribing from 2007 onwards (OFCE, 2016). This suggests that the numbers of enterprises claiming CIR may correlate positively with an increase in job quality (namely by the creation of more skilled jobs in the form of research posts). The evaluation commissioned by the Ministry of Education also finds a large increase in the number of researchers being employed thanks to the CIR. What is particularly interesting, however, is that it finds the DJD to have a negligible effect on employment overall – rather substituting posts which tend to be filled by post-doctoral engineers (who are rendered cheaper by the extra tax credits available) for existing posts which had been filled by engineers without doctorates (for more precise information, see the section on summary of the main evidence available). The findings therefore seem to suggest that, at least in this case, a broad-based measure to increase R&D investment is more effective than a targeted measure which effectively subsidises one type of employee.

Overall assessment

The policy framework in France is generally conducive to research and innovation, with a number of long-standing measures designed to promote private sector R&D and clearly identified societal

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objectives in the France 2020 Europe Strategy. Nonetheless, the country has historic difficulties with the employment of skilled graduates, which date back to the 1980s. It has been suggested that these are due to a disconnect in terms of utility between the subjects studied by researchers at university and their applicability in the industrial sphere.

The French government is therefore using the CIR to achieve multiple goals. The principal objective of the CIR is to increase investment in R&D through the provision of generous tax credits, but the inclusion of the DJD is specifically aimed at solving high unemployment rates amongst PhD graduates.

Tax credits are a commonly used measure across Europe and beyond and they are relatively easy to understand and straightforward to administer. The CIR is a measure which is well worth studying, since it has been in place for more than 30 years, has a wealth of evaluation evidence available, and combines broad innovation support with measures specifically aiming to improve job prospects.

Evaluation findings with regard to outcomes are broadly positive, both in terms of the impact of the CIR on innovation (private sector investment in R&D specifically) and on employment – at least in terms of the recruitment of PhD graduates and an overall increase in the number of researchers being employed in the private sector. Broader indirect employment effects can be expected, but these have not been measured in any meaningful way.

One of the key strengths of the CIR lies in its accessibility, which has been further improved thanks to the reform of 2008. This means that over half of eligible enterprises are now claiming the tax credit. This does appear to have a significant impact on R&D investment in the private sector and some employment-related impacts have been identified – namely increased employment of researchers. This suggests a positive influence both on job creation and improvements in job quality, although these have not been the primary focus of evaluations carried out to date. The most recent evaluation is expected to provide more concrete evidence of a link between this measure and job creation.

Weaknesses of the measure include its high cost, and the difficulty of ascertaining a clear link to the impacts (due largely to its broad application and interaction with other measures to promote innovation). The design of the DJD may also need to be rethought, in order to create true additionality rather than displacement of existing workers. Informal criticisms have been raised with regard to the €100 million ceiling for the measure. The CIR is subject to the law of diminishing returns, and in terms of value for money, it is suggested that similar results could be obtained with a lower ceiling for the amount of tax credit claimed.

In terms of transferability, the CIR lends itself well to replication in other countries. Its link to tax collection instruments makes it straightforward to monitor and administer. However, it is costly and has a direct impact on government income, which may be a negative factor for economies facing pressure on public finances. It is a relatively simple measure which makes it easy to replicate, but the specific details would need to be adapted to the structure of the tax system and the specificities of the workforce in any given country (for example, adjusting for the main groups of people who are unemployed as well as assessing the appropriateness and capacity of tax incentives to increase employment amongst these groups as compared to other measures, such as capacity building). A thorough mapping would also be required to ensure there are no negative interactions with other innovation support measures in-country.

The sustainability of the measure depends very much on the structure of taxation and public spending within the target country, as it comes at the cost of tax intake, at least in the short term, and therefore involves a high up-front investment from the government (in terms of reduced taxes received) with impacts (in terms of increased growth and therefore increased tax revenue) which will only be realised in the long-term, and possibly not at all.

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Information sources

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MESRI (2017), *Guide to the CIR* (Guide du crédit d'impôt recherche)

Links

http://www.enseignementsup-recherche.gouv.fr/cid20358/le-credit-d-impot-recherche-cir.html

https://www.economie.gouv.fr/entreprises/credit-impot-recherche

https://www.service-public.fr/professionnels-entreprises/vosdroits/F23533

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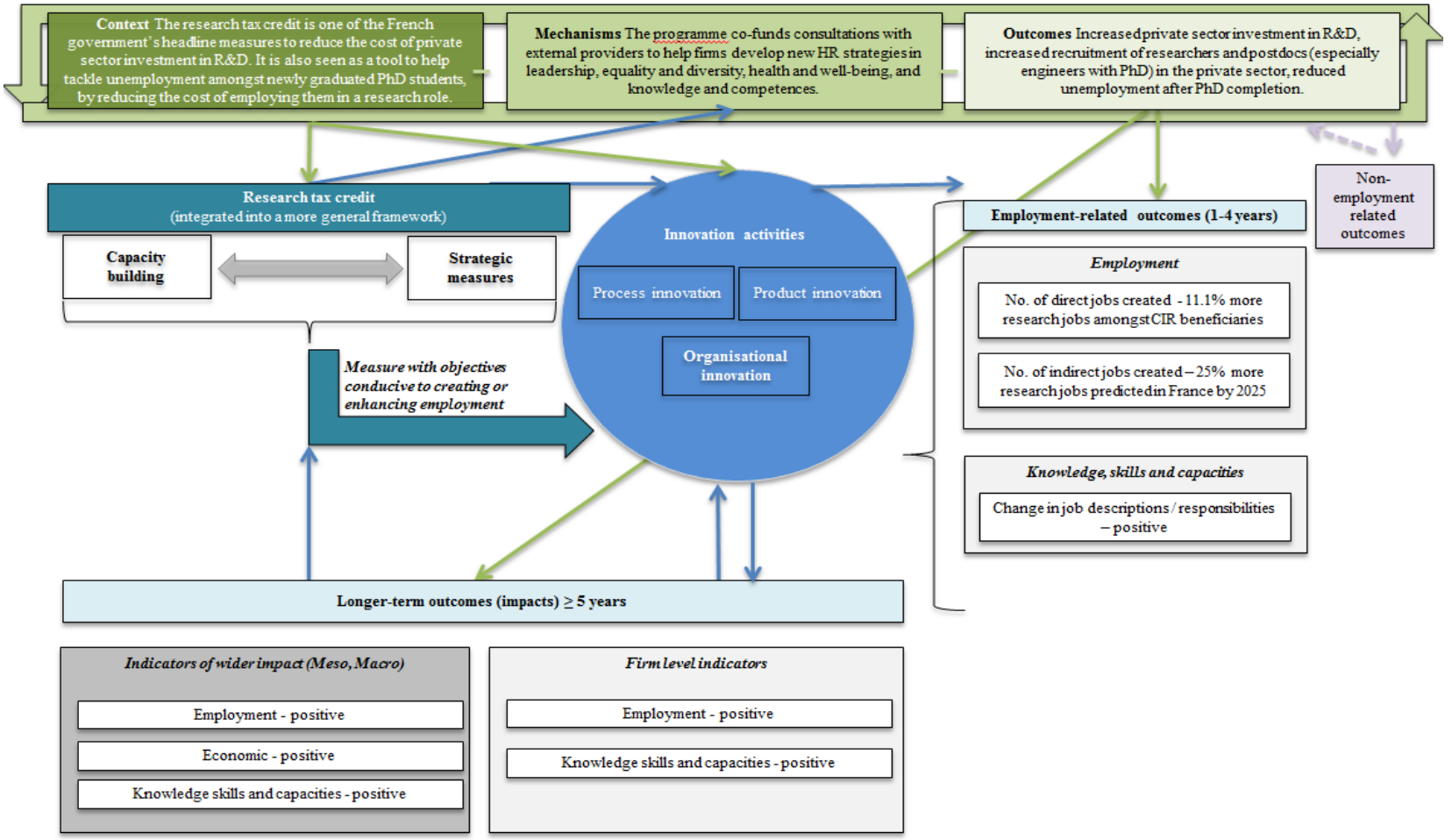
Graphic representation of the intervention logic of the measure



WBSO tax credit – The Netherlands

WBSO tax credit – The Netherlands	
Measure identification	**NL WBSO R&D tax credit**
Name of the instrument	WBSO R&D tax credit - Wet bevordering speur- en ontwikkelingswerk (WBSO); the Promotion of Research and Development Act In full: Wet Vermindering Afdracht Loonbelasting en Premie Volksverzekering, Onderdeel Speur en Ontwikkelingswerk Law on the reduction of wage tax and national insurance in favour of research and development work
Web link	https://english.rvo.nl/subsidies-programmes/wbso
Location	The Netherlands – all regions
Starting year and duration	1994 – present (2018) The Promotion of Research and Development Act (WBSO) first came into effect in 1994. The detailed provisions are determined in the annual national budgets
Name of the organisation providing measure	Ministry of Economic Affairs and Climate Policy (Ministerie van Economische Zaken en Klimaat) Implemented by: Netherlands Enterprise Agency (NEA) (Rijksdienst voor Ondernemend Nederland
Type of organisation providing measure	A central government department
Other contributions	No EU support or contributions from industry or social partners
Total budget for the measure	The cabinet determines the budget for the WBSO on an annual basis. The budget for 2017 was €1,205 million, and for 2018 is €1,163 million.

Reason for highlighting this measure

Tax credits are a common form of support for innovation and for Research and Development (R&D) in particular.

The WBSO is a particular type of tax credit affecting employment directly, since it offers reductions in payroll taxes. It aims to increase R&D by reducing taxes on wage and salary costs of staff working on R&D, irrespective of the outcomes of the R&D activity. Therefore, there should be a direct effect on employment.

The WBSO has been in operation since 1994. As such it has had an impact on innovation over a long period. Some 80-90% of the enterprises that do R&D in the Netherlands have used it. Its targeted uses and impacts have evolved according to the different phases of the economic cycle. For example, during the post-2008 downswing, the measure helped enterprises to retain R&D staff and capabilities that might otherwise have been made redundant.

There is a good evidence base on the tax credit that has been built up over a long period, with some in-depth independent evaluations commissioned by the organisation responsible for administering the WBSO (by law, an independent evaluation of the instrument must be carried out every five years). In addition, some independent academic evaluations have also been undertaken. The evaluation for the period 2011-2015 is due in 2018.

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The policy context for this measure

The WBSO came into operation in 1994 in the context of a policy shift away from relatively *ad hoc industrial policy interventions* (aiming to support declining industries or 'national champions') towards an *overarching technology policy* to support innovation, R&D and technological change to create an innovation-driven economy (Van Zanden, 1999).Innovation was becoming an important pillar of the economic policy of the Netherlands.

This approach to R&D reflected the market-oriented policies of the government which emerged from the 1994 elections. It was the Netherlands' first right-left coalition, led by Wim Kok (a former labour leader), and it launched a series of reforms designed to cut government expenditures, reduce taxes, increase market forces in the Dutch economy, lower regulation, and reform the welfare/social system to move people off dependence and into the workforce. A focus on privatisation, including large parts of the social security system, was also part of the new government's agenda...

Reflecting this greater market orientation ('*marktperspectief' in Dutch)*, the measure only establishes broad guidelines regarding the type of eligible innovation activities to be performed (please see below), while allowing enterprises to choose what they want to research and how.

In addition, the measure was seen as contributing to the attractiveness of the Netherlands as an inward investment destination and helping to counteract relatively high salary and wage costs compared to other knowledge economies. There was also a proliferation of similar measures occurring in other OECD economies, and the WBSO was a response to that situation by providing a similar competitive offering to attract and increase R&D activities (Brouwer, E. (et.al.) 2002),

More specifically, the reason for the use of a fiscal measure to stimulate R&D was a reaction to an existing underinvestment in R&D, given that research does not always result in commercialised innovation (EIM, 2012a). This risk could discourage enterprises from making R&D investments. R&D also requires expenditure on laboratories and equipment, and support in meeting these costs makes the investment in R&D more attractive. In addition, at the time of the introduction of the measure, salary and wage costs for knowledge workers were considered rather high in the Netherlands as compared to other knowledge economies, which had a negative effect on the investment climate in the Netherlands, also in the case of R&D.

Furthermore, at the time that the measure was implemented, much R&D expenditure in the Netherlands was being done by a handful of global multinationals such as Phillips, Shell and DSM. The WBSO aimed to encourage more SMEs to be active in carrying out R&D.

Since then, the instrument has been a pillar of innovation support in the Netherlands, remaining in use, with slight modifications, as various other initiatives were introduced. The new enterprise policy introduced in 2011 marked a shift from the market-oriented approach to a more systems-oriented approach (*systeemperspectief*). This is reflected in the implementation of the 'Top Sectors' strategy in 2011 (referred to below). The fact that the WBSO was retained in this context suggests that it was seen by policy makers as making a useful contribution from a systemic point of view.

There has also been increasing integration of R&D incentives. As an example, the WBSO and the Research and Development Allowance (RDA) have been integrated since 2016, under the name of the WBSO.

The WBSO is the main tax credit measure in support of innovation operating in the Netherlands.

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Other tax measures in the country allow deductions against corporate income tax rather than payroll taxes. These include the 'Innovation Box'[3], which allows a lower rate of tax on income from qualifying intellectual property, investments in new energy-efficient business assets that meet the Energy List requirements and also deductions for small investments that meet list requirements. To access the Innovation Box fiscal incentive, it is necessary to have a WBSO project.

Other non-fiscal measures may be seen as complementary to the WBSO scheme. As mentioned above, in 2011 the Dutch Ministry of Economic Affairs launched a new enterprise policy aimed to deliver excellent framework conditions, with attention to strategic sub-sectors of the economy, known as 'Top Sectors' (Panteia, 2014).[4] The framework conditions included standard elements of enterprise policy, such as reducing the regulatory burden and improving access to finance, but also stimulating R&D and innovation. Under the latter heading, the WBSO featured among the measures addressing framework conditions. A further development in 2011 was the launch of the Dutch Research Agenda, which summarises the key scientific questions and themes to which Dutch researchers can make a major contribution. This agenda is concerned with questions of a natural scientific nature, and therefore links in well with the WBSO approach (see below).

Aims and objectives of the measure

Rationale, objectives and main elements of the support

Policy makers considered R&D a key factor contributing to economic growth, with industry transforming research into useful applications, while carrying out fundamental research with a long-term focus. The positive social externalities of R&D were deemed very important. Furthermore, the measure was in line with the Lisbon agenda and achieving the target of spending 3% of GDP on R&D (this target was subsequently reduced to 2.5% in 2011).

The overall objective of the WBSO is to increase R&D in the Netherlands by reducing taxes on wage and salary costs for staff working on approved R&D. The target population was all organisations carrying out R&D for commercial purposes.

Increased R&D is also expected to increase the competitiveness of enterprises and the development of knowledge and technology are expected to generate positive external effects, ensuring that social benefits are greater than private benefits.

By making the measure widely available, the aim is to drive the development of an innovation culture in the Netherlands.

More specifically, however, the WBSO is a fiscal measure that stimulates approved R&D in organisations (enterprises, research institutions or individuals) through a direct reduction in the salary/wage costs of R&D personnel. Beneficiaries of the measure can deduct the tax benefit in their tax return to the Netherlands Tax and Customs Administration. Companies and research institutions (the latter being treated in the same way as companies – public institutions do not qualify for WBSO) pay less wage tax and lower national insurance contributions, and self-employed individuals can make use of a fixed deduction on income tax. Start-up entrepreneurs

[3] A company with a successful WBSO application can save on tax by using the 'Innovation Box', an income tax incentive introduced to promote innovative technological developments and support investments in new technologies. Through the Innovation Box, part of the profit earned with R&D projects qualifies for an effective corporate income tax rate of 5% (instead of 25%).

[4] Chemicals, horticulture, life sciences and health, water, high tech systems and materials, logistics, energy, the creative industry and agri and food.

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benefit from a supplementary credit.

Target beneficiaries

The measure is targeted at entrepreneurs and research institutions in the Netherlands planning to undertake R&D. The enterprise can be of any size and can be working in any business field. The WBSO distinguishes between enterprises which employ staff and withhold payroll taxes ('inhoudingsplichtigen') and are subject to company taxation; and the self-employed (working on R&D for at least 500 hours per year) who are subject to wage tax ('belastingplichtigen'). This reflects the differences in the way these forms of business organisation are treated from a fiscal point of view.

Characteristics of the measure

Instrument type

The measure works through tax credits against employment (payroll) taxes for those carrying out R&D, but also has special treatment for the support of start-ups undertaking innovation. Since 2016 the WBSO has been integrated with the deduction for qualifying non-wage costs (Research and Development Allowance) (Schrievers and Emonts, 2016). As such, it is an 'above the line' measure affecting costs rather than a measure affecting taxes on profits.

Relation of the measure to other measures

WBSO is a stand-alone measure, but it is implemented within the general context set out above under 'Policy context', of moving the economy to one driven by innovation and with a more market- oriented approach. Various measures can be combined. There was a close relationship between the use of the WBSO and the RDA and, as a result and as mentioned above, since 2016 WBSO has been integrated with the deduction for qualifying non-wage costs (RDA). To have access to the Innovation Box incentive, companies must use the WBSO. The WBSO may also be seen as supporting the Top Sectors strategy. The 'Top Sectors' strategy focused on nine strongly competitive and knowledge intensive key sectors and aimed to promote interaction between their key players and especially between enterprises of different sizes, research institutions and public agencies. This more strategic approach to modern industrial policy therefore provided a reference framework for much of the R&D being supported by the WBSO, although it should be recalled that the WBSO can be applied across the economy and not just by enterprises in the Top Sectors.*Type(s) of innovation supported*

The measure supports technical product and process innovation. There is no scope for the inclusion of organisational and marketing innovation.

For the purposes of the Act, R&D is defined as: development of technically new physical products, physical production processes, software or components thereof; and, technical-scientific research seeking to explain phenomena in fields such as physics, chemistry, biotechnology, production technology and information and communication technology (NEA, 2017).

The scope of the permissible research was widened to include projects in the field of technical research for own use (process innovation) in 2006 and the development of technically new software in 2009 (EIM, 2012).

Sectoral focus

The measure does not pre-define sectors in which the R&D is to be carried out, but it focuses on R&D aiming to result in products, processes or components including software. Given the type(s) of innovation supported, it is expected that there will be mainly physical outcomes, so the research will be mainly in areas falling under the physical sciences and related fields, such as ICT and

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engineering.

Regional specificities

There are no region-specific aspects related to this tax measure, which applies across the Netherlands.

Funding available for applicants

The cabinet determines the budget for the WBSO on an annual basis. The budget for 2017 was €1,205 million, and for 2018 it is €1,163 million. However, not all will necessarily be allocated – that will only be known at the end of each year.

In the table below, the 'awarded WBSOs' refer to the value of WBSOs awarded, which can be higher than the total amount of budget spent ('realised WBSOs'), because not all WBSO projects are carried out ('realised'), or maybe the whole 100% is not used. When more are realised than there is budget for in a year, the balance is deducted from the following year's budget.

Table 1: Yearly approved and realised WBSOs (€ million)

Year	Awarded WBSOs	Realised WBSOs	Available budget	Balance
1998	372	287	281	-6
1999	353	272	293	21
2000	365	284	302	18
2001	435	332	337	5
2002	464	347	367	20
2003	425	312	336	24
2004	466	349	367	18
2005	475	359	392	33
2006	506	377	417	40
2007	501	410	417	7
2008	554	445	417	-28
2009	848	701	606	-95
2010	1.037	860	692	-168
2011	1085	915	870	- 45
2012	853	731	864	133

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2013	893	766	735	-31
2014	912	781	912	131
2015	898	771	1040	269
2016*	1469	1200	1206	6

**Includes RDA*

Source: Agentschap NL, Ministerie van Financiën

It can also be observed that, during the years of the economic crisis, there were some substantial increases of R&D expenditure.

Time-period over which effects are expected to be felt

At project level the effects are expected according to the timeframe of project implementation, namely in the tax year for which the WBSO has been approved. Beneficiaries can make repeated use of the measure. Some have been taking advantage of the scheme continually since its inception.

The timing of effects depends on when projects are launched, their success and the stages of the project life-cycle. Other wide-ranging effects may be immediate such as when an increased risk appetite leads to new R&D. Or, effects may be expected over a longer period, influencing the overall business climate, or contributing to the development of a culture of innovation and longer term positive socio-economic externalities from the growth of a knowledge economy.

How the measure is implemented

Instrument design

In the context of the early-mid 1990's as outlined above, the WBSO was designed to make a direct impact on beneficiary's activities through cash flow, the profit and loss account and the balance sheet. As such it was relatively simple to administer and monitor as all user organisations submit annual accounting data.

In addition, the impact on employment would also be immediate and direct.

Over time the whole mechanism and process has become increasingly sophisticated and streamlined. It has become an institution in the R&D ecosystem and fiscal landscape.

Eligibility criteria and restrictions

Every entrepreneur and research organisation (for example, an 'ingenieursburo') in the Netherlands planning to undertake R&D can apply for a WBSO tax credit. The enterprise can be of any size and can be working in any business field.

As the measure has been in operation in the Netherlands since 1994 it is very widely known among the research community. It hardly requires any active marketing by NEA other than by making information available on its website organising a few information sessions on WBSO every year. Most WBSO applicants use an intermediary. NEA organises an annual information session especially for intermediaries, Intermediaries have done much to publicise the WBSO over the years. The fact that, as mentioned above, some 80-90% of organisations doing R&D in the Netherlands either are using or have used it, suggests that the largest share of such organisations are eligible, and restrictions are few.

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Two types of project are eligible for WBSO support: development projects which concern the development of technically new (components of) physical products, physical production processes or software; and, technical scientific research, which concerns explanatory research that is technical in nature. These are always based on the principle that the applicant is the party that carries out the work.

Different tax reductions are applied, according to various criteria:

- For companies, there are two brackets with differing tax reduction percentages. The first bracket gets to a certain ceiling and applies a higher reduction than the second (above the threshold). The aim is to encourage use by SMEs. For 2017, the tax credit (R&D payroll tax deduction) amounts to 32% of the first €350,000 of R&D wage and other costs (either the actual related costs and expenses or a fixed sum against costs and expenses); and to 16% of all further R&D costs.
- To better target start-up firms, a 'start-up facility' was introduced. The tax deduction for the first €350,000 spent on R&D is higher for start-up companies (40%) as compared to other companies (32%).
- Self-employed entrepreneurs are entitled to a fixed 'R&D tax deduction' of €12,484, and start-up self-employed entrepreneurs are entitled to an additional deduction of €6,245. Self-employed entrepreneurs who employ others are eligible for R&D deductions from the payroll taxes paid for these employees, as well as for their own R&D tax deductions.

WBSO is only available for employees employed by the business (as required by Dutch employment legislation). It cannot be used for temporarily contracted staff, or for outsourced research.

Since 2006 WBSO research activities in other EU countries can also count towards the total deductions. Some 5% of WBSO users indicated that they had done this. This use of WBSO is more prevalent among enterprises with 50 or more employees than smaller ones (EIM, 2012a).

How the measure is accessed and delivered

The measure is well-known in the Netherlands, especially among those active in conducting R&D. A WBSO Manual is available online to explain to those wishing to make use of the tax credit the steps that have to be taken to have a project approved. This process, which is now well tried and tested, also prepares those whose projects are approved for a successful implementation.

The WBSO tax credit is granted for the research activities of the beneficiary in general. Once the level of the overall WBSO benefit is established, it is deducted from the total sum of payroll tax due.

The mechanisms used for the implementation

The process of planning, applying and gaining approval for a project that is eligible for WBSO tax relief consists of eight steps:

1. Development of a project plan

To develop a project-plan some basic administrative processes are required. These are to: request an eHerkenning (level 2 - an online digital recognition technology between enterprises and government) from the NEA to enable submission and decide which application process is to be

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followed; determine the approximate project time-frame; decide whether intermediaries (such as business consultants) will be used for the application process; prepare the project questions (see below); estimate hours to be spent on the project; determine R&D costs; and submit the application.

Key WBSO project questions that need to be dealt with in the application form are to: determine whether it involves a 'development project' or 'technical scientific research'; identify the focus point (what will be technologically new); describe the project from start to finish; and set out the project phases, milestones and results expected in each phase.

For 'development projects' applicants are required to: specify the technical obstacles and solutions envisaged; demonstrate the technologically new operating principles; and explain how these will lead to new technological innovation. The questions for software development projects are similar, but it is necessary to indicate which formal programming languages, development environment and tools will be used, the foreseen operating principles and which of them are new.

For 'technological research' it is necessary to indicate the motivation for not using generally available, accessible knowledge, what concrete research questions and phenomena are to be investigated, how results will be used, the technological field in question, and how research will be structured and implemented.

2. Application submission to the NEA

The measure uses an on-line application submission process. There are two ways to submit a WBSO application. Both require the use of level 2+ eHerkenning (e-Recognition) which must be requested from the NEA.

If the applicant received an R&D Declaration in the previous year and has carried out R&D activities, the Citizen Service Number (burgerservicenummer, BSN) of all those year's R&D staff must also be supplied, so that the NEA can calculate the average R&D hourly wage for 2017.

One finding of the 2012 evaluation (Panteia, 2012) was that intermediaries were increasingly used for the application process. The view of the NEA was that this was unnecessary, as application procedures had been designed to make them as clear and as succinct as possible.

3. Set up of internal R&D records

The WBSO applicant must set up R&D administrative records that list the nature, content, progress and scope (number of hours) of the R&D work. If the application is for a tax credit based on actual costs and expenditures, then the firm is obliged to keep administrative records of the costs and expenditures incurred for each R&D project. If the application is for a tax credit based on a fixed sum against costs and expenditures, then no separate administration of the actual costs and expenditures is required. Firms must keep administrative records from the very beginning of the project(s), even if they have yet to submit their R&D Declaration.

4. Application completeness check by NEA staff

NEA staff check the application to see if it is complete in all respects. Once the submitted application has been checked and found to be complete, NEA technical experts review it.

5. Application review by technical consultants of NEA

Applications are assessed by NEA experts and WBSO advisors based on the answers provided in the application form and information on the costs and expenditures, against relevant laws and regulations. A technical expert makes the award decision on whether to go ahead or not. This 'WBSO Decision' is issued to the applicant/ intermediary together with an R&D Declaration.

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The Decision specifies the number of hours and, where relevant, the costs and expenditures approved for each project. The R&D Declaration specifies the maximum amount of R&D tax credit deduction that the firm is entitled to apply to the payroll tax number in the reference Declaration period. 6. R&D tax credit deduction from the enterprise's tax return Beneficiaries deduct the R&D tax credit they have been granted from their payroll tax return. Self-employed persons that have spent 500 hours or more on R&D may deduct the R&D tax credit from their wage tax return. 7. Submission of a statement of the actual R&D hours worked, costs and expenditures Beneficiaries submit a statement to NEA of the actual R&D hours worked and the actual costs and expenditures incurred, where relevant, within three months of the end of the calendar year covered by the R&D Declaration concerned. Self-employed persons need to provide this statement only if they have failed to invest 500 hours of R&D. On the basis of this statement, a 'correction R&D Declaration' may be issued by RVO, or in the case of an individual that did less than 500 hours of R&D, the R&D Declaration may be withdrawn. 8. Potential inspection visit by NEA staff (scheduled or random) The enterprise must implement the approved R&D scheme in line with the agreed project and the allocation of staff and related costs that have been approved. RVO.NL may visit firms to carry out a retrospective inspection of the beneficiaries' R&D work, hours worked, and any costs and expenditures against its R&D administrative records. If errors are identified in the administrative records, the firm will be issued a 'correction R&D Declaration'. RVO.NL may also impose a fine. Every year there is a report on the sums recouped resulting from the inspections. *How the measure is expected to generate its intended effects* The reduced employment cost of R&D personnel reduces the overall R&D cost and as a result the beneficiaries can afford to do more R&D than they would otherwise. This translates into increased employment of R&D personnel.
The intended general and employment effects of the measure The reduced costs for employing R&D staff are intended to lead to a greater use of R&D employees and increased innovation. This should have other effects such as retaining knowledge in the enterprise to provide a basis to build on in the future or to carry out R&D that would not have been done without the measure. This would in turn increase the overall competitiveness of the enterprises and the economy by supporting the introduction of a flow of new products, IT services and processes. Such a context makes it easier to retain R&D employees, especially in smaller enterprises, which usually find it more difficult than larger enterprises to employ highly functionally specialised staff. From a wider perspective, the positive externalities of increased R&D activity throughout society are considered important as a contribution to a more innovative and knowledge-driven and sustainable socio-economic environment. These employment and related effects are explicitly foreseen in the measure, although employment as such is not the focus, but it is seen as functional to an increased level of R&D.
Summary of the main evidence available Three official evaluations of the WBSO have been undertaken for the periods 1995-2000, 2001-

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2005 and 2006-2010, namely:

Brouwer, E. (et.al.) (2002), *WBSO nader beschouwd. Onderzoek naar de effectiviteit van de WBSO,* In opdracht van het Ministerie van Economische Zaken, DG Innnovatie *(WBSO closely observed. Investigation into the effectiveness of the WBSO. Commissioned by the Ministry of Economic Affairs, DG Innovation*)

EIM, UNI-Merit (2007), *Evaluatie WBSO 2001-2005 Effecten, doelgroepbereik ¬ en uitvoering,* in opdracht van het Ministerie van Economische Zaken *(Evaluation of WBSO 2001-2005, Effects, target group attainment and execution, Commissioned by the Ministry of Economic Affairs)*

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EIM (2012b*), Evaluatie WBSO 2006-2010. Bijlagenrapport, (Evaluation of WBSO 2006-2010, Annex)*

Rijksdienst voor Ondernemend Nederland, *Focus op speur- en ontwikkelingswerk,* (*WBSO annual publication commissioned by the Ministry of Economic Affairs. (Netherlands Enterprise Agency, Focus on research and development work*).

In addition, there have been some academic studies (listed in the references) that look at effects on wages or effectiveness in general for the period before 2013.

The evaluation for the 2011-2015 period is due to be carried out in 2018. The discussion presented in this document focuses on the 2006-2010 evaluation and, in some occasions, also uses information from the preceding two evaluations.

The 2002 evaluation: from 1995 to 2000

The evaluation addressed several matters:

- The main question (first order effect) asked was whether the WBSO led to increased R&D activity. Further questions were:
    - are the circumstances of 1994 which justified the measure still relevant – what were the effects on innovativeness (second order effects)?
    - what were the effects on business performance (third order)?
- Additionally, the evaluation analysed whether the intended target users were reached; the users' perception of the measure (including use of intermediaries); and the eventual need for any modifications.

The evaluation used an econometric analysis to assess additionality, as well as a telephone survey of users, desk research and interviews with enterprises and research organisations.

The focus was not directly on employment, but the key findings as listed below did have employment implications.

The main finding was that the WBSO led to increased R&D. For €1 expenditure through WBSO, €1.01 to €1.02 additional R&D expenditure occurred. This was additional to what the enterprise would have done in the absence of the measure, not a substitution of company funds for public funds. Furthermore, there were long term benefits and social returns related to increased R&D

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expenditure that were not considered in the study.

Regarding the relevance of circumstances in the last years of the 20th century as opposed to 1994, the view was that the rate of wages growth in R&D activities in the Netherlands had moderated, but that R&D wages were still high relative to competing OECD economies. Since tax credits for R&D were observed to be continuing to spread in OECD countries, it was decided to retain the WBSO so that the Dutch economy would remain competitive. Furthermore, while R&D was more prevalent in the Netherlands than it had been in the early 1990s, expenditure on R&D was still below the OECD average. The WBSO also acted as a signal to firms regarding the importance attached to R&D, given that social returns are greater than private returns.

The effects on innovativeness were especially useful for enterprises employing less than 50 people, and for structural users (continuous, on-going/ multiple users) of the WBSO.

From the point of view of improved business performance, according to the field research 42% of respondents indicated that they had experienced an increase of turnover as a result of the WBSO and, of these, 51% said that it was due to bringing new innovative products on to the market. The effects on business performance were also strongest for enterprises employing fewer than 50 people.

In relation to the target users, it was found that some 75% of businesses doing R&D had applied to use the WBSO. For businesses with 10-50 employees it was 61%, whereas for larger businesses penetration was at 76%. However, it was still difficult to reach the technologically innovative, small, service industry enterprises (*technostarters* and software companies), but progress was being made.

Generally, the measure had been well-received, and some suggestions were made about changes, such as for example being able to submit two applications during a fiscal year.

The 2007 evaluation: from 2001 to 2005

The evaluation of the 2001-2005 period aimed to increase insights into how the WBSO worked and had three goals: to determine effects on private R&D (and other effects); to assess the extent to which various target groups were being reached; and to evaluate the implementation of the measure. Possible improvements in these areas were also to be put forward.

The tools employed to carry out the analysis were: an econometric model based on data from SenterNovem and the innovation and R&D returns data from the Central Bureau of Statistics (CBS); a telephone enquiry with 1,000 users of the WBSO; a literature review; a 'quick-scan' of administrative burdens; and some interviews with multinationals using WBSO. Regarding the econometric study, it was pointed out that it was not possible to use the 'gold standard' methodology of a randomised control group, since most Dutch R&D enterprises made use of the tax credit. Consequently, a direct approach as espoused by Hall and Van Reenen (2012) was applied.

The evaluation found positive effects on additional R&D hours (measured through the 'Bang for the Buck' – BFTB, meaning the amount of R&D expenditure by organisations per euro of WBSO credit). This was estimated at between 1.50 and 1.94 (with 1.72 as the most likely result). The value was larger than that in the 2002 evaluation since that evaluation had just considered the impact on wages, whereas in the current study the impact included effects not only on wages, but on all R&D costs including machinery, equipment and buildings. If a direct comparison with 2002 were to be made, the value would be between 1.05 and 1.49 with 1.27 as the most likely outcome.

The cost of implementing the measure was estimated at €0.02 per euro invested for the government administration and €0.07 for the administrative burden on the enterprise, so overall, with the cost of

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tax foregone at €1.09 compared to the benefit of additional R&D expenditure to the value of €1.5 to €1.94, a positive return was experienced.

There are also positive effects identified on innovation and performance. The 'absorption capacity' for R&D (the ability to take in and apply valuable knowledge) was improved. The telephone survey found that 60% of respondents agreed or agreed strongly that, as a result of the scheme, R&D projects were executed more rapidly. 55% agreed that higher risk projects were initiated, 52% said that the projects were planned better, 51% that more R&D was done in-house, and 46% said that projects were evaluated better before deciding whether to proceed with them or not. This was particularly the case with those employing 49 or less people. However, the multinationals interviewed also responded positively, even if to a lesser degree. Business performance was improved – it was estimated that the WBSO had a positive effect on turnover during the first year after its use. Each additional euro of WBSO led to €0.79 increase in turnover from new products. This increase in turnover would however continue for some years. The measurement did not take into account better performance as a result of process improvements.

Externalities were not measured but strong positive effects are assumed to exist, such as having an increased supply of higher-skilled knowledge workers in the economy.

There was increased usage among the target group of SMEs, especially the 1-9 employee category, but more could have been done to reach them (37% had been reached) (EIM, 2007). Penetration of the 10 or more employees' category was at 80%. The expansion of the start-up facility in 2001 was considered to have had a positive effect in this regard. Smaller firms tended to benefit the most from the WBSO (especially those in the 1-9 employee size category).

The quality of implementation was considered good by beneficiaries and had improved since the previous evaluation.

The WBO was not seen as particularly attractive in terms of competition for attracting inward investment in R&D intensive projects.

The 2012 evaluation: from 2006 to 2010

The objective of the evaluation of the WBSO over the 2006-2010 period (EIM, 2012a) was to provide clarity regarding: the effects of the WBSO; the effects of the changes implemented in 2006-2010; the target market attainment; and the efficiency of the implementation of the WBSO (costs/administrative burden).

Tools employed for the research were:

- Desk research – a literature review;
- Analysis of datasets - the WBSO-database was provided by the government and was linked to the firm-level data of Statistics Netherlands. These include data generated by the R&D-survey, the Innovation Survey (CIS), the Production data, the general Register of Businesses (ABR) and the Statistics on Company Finances (SFO);
- Econometric analysis, which was the core element in the evaluation. It was made clear though that the type of econometric research that was used in the evaluation can leave uncertain results.
- Target group analysis to assess the extent to which the target groups have been reached;
- Quick-scan measurement of administrative burden (costs of implementation);

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- A telephone survey - 1,026 interviews were achieved including three categories of beneficiary: the self-employed, businesses and research institutions. The sample included all firm sizes.
- In-depth interviews with some large enterprises;
- Synthesis and reporting.

The evaluation looked at first order, second order, third-order, and other side-effects:

- First order effects are on R&D wage costs (additionality). Reduced R&D wage costs are intended to lead to an increased use of the R&D production factor due to the R&D labour cost discount. This effect is measured through average marginal BFTB, the average BFTB, elasticity and deadweight loss;
- The second order effect is on innovation. For this criterion the share of revenue from new products in turnover is used;
- Third order effects are effects on company performance. For this, nominal added value per worker is used as an indicator; and
- Side-effects. These tend to be qualitative and refer to, for example, the business climate for R&D activity, increased risk taking and cooperation; more use of other fiscal measures; increased absorption capacity for knowledge (and ability to apply external knowledge); more in-house R&D; and better implementation of R&D (structure and awareness).

The evaluation indicates that the measure does produce an increased BFTB in terms of expenditure on innovation, in the sense that there is an increased expenditure on employment in R&D. The measure focuses on the effect of the WBSO on R&D salary and wage costs, and the research finds that there is an average BFTB of between 1.55 and 1.99, with 1.77 as most plausible (EIM, 2012a). Some 76% of additional expenditures, on average, are for wages. This means that there is a positive effect on employment, which can either be through existing staff working longer hours on R&D, or additional staff being recruited for R&D, or higher remuneration of R&D workers, or upgrading the functional/ skill levels of R&D workers – or a mix of these. It is pointed out that the econometric model estimates do not generate an unequivocal value for BFTB. Not all statistical tests were passed but, based on various robustness tests; it is considered that there can be sufficient confidence in the results.

The evaluation also recognised that part of the increased expenditure on employment may go to inflationary increased remuneration of existing employees rather than on additional employees or hours worked by existing employees. This is estimated at about 10%, including expenditure to pay for promotions of employees. It is pointed out that an increase in wages per employee (and therefore no additional hours spent on R&D) is not *per se* a negative factor, if it reflects increased productivity or leads to increased skill levels, increases retention, improves the image and standing of the profession and attracts new entrants. Lokshin and Mohnen (2012a) confirm that there is such a wage effect and argue that the efficiency of the incentive would increase if wage effects were avoided, but also accept that it might be the price to pay for more highly skilled researchers who can generate promising returns in the future.

The evidence on employment does not provide data related to long or short-term employment, other than that for the duration of the subsidy, expenditure on employment for R&D is increased. Where multiple projects in succession are implemented, the effects will have a longer duration.

As in previous evaluations, impacts on innovation, enterprise performance and side effects were

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considered positive. A 1% increase in WBSO led to a 0.19-0.26% increase in the share of new products in turnover. In addition, there were unmeasured operational improvements as a result of process innovations. It was also found that use of the WBSO led to an increase in the nominal added value per worker: each 1% increase on WBSO led to a 0.13 -0.17% increase.

Further qualitative effects were identified: an increased appetite for higher risk projects, more R&D done internally rather than outsourced, better planning of R&D work, and an improved ability to apply knowledge from R&D and work with external parties.

Regarding the changes implemented during the 2006 period, the following was found:

- More R&D was carried out abroad after the 2006 changes which allowed that, particularly by larger enterprises;
- In 2006 it was made possible to submit applications throughout the year, rather than at a given time only, as was the case previously. This development was well-received by users;
- Also in 2006, the definition of R&D was extended to include technical research for own use (process innovation), which was well received by users;
- In 2009, during the crisis, measures (extending the first tax bracket and increasing the percentage deduction) were implemented to ensure that R&D workers were retained, R&D continued to be carried out, and enterprise liquidity was improved to support R&D. The effects of these changes were considered positive by users of the WBSO; and
- Also in 2009, the definition of R&D was broadened to include development of technologically new software.

In terms reaching the target firms, the chart below shows the increase in the numbers of WBSO users between 1996 and 2010. Some 85% of those undertaking R&D were using the WBSO by 2010. The share of enterprises employing less than 10 people that used WBSO had grown to 42%. It seems therefore that, although the measure was originally targeted particularly at firms employing 10 or more people carrying out R&D, it has been very popular among micro-enterprises. This is related to the increasing interest shown by start-ups (particularly in software) and appears to be a natural progression. BFTB for smaller enterprises remained higher than for larger enterprises. As the WBSO labour becomes cheaper, a substitution should occur from other R&D expenditures to an increased use of labour (assuming other expenditures are price elastic and not 'lumpy'). However, there were too many uncertainties in the calculation of substitution effects to enable their quantification in this evaluation. While the average share of wages and salaries increased from 74% to 76% in the 2012 evaluation as compared to the previous one, this may have had more to do with the higher percentage reduction in tax during 2006-2010 than with an increased substitution.

Deadweight loss was estimated at 55% on average, but lower for smaller enterprises (EIM, 2012a). The overall implementation of the measure was considered positive, although the NEA cost had increased to €0.08 (from €0.07 in the previous evaluation) because a higher number of smaller enterprises were using the measure.

It is worth mentioning that it appears that in none of the evaluations had the question been raised of whether the measure has led enterprises/individuals not involved in any R&D to start doing so. The target market is the population of those who do carry out R&D.

Discussions with the Ministry of Economic Affairs and Climate Policy confirmed that the focus is very much on R&D, rather than employment effects.

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The 2012 evaluation (EIM, 2012a) estimated the cost of implementing the scheme (NEA) at €0.02 per euro tax cost, and €0.08 per euro in administrative costs. The cost of implementing the scheme had increased slightly due to the increased share of smaller/micro enterprises applying. This compares to the BFTB of €1.55 to €1.99 against total costs of €1.10, suggesting a significant positive return in terms of R&D expenditure.

Evolution of the numbers of beneficiary enterprises

Data provided in the 2012 WBSO evaluation (EIM, 2012) show that the number of enterprises using WBSO grew from 5,500 in 1995 to 15,600 in 2010. Between 1995 and 2010 the share of micro firms using the WBSO increased from 30% to 52%, while that of small firms (10-49 persons employed) declined from 37% to 29%, and medium-sized firms (50–249 persons employed) from 24% to 15%. The share of large enterprises also declined – from 9% to 4%. About 8% were self-employed.

With the growth in the share of micro enterprises between 1995 and 2010, the share of new (up to one year old) enterprises grew (4% to 12%), as has that of young enterprises (1-3 years) – from 24% to 36%.

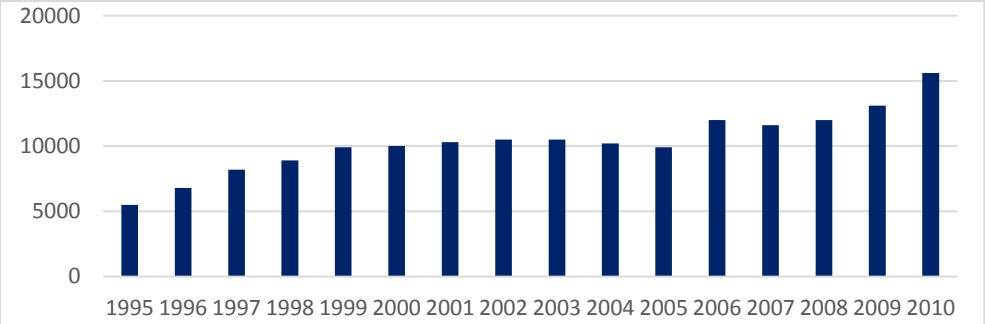
In terms of sector, the largest group of beneficiaries is from the machine industry (26%), followed by ICT (21%).

Some 28% of beneficiaries were new users. The use by knowledge centres/research organisations of the WBSO declined from 58 to 48 between 2006 and 2010.

The average period for using the WBSO was 4-5 years. There is no maximum period, or limit on how long enterprises can use the WBSO.

The chart below shows clearly the upward trend in WBSO use after 2006. This reflects the effects of the changes implemented (see above) in 2006 and also in 2009 during the economic crisis.

Figure 1: Number of enterprises using WSOB 2006-2010



Source: EIM (2012)

The number of total WBSO users and start-up users for the 2011 -2016 period is presented in the chart below. After a gradual increase from 2011 to 2012 it appears that usage has levelled off and even declined slightly during 2016.

Figure 2 Number of WBSO Users 2011-2016

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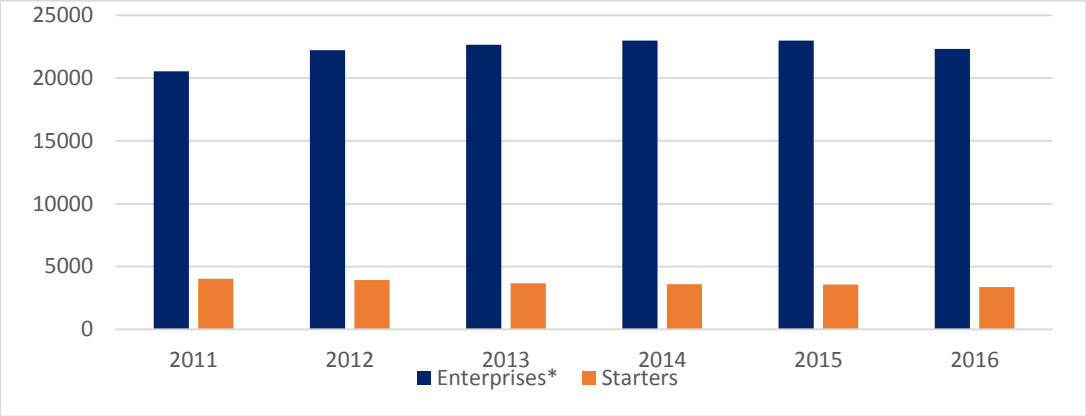

Source: FOCUS op speur- en ontwikkelingswerk, NEA, reports for 2013-16

* Includes all beneficiaries

Quality of the evidence base

The three official evaluations to date have been completed within two years after the evaluation periods in question. The evaluations show a strong similarity in scope and aims, looking at first, second, third and fourth order effects, as well as other wider effects. The three evaluations dealt with the analysis of efficiency robustly and calculated cost estimates of the implementation. Consideration of the effectiveness and efficiency of the measure in the evaluations is therefore one of their strong features.

The evaluations have not, however, paid much attention to the relevance of the measure in relation to enterprise and policy needs nor its coherence with other measures adopted within the framework established by the new Enterprise policy. Similarly, the analysis of the value-added of the measure is limited and could have been conducted more systematically. Finally, regarding sustainability, given the positive social externalities associated with private R&D, and the competition between OECD countries in the knowledge economy through, for example, tax credits, it is unlikely that the measure will be withdrawn in the near future.

The 2012 evaluation also includes, in an annex, In-depth details about the data used, and the methodologies employed (EIM, 2012b).

The main data sources used are:

- NEA: Data on organisations that have used the WBSO since 1995 (including, for example, numbers of R&D hours, payments to R&D workers, background data).
- CBS (Statistics Netherlands): Data on production, finance, the general business register, innovation, profitability, etc.
- Survey and interview data.
- EIM: In-house proprietary data (no further information on the nature of those data available).

These data are sound and as good as are generally available in the context of the evaluations. Counterfactual evidence is not referred to.

In all three evaluations a very similar approach was adopted. Regarding the model developed for estimating first order effects, it is accepted that the best way to estimate effects is to make a comparison between a test and a control group (random control trials - RCTs). However, with a

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fiscal measure available to a large proportion of enterprises conducting R&D, the identification of a control group is problematic. As a result, the next best option was to develop an econometric model based on official data and complemented with further field work. The initial basis model was developed and expanded into a formal regression model. The studies point out that there are certain shortcomings related to the use of such a model, the main ones being its inability to provide an unequivocal result and the lack of a control group against which to test results. However, the researchers carrying out the study (EIM, 2012b) consider that the methodology is sufficiently robust to produce valid results.

The data used are from actual firm-level sources: comparing proposals submitted by WBSO users to the data they provided in tax returns. Such data are reasonably reliable and robust, given that regular inspections are carried out to check users' records. There does not appear to be an alternative approach that is as wide-ranging and complete that could be readily applied to assess a measure such as this. The interviews were used to corroborate some econometric findings and obtain additional qualitative feedback

It would have been useful if there had been some enterprise-level case studies presented that could illustrate in more depth how the WBSO works at firm level and reveal some of the other, possibly unexpected, impacts.

Having said that, the results in terms of outcomes and impacts identified in the evaluation are reasonable and consistent.

Regarding the transferability of results, the fact that this measure focuses on relief from payroll taxes as opposed to tax credits on enterprise profits may be a matter for consideration by other tax authorities that make use of a profits-based system.

However, it needs to be borne in mind that the Netherlands is a small and relatively homogenous country, and it may not be so straightforward to transfer or compare results directly to larger and more diverse countries. For example, the Dutch e-government system is well established and, since individuals are required by law to have ID cards and electronic identities, the application and submission system are relatively easy. Also, the WBSO may not be suitable for all contexts. Employment costs for R&D workers may not be the main issue affecting employment in R&D in other countries. For example, the presence or absence of knowledge clusters could have a major impact on the effectiveness of R&D measures on increasing employment in R&D activities.

Overall, it can be said that these evaluations are thorough, well-planned, and robust exercises. As with other studies that rely heavily on econometric analysis, the emphasis is on assessing the effectiveness and efficiency of the measure, while paying less attention to wider aspects, such as the coherence of the measure with other policies and its relevance to the needs of enterprises and the overall policy agenda. Even in relation to effectiveness and efficiency, however, it would have been useful to have some case studies and counterfactuals, and there is an opaque use of econometric modelling. Nonetheless, they appear to make good use of the data available and of the methodologies that can be applied to assess this type of measure.

Actual employment outcomes

The discussion with the Ministry of Economic Affairs and Climate have confirmed that the WBSO focuses on employment as a means of delivering increased innovation rather than as an objective in itself. Research by the public sector related specifically to the employment effects of WBSO has not been published. The most recent evaluation of the WBSO, for the 2006–2010 period, found additionality of 55% overall for the measure, with 76% of the increased R&D activity going to salaries and wages. The Focus op speur- en ontwikkelingswerk *(Focus on Research and Development work)* (NEA, 2016) shows that in 2016 83,980 work-years (based on a 1400-hour work-year) were awarded through the WBSO, a slight increase compared to 2015 (83,400). The

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average number of WBSO work-years per WBSO enterprise rose by 3.1% in 2016. With a 55% additionality (assuming no major change as compared to the 2012 report), this suggests that the WBSO has had a positive impact on employment in R&D, given the share of increased R&D expenditure on salaries and wages at 76%. From a purely quantitative point of view (in terms of additional hours spent on R&D), this is a positive outcome in terms of employment. It is also worth recalling, in this respect, that the WBSO is only available for those employed by the enterprise. There are also long-term (4-5 years) and structural users of WBSO, which means that these effects are sustained over long periods. However, the high level of additionality implies that if the measure were withdrawn it would lead to a significant reduction in expenditure on R&D.

From a qualitative point of view, the evidence indicates that use of the WBSO results in beneficiaries being able to reward researchers better and retain them longer. The WBSO has also supported the development of capability within enterprises to better absorb knowledge, thereby creating a better working milieu for knowledge workers such as R&D researchers. This has been true particularly for smaller enterprises and self-employed researchers, as well as start-ups, where such support is required to a greater extent than larger enterprises. The share of micro-firms using the measure increased from 30% to 55% during 1995-2010. This means that the measure is especially useful for those firms where the owner is also the manager and head of R&D, etc. It is often in such businesses that it is most difficult to carry out specialised activities such as R&D and a support measure of this type can be very helpful in offsetting opportunity costs of research activity, as opposed to management activity.

The evidence on employment does not provide much data related to long or short-term employment, other than that for the duration of the subsidy, expenditure on employment for R&D is increased. Interview results do however indicate that in some instances the WSOB was used to implement wage increases/ promotions.

From a societal point of view, the view in the Netherlands is that the social returns from such investment are greater than the private returns.

Overall assessment

The overall judgement of this instrument in terms of its usefulness in promoting employment enhancement is set out below.

- *Strengths/success factors of the instrument from an innovation and employment perspective*
  - The measure aims to increase R&D activity by employees and the evaluations indicate that it does succeed in doing that. The increase in R&D activity is underpinned by hours worked in R&D by R&D workers, pointing to a direct effect on employment. This in turn supports other aspects of the R&D milieu such as retention of R&D employees and increased ability to absorb knowledge, which creates a qualitatively better working environment for R&D workers.
  - However, actual innovation and successful commercialisation are not measured. Nor does the measure target any specific employment-related effects, other than that of realising more R&D hours than would otherwise have been the case.
  - The application process is relatively simple and straightforward. The institutional structure is well-established.
  - The measure is flexible – it can be adapted to meet changing circumstances if necessary (for example during an economic crisis).
  - There is a long time-series of data available which can be used to evaluate the impacts of

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the instrument.

- *Weaknesses/bottlenecks of the instrument from an innovation and employment perspective*
  - The measure does not consider innovation outcomes in terms of, for example, successful innovation projects.
  - The measure does not assess the effects on quality of employment.
  - The WBSO targets those that are already carrying out R&D. There does not appear to be any consideration, in the evaluations, of extension of the target market beyond the existing population – encouraging more to carry out R&D.

Given the extent of funding dedicated to the measure and its extensive use by the population of innovating Dutch enterprises, the WBSO has been the key pillar of Dutch innovation strategy since it was first implemented.

It has been modified several times in the light of prevailing circumstances and used in combination with other measures, such as the R&D incentive, the R&D deduction, Innovation Box, Top Sectors and Smart Industry.

The aim of this measure is to reduce the costs of employment for R&D workers, and thereby to lead to an increase in R&D. Based on the data and econometric models used, it appears that the measure has been effective in achieving this.

However, the focus of the WBSO is on increased R&D, or R&D hours worked rather than specificities related to the quality and other conditions of employment. Having said that, there is interview evidence in all three evaluations carried out to date that indicates that it has led to increased job retention, upgrading and upskilling of employees, increased salaries and wages and as such better working conditions.

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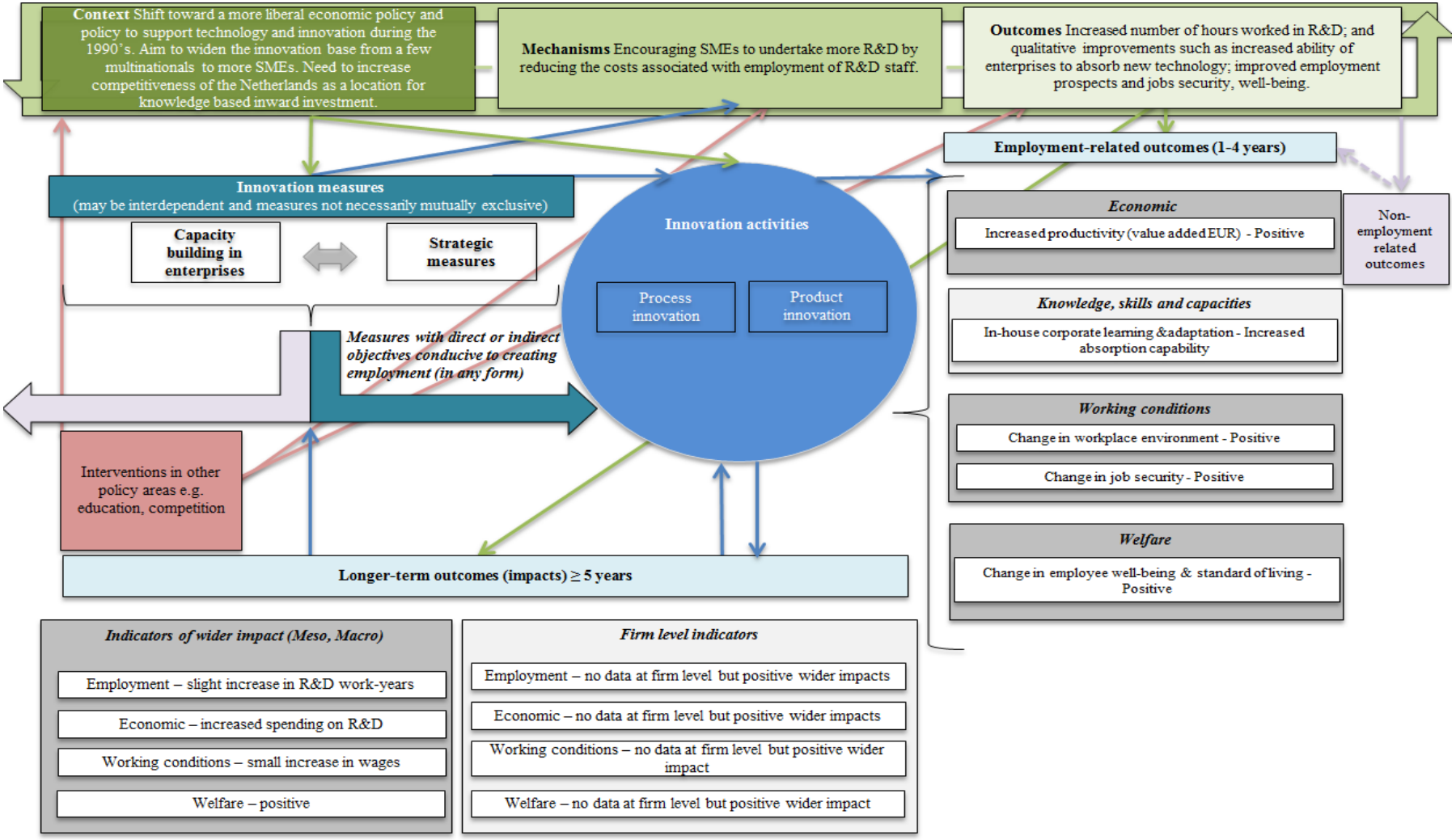
Links

NEA, *Subsidies and programmes, WBSO (tax credit)* https://english.rvo.nl/subsidies-programmes/wbso

Report author: Jan Smit, CSES

Graphic representation of the intervention logic of the measure



WAFF innovation and employment subsidy - Austria

WAFF innovation and employment subsidy - Austria	
Measure identification	**AT WAFF I&E subsidy**
Name of the instrument	WAFF innovation and employment subsidy - Förderung Innovation und Beschäftigung
Web link	https://www.waff.at/en/service-for-companies/support-for-innovation-and-employment
Location	Austria, Vienna
Starting year and duration	Ongoing, in operation since 2000 (previously known as 'Innovationsassistent')
Name of the organisation providing measure	Initiated and administered by WAFF, an institution for active labour market policy and promotion of employees by the City of Vienna
Type of organisation providing measure	Public institution
Other contributions	European Social Fund (ESF) contributions – The exact amount dedicated to this measure is unspecified, but WAFF disbursed €2 million of ESF funds in 2016 across its programmes. According to the WAFF annual report, €52 million are available from the ESF up until 2020, and with matching national co-financing, the funds available for labour market projects are €104 million (Wiener ArbeitnehmerInnen Förderungsfonds, 2016).
Total budget for the measure	€2.5 million per annum

Reason for highlighting this measure

The measure explicitly aims to combine innovation support, including social innovation, with job creation, job retention and/or the improvement of the quality of employment. The measure also promotes the inclusion of older employees, equal opportunities between men and women, and opportunities for employees with a migration background.

The policy context for this measure

WAFF is composed of representatives from employers' (Vienna chamber of commerce, industry association), and employees' organisations with the latter being the majority. Together they defined the target group and initiated the measure in 2001 with the explicit aim to create jobs. At the time, this was an interesting new measure in Vienna combining for the first time the objective of creating employment with funding personnel cost and training measures. Since then, similar measures have been adopted in other parts of the country. This fiche describes the (original) measure implemented in Vienna.

The measure is relevant in a strategic policy context. The Austrian Strategy for Research, Technology and Innovation highlights long-term employment and the creation of unlimited, high-quality and future-proof jobs as explicit goals. The strategy stresses that Austria is in the process of catching up with 'Innovation Leaders' as categorised by the European Commission's Innovation Scoreboard, and that this translates into improved economic competitiveness and higher employment rates. In particular, the strategy sets a goal of increasing the share of employment in the medium- and high-tech sector of manufacturing. While not an explicit objective of the WAFF innovation and employment measure, its focus on innovation may contribute to Austria's RTI

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strategy.

Austria has a dedicated national strategy for R&I policies in place since 2011 – thus the measure precedes the innovation strategy by a decade. Austria is striving to reach a R&D to GDP ratio of 3.76%. However, this is only possible on the basis of increased private investments in research. The private sector share should rise to 66% of total research expenditures.

In general, framework conditions are very supportive of business research and innovation in Austria. R&D and innovation funding support is well tailored to the needs of enterprises. Nonetheless, despite the internationally comparatively generous provision of public financing for private R&D, the private financing shares stagnated and absolute R&D investments by businesses did not increase significantly faster than public ones.

As part of the innovation strategy, Austria has put in place numerous measures to encourage enterprises to strengthen the basic conditions fostering innovation (Austrian Federal Government, 2011). The most important strategic recommendations, emerging from an ex-ante consultation process for the national strategy, were to: 1) enlarge from a narrow innovation policy towards a broader approach including linkages towards educational policies and other social and economic framework conditions, 2) transform governance from fragmented to coordinated and consistent public interventions based on a shared vision and a joint strategy, and 3) advance from an imitation to a more radical innovation strategy (Cuntz, 2015).

The measure is also relevant in the context of the Open Innovation Strategy Austria published in 2016 and which seeks to boost the efficiency and output orientation of the innovation system. The strategy also emphasises the importance of improving links between science and research, industry, and public administration and includes a commitment to providing open innovation skills training to all age groups. According to the Strategy, the skills level and educational attainment of the Austrian population is above the EU average. More than one third of total employment was in knowledge-intensive activities, and the R&D labour market is one of the most dynamic in the country. The number of graduates from higher education institutes continuously increased between 2008 and 2013 but has since dropped slightly.

Aims and objectives of the measure

Rationale, objectives and main elements of the support

The primary objective and target value is to create at least one additional job per supported project for the duration of the funding period, and to help firms with the implementation of an innovation project defined by the beneficiary firm. Achievement of this is monitored at the end of the funding period. According to the WAFF's 2016 annual report, the rationale behind the measure is to ensure local enterprises continue to invest in innovation even in economically challenging times, contributing to the long-term competitiveness of Vienna as a location to do business (Wiener ArbeitnehmerInnen Förderungsfonds, 2016).

The measure fits into the wider WAFF objectives, which are to:

- Create better professional development opportunities for Viennese employees;
- Remove discrimination in the labour market;
- Ensure good professional training and successful entry into the job market by young people;
- Improve the attractiveness of Vienna as a business location; and
- Support equal opportunities between men and women and for people with a migration

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background.

The WAFF supports the implementation of innovation and projects and skills development as part of a successful business destination policy.

Target beneficiaries

The target group of the measure are SMEs (using the EU SME definition) (see section on *Eligibility criteria and restrictions* for more specific information).

The measure provides financial support to SMEs in Vienna that seek to implement innovation projects. Funding is provided for training of staff, consultancy, and to pay for 'innovation assistants' needed to develop innovation projects. Innovation assistants may be current employees of the company or newly recruited staff members. The measure is implemented by the Fund itself. Projects to be funded are evaluated by a jury of experts based on a scoring system.

Characteristics of the measure

Instrument type

Business advice and direct support: human resource development; finance for innovation; marketing.

Relation of the measure to other measures

This is a standalone measure, although it is managed by a fund that also supports labour market policy and training through other measures. However, as far as the author of this report is aware, there is no active coordination between these measures.

Type(s) of innovation supported

The measure supports product, process (including upgrades/introduction of IT systems, especially in the early years of the measure), and 'quality of working conditions' innovation (see 'social innovation' below), marketing and knowledge transfer. The measure also supports social and organisational innovation. In recent years, most projects concerned product innovation or market expansion.

Social innovation was only introduced in 2013 upon the request of the Municipality of Vienna (which provides the funding for the measure). It was hoped that this would lead to projects improving the employability of older employees, the inclusion of temporary workers in training initiatives within the firm and gender equality. In practice, very few such projects have been supported to date. The reason is that for small firms with sometimes only 10 employees it is difficult to implement social innovation projects and devote the necessary human and financial resources, even with funding from WAFF.

Sectoral focus

No sectoral focus. Most beneficiaries are in the IT sector, or in other sectors undergoing a transformation such as medicine technology or biomedicine.

Regional specificities

The measure only covers the municipality of Vienna.

Funding available for applicants

Funding is provided for up to 50% of the annual gross salary/remuneration of the innovation assistant (sometimes, two innovation assistants are hired for one project), up to a total of €47,000.

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A bonus of €5,000 is available if the employment of an innovation assistant improves gender equality in the firm. Moreover, the measure funds 50% of training cost up to €7,300 and 50% of consulting cost up to €4,700. This adds up to a total of maximum €58,000 per beneficiary. Funding is provided for up to 12 months.

Time period over which the effects are expected to be felt

WAFF only reviews the results at the end of the funding period, namely up to 1.5 years after an application has been received. Beyond that, they only have anecdotal evidence of the performance of beneficiary firms over the years. This shows that the measure takes a rather short-term view as to the sustainability of its effects. This is also confirmed by the fact that no further evaluation of the programme is planned (see further below).

The figures on the number of enterprises supported and the number of jobs created show that these effects take place immediately – usually through the direct employment of an innovation assistant.

How the measure is implemented

The instrument design

The instrument is designed as a measure focusing on covering part of the cost of using an innovation assistant to support innovation and employment within SMEs. The measure rests on the assumption that innovation and employment within small enterprises are mutually reinforcing.

Eligibility criteria and restrictions

The beneficiaries must be SMEs based in Vienna or with operations in Vienna, and which have been established for more than a year at the time of the application. Applicant SMEs must produce a plan outlining an innovation project which is to be implemented by the SME staff. For projects focusing on product, process or marketing innovation, or focusing on knowledge transfer, the beneficiary must involve at least one new innovation assistant. In case of social innovation projects, the innovation assistant can be an existing employee. Whether hired for the project or a new employee, the innovation assistant must be a regular employee (not self-employed) and have full social security coverage. Depending on the project, innovation assistants need to possess different qualifications. Often, they are required to have a degree from a business school, technical skills, sector expertise, leadership and organisational competences, and innovation aptitude. The project must create the necessity for training of the innovation assistant and/or (other) employees.

Firms must include in their application how many jobs they expect to create should they be able to implement the innovation project. The minimum requirement is to create at least one new job that is in place at the end of the funding period but, in practice, beneficiary SMEs tend to exceed the expected number at the end of the funding period.

Applicants are not required to demonstrate compliance with standards relating to working conditions. This is dealt with by the Austrian Labour inspectorate.

There is limited competition among applicants in that they are selected on a first come first serve basis (provided they meet the eligibility requirements).

In terms of competition rules, the EU's *de minimis* regulation needs to be complied with.

Unlike other employment measures in Austria, this one is not linked to the criterion of unemployment, nor is it restricted to university graduates.

How the measure is accessed and delivered

The measure is delivered through an innovation subsidy. There are two calls and funding rounds

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per year – each call is open for about 10 weeks. Firms can apply online in response to a call for funding for a specific project. Project applications are evaluated by a jury of experts based on a scoring system. Once projects have been ranked, WAFF establishes how many firms it can fund in that round. This depends on the budgetary amounts of the applications. WAFF does not have a target number of firms it wants to fund each year, but it wants to use up the entire budget.

WAFF has tried to reduce the administrative burden both internally as well as for beneficiaries over the years. Applications are received online and from 2018 onwards, reporting will also be done online.

The mechanisms used for the implementation

The mechanism by which the measure creates its effects follows the logic according to which training and consulting raise the skills level of staff in beneficiary firms which in turn improves firms' competitiveness and thus allows them to hire or retain employees. The key tools are training, consultation, and the temporary deployment of external innovation assistants in beneficiary firms.

How the measure is expected to generate its intended effects

The subsidies are intended to generate innovation by allowing firms to invest in innovative projects that they would not be able to fund from their own sources (in practice, the 2003 evaluation discussed below found some windfall effect of enterprises stating they would have carried out the project even without WAFF funding). This is then expected to result in increased innovation within the firm, competitiveness in the market, and hence ability to hire and retain (further) staff.

The intended general and employment effects of the measure

The measure is designed around the assumption that the innovation capacity of firms is directly and positively linked to employment creation and the retention of jobs. After the 2008 economic crisis, job retention became more important than the creation of new jobs. In the short term, the measure is intended to translate directly into the creation of new jobs by requiring beneficiary firms to employ at least one innovation assistant for the funding period.

In addition, a range of employment outcomes is expected. WAFF monitors the size of the workforce of beneficiary firms at the date of application and at the end of the funding period. They need to have at least one more person employed on the latter date compared to the former. Beyond that, WAFF periodically notices that beneficiary firms perform well years after the funding period, for instance by successfully internationalising, or by being featured in the media.

The expected effects primarily extend to improved working conditions, job creation, security and retention, but also enhanced business competitiveness. The measure, and WAFF's work in general, seems to put an emphasis on the improvement of employment conditions and business competitiveness, with innovation being viewed as a means to achieving these goals. Training and skills upgrading also play a role and should benefit at least the innovation assistant(s) employed for a project, but ideally also other employees of the beneficiary firm.

At the same time, WAFF does not expect that the measure will lead to beneficiary firms creating more jobs than those that do not receive funding. To the contrary, it may be that firms not implementing innovation projects are doing better on average and are more concerned with completing past orders. According to an interview with the managing authority, at the time of an economic upswing, many firms are less focused on innovation since they feel less of a need for changing their business model. Indeed, the measure in question targets a specific type of firms that expressly want to implement innovative projects. There are other support measures in place by various organisations in Vienna that make it much easier for firms to take on additional staff, albeit not focussing on innovation. For instance, the professional development opportunities of Viennese

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workers are supported with €18.5 million by the WAFF in 2016 alone. Another €11.8 million are spent on job seekers and enterprises searching for skilled personnel.

Other anticipated effects include improving the skill levels of the employees of the SMEs that benefit from the measure and promoting Vienna as a business location, improving the competitiveness of Viennese firms. In this sense, the measure may contribute to the creation of additional jobs in the longer term; not only at the beneficiary firms but possibly also employment in suppliers and business partners of the supported firms.

Summary of the main evidence available

Two evaluations have been carried out to date.

The **first evaluation** (Stoppacher et al, 2003), was commissioned by WAFF and carried out by the Institute for Labour Market Support and Research (IFA). It presents data on the number of applications and success rate, and the cost of approved projects.

From 2000 until 2003, 87 projects were approved with a total funding sum of €4 million. Most beneficiaries were found to operate in the IT and business-services sectors which are under particular pressure to innovate. 40% of beneficiaries had previous experience of public support. More than half of innovation projects concerned product innovation whereas social innovation seemed to play a marginal role. The support measure seems to have good additionality in that 27% of beneficiaries stated they would not have carried out the innovation project without it, and 61% stated they would have carried it out in a reduced form – at the same time, this suggests there has been some windfall effect of enterprises using the funding for projects they would have carried out anyway. More than three-quarters of respondents maintained that the support had a long-term positive effect on their firms' capacity to innovate.

According to the evaluation, 91% of the participating companies stated that the innovation projects contributed to a large extent to the creation and securing of jobs. On average, firms estimated that they would create 5-6 additional jobs thanks to the measure in the long term. Over three-quarters of the respondents in the evaluation stated that skills upgrading and further training contribute towards increasing job prospects of employees to a large extent. The large majority of innovation assistants accompanying projects also saw positive effects in terms of their skills and personal development.

The **second evaluation** was commissioned by WAFF and carried out by Synthesis Forschung (2009). It was limited in its scope by focusing on the effects of the measure on the innovation assistants accompanying projects, and only presenting marginal information on the overall effects on the benefiting firms and their employees. The evaluation presents evidence on the innovation assistants (240 in total) accompanying projects between January 2002 and June 2007. Three quarters of assistants remained employed in the beneficiary enterprise 30 days after the end of the funding period. After three years, 22% were still employed there. The great majority of those not continuing to be employed by the firm found other employment within 90 days of the end of the funding period. Assistants saw their income rise by 52% compared to the year before project launch.

According to the second evaluation, there is a clear immediate job creation effect in that the total number of jobs among beneficiary firms increased by 1,100 to 2,730 employees at the end of the funding period. In the year after the end of the funding period, 37.5% of beneficiary companies were enlarging their workforce further, whereas 41% were shrinking it again. WAFF commented that firms must have a workforce larger by at least one employee at the end of the funding period but do not track the workforce size of beneficiaries after this point. Thus, the 41% of companies stating they had reduced their workforce one year after the end of the measure would still need to have created at least one new job on the day the funding came to an end; otherwise they would not

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have been eligible to receive the funding.

Apart from these two evaluations, monitoring is carried out through at least one visit to each beneficiary firm. WAFF collects data on the number of additional jobs (other than innovation assistants) created since 2005. It also collects controlling data on a quarterly basis. This includes information on who has been chosen as the innovation assistant, the gender of the assistant, which sector the firm operates in, and who is being trained and since when. To collect this data, WAFF is in contact with beneficiary firms on a regular basis.

According to WAFF, no further evaluations are planned.

Quality of the evidence base

The first evaluation focused on the pilot phase of the scheme (in 2003) whilst the second study covered a more extended period of implementation (in 2009).

Both evaluations take similar approaches in that they provide a qualitative assessment of the implementation of the programme based on an interview programme with programme managers and other stakeholders. The first evaluation also included a control group (unsuccessful applicants) and complemented the interview programme with analysis of the monitoring data collected by WAFF.

As an evaluation of the pilot stage, the purpose of the **first evaluation** was to help WAFF optimise the measure on multiple levels and to inform their decision-making in the future management of the measure. It is guided by three research questions:

1. To what extent does the support meet the needs of SMEs and improve their competitiveness?
2. Labour market dimension: To what extent did the measure create new, sustainable jobs, and to what extent did the innovation project and accompanying qualification measures translate into higher skills and competences of staff?
3. Project implementation: To what extent did the eligibility criteria facilitate applications by SMEs with limited or no previous experience of applying for public funding?

These guiding research questions allowed for an assessment of the measure's effectiveness (in terms of objective achievement) and (relevance in terms of reaching the intended target group). The evaluation also examines the creation of incentives for innovation efforts and their effectiveness as regards leading to knowledge transfer, enhanced willingness to cooperate, increased innovation awareness, and organisational changes.

Methods

A combination of eight explorative qualitative interviews with WAFF and innovation experts, desk research, analysis of WAFF monitoring data was followed by more qualitative interviews with beneficiaries and innovation assistants (10 each). This then led to the design and implementation of a semi-standardised telephone interview programme. The data basis for the programme was clearly stated in the report: the 86 beneficiaries that received funding up until the time of the evaluation. Out of these, 68 responded to the survey (79% response rate). The methodology contains a control group element in that 12 unsuccessful applicants were also interviewed.

Answer to each evaluation question

Related to the first question, the answer is that the measure reaches the intended target group as 95% of beneficiaries are micro and small enterprises. Over 40% of beneficiaries operate in the IT and business services sectors which face particularly strong competition and are under high

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pressure to innovate. As mentioned before, most firms would not have carried out their innovation projects without WAFF support or only in a reduced form. Most beneficiary firms surveyed stated that their participation in a project triggered the development of sustainable innovation processes within their firms, which should improve their competitiveness.

In case of question two, evidence of job creation was already cited in the previous section. The study presents a differentiated understanding of the employment effects of innovation, acknowledging that innovation can also lead to a workforce reduction in theory which would not have been intended by the measure. Apart from survey findings, more long-term employment effects could not yet be identified due to the short timeframe of the programme at the time of the evaluation.

The evaluation also surveyed the innovation assistants accompanying projects. This confirmed an improvement in staff skills and qualifications, ranging from improved teamwork, systematic innovation identification, project management, to personal development. The study also uncovered gender differences, with male innovation assistants regarding 'successful task completion' as the most important result, and female assistants emphasising 'learning and gaining experience'.

Finally, the conclusion as regards the third question is that the evaluation criteria and approval procedures are clear and transparent, according to survey respondents. On the negative side, a high administrative burden is mentioned.

Overall results

Overall, the evaluation concludes that the measure is very positive, highlighting the quality of support, and the opportunity for continuous personal development.

The authors recommended increasing support for women and the elderly, both groups disadvantaged on the labour market.

The **second evaluation** focuses on the effectiveness of the measure on the innovation assistants employed, including job creation effects at the level of these employees. It does not present any evidence relating to overall job quality in the beneficiary firms and other anticipated outcomes of the measure. The research questions are as follows:

1. Does the measure lead to an increase in income?
2. Do assistants remain employed after end of funding period?
3. How does their career path evolve after the end of the measure?
4. How does the workforce of beneficiary firms develop?

Methods

The evidence is collected through a survey to the innovation assistants and the evaluation mainly displays percentage figures of the survey findings. In addition, data retrieved from the Austrian Social Insurance Association was used to assess the effects of the measure on innovation.

Results

In relation to the first question, the study concludes that on average, assistants earn much more after the funding period than before the beginning of that period. The majority of assistants remain employed after end of the funding period (question two). Most of the others had a regular employment in another enterprise or took up another form of occupation. Only about half of the assistants no longer working in the beneficiary firm after the end of the funding period changed sectors. The beneficiary firms increased their workforce substantially during the funding period

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(question four).

The study concludes that the measure has led to a great improvement in the work situation of assistants but that the support has not comprehensively translated into rising levels of employment among participating firms.

Assessment

Overall, the study provides some interesting insights into the effects of the measure, but rests on less than robust methodological foundations. The study does not clarify whether all beneficiaries or only a subset were consulted, making it difficult to judge the representativeness of findings. It lacks a quantitative element and does not include a control group but does report on feedback collected through the opinion survey of firms' intentions in the absence of funding (hypothetical counterfactual scenario). No information on the approach for the collection of the monitoring data used in the evaluation is provided, making it difficult to assess its quality. Often, the only source given for statistical data is that this was purchased by Synthesis. Even the full version of the evaluation report only presents findings and annexes but does not contain a chapter on the methodology of the evaluation.

Looking beyond these issues, the report is well-argued and clearly presents the research questions and the related results, but it does not provide extensive recommendations.

The **independence of both evaluations may be limited** in that they were commissioned by WAFF, the organisation implementing the measure concerned.

Both evaluations rest on opinion surveys, meaning the evidence is relatively weak in the absence of a proper control group (although the use in the first evaluation of a control group consisting of unsuccessful applicants should be recognised as good practice). Neither evaluation report yields any insights into the measure's overall coherence, its value added and efficiency, or its sustainability.

Actual employment outcomes

- In 2016, the measure supported 63 SMEs, creating 76 new jobs.
- In 2015, it supported 74 SMEs creating 88 new jobs.
- From 2013 until to date, 356 positions for innovation assistants were created. In addition, 212 new jobs were created over the same period.
- According to the second evaluation from 2009, the number of jobs in beneficiary firms increased by 1,100 to 2,730 during the funding period.
- Positive feedback by innovation assistants as to the working conditions in the beneficiary firms ('good' or 'very good' on a 5-point-scale)

Overall assessment

Strengths/success factors of the instrument from an innovation and employment perspective

The aim of this measure is to create jobs, upgrade skills, and improve firms' competitiveness by supporting innovative projects. The measure supports a wide range of innovation types and covers all economic sectors and also social innovation, with a focus on SMEs based in Vienna. The wide range of eligible innovation projects is a positive aspect of the measure. Employment effects concern working conditions, and job creation, security and retention. Overall, this is an interesting measure that has been running successfully for the past 17 years. The key success factor seems to

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be the introduction of external innovation assistants to SMEs that lack the in-house capacity to develop innovation projects on their own, with positive effects both for the assistants and the beneficiary firms.

Weaknesses/bottlenecks of the instrument from an innovation and employment perspective

In practice, the job effects of the measure are fairly limited, with less than 100 new jobs created per year on average against an annual budget of €2.5 million. The limitation to firms based in Vienna will necessarily limit any economies of scale and spill over effects to rural or less innovative regions of the country.

Implementation requirements and its degree of transferability

While some beneficiaries complained about the administrative burden, overall, the appraisal process as well as the support provided throughout project implementation by WAFF was viewed positively. As mentioned above, the measure is part of a wider package of employment-enhancing measures managed by WAFF and contributes to Austria's RDI strategy. Several other support organisations in Vienna have already adopted comparable instruments inspired by this measure and there is a general trend to support innovation. The measure should be fairly transferable to other parts of the country or other countries given that there will be enterprises with similar challenges in other regions. One limitation could be that there may be fewer qualified innovation assistants able and willing to be deployed in firms in more remote regions.

The evidence from the two evaluations is fairly weak. The first evaluation has a robust methodology but was carried out in 2003, meaning that the results are now likely outdated. The second evaluation, carried out in 2009, is too reliant on the opinion survey supplemented by data whose origin is not clearly stated in the evaluation report. Both were commissioned by WAFF, the organisation running the measure. No further evaluation of the measure is planned.

Information sources

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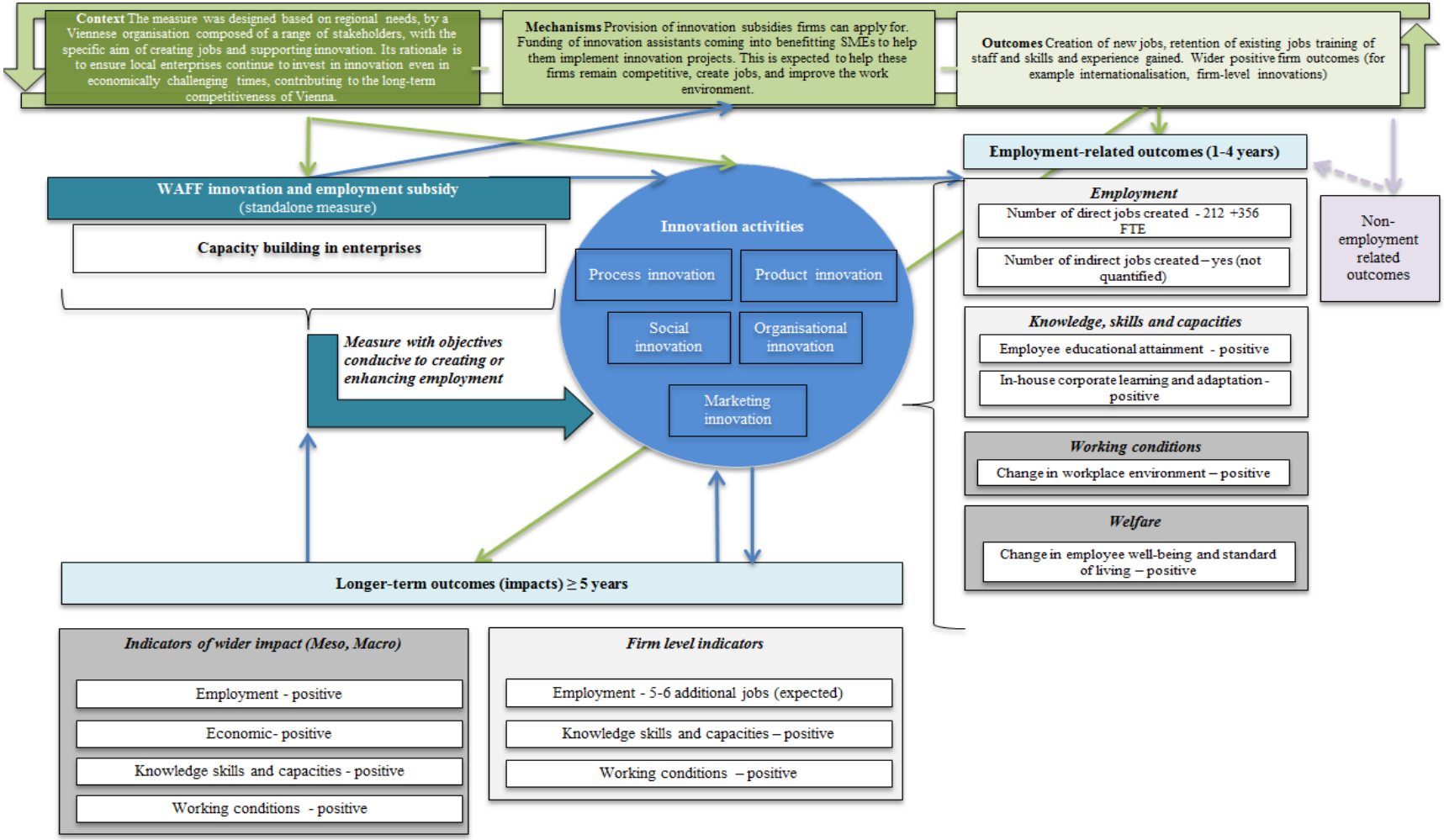
Report author Stephan Kreutzer, CSES

Graphic representation of the intervention logic of the measure



Innovation Vouchers - Estonia

Innovation Vouchers - Estonia	
Measure identification	**EE Innovation vouchers**
Name of the instrument	Innovation Vouchers - Innovatsiooniosak
Web link	http://www.eas.ee/service/innovation-voucher/?lang=en (EN)
Location	Estonia, all regions
Starting year and duration	2009 The current financing period ends in 2023; it is not known whether the measure will be continued afterwards. It is estimated that by 2019 all the funds will be used.
Name of the organisation providing measure	Administrator: Enterprise Estonia (Ettevõtluse Arendamise Sihtasutus - EAS) Initiator: Ministry of Economic Affairs and Communications (Majandus- ja Kommunikatsiooniministeerium)
Type of organisation providing measure	Government foundation, responding to the Ministry
Other contributions	The EU's ERDF provides all the public funding for this measure under the Operational Programme for Cohesion Policy Funding 2014-2020. There is no direct national funding, though beneficiaries have to cover 20% of the costs. No other contributions.
Total budget for the measure	Total amount of the programme (which also includes Development Vouchers) is €4 million. There is no separate financial information available on the Innovation Voucher measure

Reason for highlighting this measure

Innovation Vouchers have been used in many countries to help stimulate innovative activity by enterprises in a relatively flexible way. The enterprises are able to choose within bounds where they wish to 'spend' their voucher. In this case they are used to stimulate the early stages of cooperation between enterprises and research institutions, though the scheme is relatively modest in the funding provided and the impacts correspondingly restricted.

The policy context for this measure

The need for the kind of services offered by this measure is set out in a government development document 'Sustainable Estonia 21' (Säästev Eesti 21), which is the overarching government strategy document on development in Estonia, but the main strategy in the specific field of entrepreneurship and business development is the Estonian Entrepreneurship Growth Strategy 2014-2020, which describes the Estonian economy's main growth areas. These mainly involve applications of information and communications technology (ICT) horizontally across all sectors, but also include health technologies and services, together with the need for a more efficient use of resources and development of activities such as co-operation networks, demand-side policies and fostering start-up entrepreneurship.

Since they involve research institutions, the need for Innovation Vouchers is also presented in the strategic document 'Estonian research- and development activities and innovation strategy 2014-

Innovation Vouchers - Estonia
2020 - Knowledge based Estonia' (Eesti teadus- ja arendustegevuse ning innovatsiooni strateegia 2014–2020Teadmistepõhine Eesti). This document lists the following targets: Estonian science that is diverse and at a high level, Research and Development (R&D) activities serving the interests of Estonia's society and economy, R&D changing the structure of the economy and increasing knowledge-intensity, and Estonia being active and visible in international R&D cooperation.

Aims and objectives of the measure

Rationale, objectives and main elements of the support

One of the main weaknesses in the Estonian business landscape has been the relative lack of investment in R&D by enterprises and a lack of cooperation between enterprises and innovation service provider organisations, such as research institutions.

The Innovation Voucher measure is one of Estonia's innovation support measures for enterprises which have been designed to address this weakness. Other measures include the Development Vouchers, which are intended to follow on from the initial contacts established by Innovation Vouchers, support for start-ups and Technological development Centres.

The overall objective of granting support is to increase the competitiveness of Estonian small and medium-sized enterprises (SMEs) by creating the prerequisites for developing innovative products, services and technologies with a higher added-value.

More specifically, the objectives of the Innovation Voucher scheme can be summarised as:

1) To stimulate knowledge and technology transfer directly to enterprises, and

2) To act as a catalyst for longer-term partnerships.

In order to achieve these objectives, the basic intention of the measure is to change the thinking of entrepreneurs so that they are more open to innovation and more likely to increase investment in scientific R&D.

This is to be achieved by establishing preliminary contacts between the entrepreneur and research institutions (universities, science institutions and support organisations), thus creating a starting platform for enterprises engaging in product development and innovation. This is expected to stimulate cooperation between innovation partners and enterprises, leading the latter to acquire new knowledge and experiences and promoting a certain behavioural change, which results in the transformation of the partners' existing development processes. This is expected to be attained by knowledge and technology transfer, increasing the effectiveness of intellectual property protection, and increasing cooperation with R&D institutions and enterprises that provide consultation and engineering services, including enterprises that provide preliminary studies and consultation regarding production and technology issues.

The Innovation Voucher scheme envisages that such a learning process will take place as co-operation begins between partners who have not worked together before.

The preamble of the decree establishing the Innovation Voucher describes the measure's expected contribution as achieving the following indicators: an increase of the share of spending allocated to R&D in the private sector (percentage of GDP) to 2.0% by 2023 (base level 1.26% in 2012) and an increase in the level of cooperation on innovation between universities and enterprises, by enterprises participating in a survey, to 6.8% by 2023 (base level 4.2% in 2012).

Target beneficiaries

The intended beneficiaries of the measure are enterprises with the ambition to start R&D projects

Innovation Vouchers - Estonia

and cooperate with research providers.

Characteristics of the measure

Instrument type

Innovation Voucher, a grant of funds in the form of a voucher that can be exchanged for professional or academic advice and support.

An indirect objective of the support measure is to create the conditions for increasing value- added per person and the knowledge intensity of production in enterprises. In addition, the objective is to increase the employees' knowledge and expertise by the production of goods with higher added-value.

Relation of the measure to other measures

The measure is a simple, stand-alone incentive for enterprises to start to develop relations with research institutions. However, there are a range of other measures that enterprises can apply for as a follow-up that complement the initial Innovation Voucher. These include Development Vouchers, start-up grants and enterprise development programmes, which all help enterprises build on the initial ideas and contacts developed through the use of Innovation Vouchers. The Innovation Voucher scheme is thus a first stage in a more complex development process.

Type(s) of innovation supported

Primarily product and process innovation, but also marketing innovation, especially in the service sectors.

Sectoral focus

All sectors are supported except:

- Agriculture, forestry and fishing (includes processing and preserving of fish, crustaceans and molluscs);
- Intermediation of sales, wholesale and retail trade, excluding maintenance and repair of motor vehicles and motorcycles;
- Real estate activities;
- Manufacture of tobacco products;
- Gambling and betting activities;
- Financial and insurance activities;
- Legal and accounting activities, activities of head offices and management consultancy activities, advertising (including online advertising) and market research;
- Rental and leasing activities, and temporary employment agency activities;
- Manufacture of beverages (excluding manufacture of soft drinks; production of mineral waters and other bottled waters).

Regional specificities

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The measure applies equally across the whole country.

Funding available for applicants

The maximum amount of support granted per project is € 4,000 and this can now cover up to 80% of the eligible costs (originally and until 2015, this was 100% of the eligible costs). A perfect candidate for the Innovation Voucher would use it to buy expert advice from specialists in their field in order to implement changes and start R&D projects. The initial consultation is provided for free.

The enterprise can also take advantage of a follow-up measure in addition to the Innovation Voucher. The same decree also covers the Development Voucher, which is intended as the next step in development activities and in cooperation with research institutions. The value of the grant is € 20,000 and the support rate of the grant is up to 70% of eligible costs. The activities covered are similar to those of the Innovation Voucher, with the added possibility of hiring a development specialist.

Time period over which the effects are expected to be felt

The time period over which the effects are expected to be felt is not determined. General effects are expected in 2020 as this is the year the effects of the initiative are to be measured.

How the measure is implemented

The instrument design

The measure offers a simple incentive to enterprises to encourage them to begin to develop relationships with research institutions, with a view to increasing the amount of R&D undertaken by enterprises. The enterprise is free to choose where to 'spend' the voucher, within the bounds of the scheme (see list of eligible activities below).

Eligibility criteria and restrictions

The main target group is any private-sector SMEs who have plans to develop innovative products, services and technologies with a higher added-value and who want to start working with research providers.

A prerequisite for applying the measure is the existence of a need to conduct small development projects between research institutions and enterprises.

The following activities are supported:

- Consulting on product or service development;
- Consulting on production or technology;
- Conducting product tests and industrial experiments;
- Carrying out feasibility and cost-benefit research;
- Legal protection consultation, tests and registration of patents, utility models or industrial design;
- Consulting on metrology, standardisation and certification; and
- Development and implementation of technological solutions.

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How the measure is accessed and delivered

Enterprises apply for funding by filling in a web-based application form. Additionally, all applicants need to provide proposals from the research providers.

The mechanisms used for the implementation

The mechanisms for implementing the measure are relatively straightforward. Once the application is approved, the enterprise approaches the research partner and requests the agreed service, which is then delivered. The partner reclaims the value of the voucher from Enterprise Estonia, while the enterprise pays directly for the costs not covered by the voucher.

Hopefully, the enterprise will follow up the initial interaction with further interactions with the research partner in order to take the innovation towards commercialisation.

How the measure is expected to generate its intended effects

The effect of the measure is direct. It arises in the form of advice on innovation by the research partner and the beginning of a relationship with the enterprise, which can be further stimulated by other measures.

The measure is also intended to provoke changes in attitude and behaviour and to make enterprises aware of the need to actively engage in R&D. Stimulating first-time cooperation within the Innovation Voucher framework helps to expand the number of enterprises who use new innovative knowledge for their business processes and products. It can then be followed up by the Development Voucher, another existing measure, which helps to create synergy and provides the entrepreneur with further knowledge of innovative solutions and problem solving.

The intended general and employment effects of the measure

The measure is not directly intended to have employment or employment-related effects, since the prime aim is to increase R&D activity and the measure is relatively restricted in terms of the financial support received by individual enterprises**.**

Nonetheless, where the measure is successful, the beneficiary enterprise will improve its knowledge and capabilities and this may give rise to improved performance, including employment increases. More directly, employment is provided for the research partners providing the range of services described above.

Summary of the main evidence available

The principal evidence on the performance of the Innovation Voucher grants can be derived from the support system evaluation reports, which cover a series of measures supported by the ERDF. The last evaluation, encompassing a whole range of measures, was conducted in 2017.

Mid-term evaluation of the business and innovation measures of EAS 2017

The numbers of enterprises receiving assistance from the Innovation Voucher scheme has been as follows:

Numbers of enterprises receiving Innovation Vouchers in two programming periods

Programming period: 2007-13		Programming period: 2014-20	
Year	**Number of enterprises**	**Year**	**Number of enterprises**

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2009	*121*	*2015*	*12*
2010	*192*	*2016*	*186*
2011	*244*	*2017*	*83*
2012	*360*		
2013	*418*		
2014	*163*		
2015	*71*		

Source: Mid-term evaluation of the business and innovation measures of EAS 2017

Note that the measure is divided in two because of overlapping EU programing periods. The first period for the measures was 2009-2015. The second period started in 2015.

69 of the 637 entrepreneurs who were supported by an Innovation Voucher grant answered the evaluation questionnaire (Mid-term evaluation of the business and innovation measures of EAS 2017).

More than half of the respondents who received an Innovation Voucher grant launched development efforts for the first time (62%).

Turnover and employment growth were compared with a control group selected from all Estonian enterprises that did not receive support and that were in operation over the period between the base year and the evaluation year. Matched pairs of enterprises were created, with the principal difference being participation or not in the support measure. Matching was on the basis of economic activity (EMTAK code), number of employees, location of employees, sales revenue, revenue from export sales, period of operation and labour costs per employee.

Turnover growth for the respondents was 153% (between base year and evaluation year). When corrected for the growth of enterprises that did not get any support, turnover growth for enterprises that were supported by the Innovation Voucher grant was 22%.

Employment growth was 116%. Corrected growth was +14%. Corrected growth of salaries paid to employees was +4%. Total employment as a result of the measure during the evaluation year (2017) was 359 employees.

Export growth was 115%. Corrected export growth was 23%.

48% of the recipients of the Innovation Voucher would have carried out the planned activities even without the grant.

Value added growth per person was higher for supported enterprises (referring to all support measures).

According to the results of the interviews with the recipients of Innovation Voucher grants, the impact of support on the development activities of enterprises can be described as more modest than suggested by the outcomes of the online survey. More specifically, the recipients of grants did increase their investments in R&D activities, as expected, but most of them stated that this was not due to the impact of the grant. The relationships were described as indirect and were deemed as attributable to the general development of enterprises in the Estonian economy.

Overall, the 2017 evaluation provides evidence, albeit with various caveats, of positive impacts

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from the measure on employment, salaries and other aspects of growth. This contrasts with earlier studies that tended to find that this and related measures had little discernible effect (see below).

Mid-term evaluation of business and innovation policies 2014

The effects described are attributed to all the innovation measures which were active during the 2007-2012 periods. They are described as follows: 'Although in absolute numbers the increase in employment levels was rather small, compared to the comparison group (that did not use the measure), the number of employees increased by 13.4%. At the same time, the sales and export revenues and added-value per employee actually decreased. 76% of the users of the measure self-reported that they had created new jobs.' There is no information about the specific effects from Innovation Vouchers or Development Vouchers. This was not researched in the evaluation. The main effect (and objective) for Innovation Vouchers has been to increase the number of the enterprises who participated in the programme and worked with innovation services providers. The numbers involved are set out above.

The 'Impact of innovation support measures on competitiveness of companies' report by the National Audit Office (2014) examined the six main measures that support innovation. It did not find any employment related outcomes and generally found rather poor results from the interventions at that time.

Only three of the six measures were found to have had a positive impact on enterprise exports or added value and there was not a single case where the support increased the sales revenue of the recipient. In particular, the National Audit Office concluded that the Innovation Vouchers had no effect on sales revenue, export revenue, added value or added value per employee.

The National Audit Office sought to explain these outcomes by pointing to the difficult initial conditions that the measures were intended to change. Cooperation between Estonian entrepreneurs and research organisations is generally weak and support has contributed little to increasing this cooperation. Less than 30% of those who received support from the measures considered that the support was effective in the promotion of cooperation.

Similarly, a report by the National Audit Office of Estonia, entitled 'The impact of the state`s enterprise supports on the competitiveness of the Estonian economy' (2010) states that only one fifth of the enterprises that had received state support for increasing productivity considered that the support had really had a significant impact on their productivity. The study also showed that support did not have a big impact on the number of new exporters. The National Audit Office declared that the state is lacking an integrated, carefully planned entrepreneurial policy with clear impact objectives. It also criticised the fact that no comprehensive impact objectives had been set for innovation support measures for the previous or the current EU budget period and that predominantly only input or output goals had been used to assess the goals of the Estonian research and innovation policy.

Innovation Studies. Innovation and innovation support for Estonian companies 2015

Estonian universities have achieved high numbers of cooperation projects with businesses. Two of the biggest universities already earn 6% and 4% respectively of their R&D budget from projects with businesses. At the same time, reports on projects suggest these offer little motivation to scientists as, generally, the projects entail low research intensity (due to the small budgets of the projects).

In general, in relation to Estonian industry, it is important to stress that the added value of low-technology sector businesses is higher than that of advanced technology businesses. For example, the average added value per employee in wood processing businesses is 90% higher than in businesses manufacturing furniture, 39% higher than in businesses that manufacture wood products

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and 14% higher than electronics businesses on average. Software development businesses show an added value only as 6% higher than that of wood processing businesses.

Overall, therefore, the latest evidence appears to suggest positive impacts for enterprises using Innovation Vouchers and similar instruments, when comparison is made with a control group. Earlier studies focused on value-for-money issues and found less evidence for these effects. They tended to conclude that the measures were ineffective, but the analysis was undertaken at a relatively early stage in the operation of the measures.

Quality of the evidence base

The 2017 evaluation report establishes that direct and positive impacts are created over a two year period in the enterprises that have used the Innovation Voucher. The impacts are on enterprise turnover, employment and exports and also on investment in innovation. The report establishes results by a comparison of the performance of enterprises receiving support with that of a control group. The report also shows that there are changes in the attitude of enterprise managers to R&D. However, the report doubts that these changes are mainly attributable to the grant and the additionality of the measure is brought into question, in that 48% of those surveyed said that they would have carried out the planned activities even without the grant.

There is also selection bias in the analysis, since growth-focused enterprises are more likely to seek additional funding compared to control group members.

Another important issue is the way that the impacts are measured. The quantitative analysis involves comparison between a base year and the evaluation year. The base year is the year a project started and this can vary in the samples from 2008 to 2013. The evaluation year in practice is 1–2 years after the project completion, for enterprise supported under the first programming period, and shows the effect of the grant on actual financial results. In 2008–2009, Estonia was experiencing the effects of the global recession and GDP fell almost 20% during these years. For these reasons, businesses might have had a stronger desire to use grants as compared to the end of the monitoring period, when the economy had recovered. On the other hand, the economic recovery that followed the recession could have affected the actual growth rates and thus had a distorting effect.

When assessing the results, it is also important to consider that only a 2-year period was monitored for effects. When it comes to research and development activities, a 2-year period is generally too short a period, since actual effects usually take longer to be revealed. In this sense, it would be better to also monitor the effects of business activities five or ten years after receiving the grant.

Earlier reports, largely based on state audit analyses, identify the need for support grants in general to encourage greater interaction between businesses and research institutions, but also point to weak results from these grants, However, in all cases, this is based on assessing results after a brief period and the analysis does not consider that there is usually no short-term effect from innovation grants and even long-term effects can be hard to detect. Effects can be revealed over a very long period and be almost impossible to detect or measure. These include a change of opinion among the population and entrepreneurs regarding the significance of innovation investment and the development of a higher risk appetite.

The earlier reports do indicate that there is a need to encourage greater collaboration between businesses and research institutions and that the objectives of the Innovation Voucher scheme can be considered to be relevant. There is little consideration, however, of how the various measures pursuing this objective interact with each other and hence whether the Innovation Vouchers act as an incentive to taking a significant first step along the road to greater collaboration. From this point of view the coherence of the measure with other policy measures does not receive the attention it

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deserves.

The evidence on effectiveness is ambiguous. The mid-term evaluation of 2017 indicates positive results in comparison with a control group, but also shows that the additionality of the scheme is in doubt in around half of the cases and also indicates selection bias. Furthermore, since the evaluation looks mainly at the relationship between objectives and outcomes and this over a relatively short time period, little is said about the effectiveness and efficiency of the mechanisms for providing assistance, namely the technical and business advice that the enterprises receive. These are important considerations for the longer-term effectiveness of the measure. All these issues raise further doubts about the sustainability of the measure in future programmes. In general, however, it should be noted that the design of voucher schemes is relatively simple and this has made them readily transferrable, such that they have been used in a number of countries across Europe and beyond.

Overall, the evidence produced on the basis of a counterfactual analysis using a control group is strong, but the contextual analysis is not sufficient to draw firm conclusions on whether or not the measure is playing its part in achieving Estonian policy objectives in relation to building links between enterprises and research communities. A more systematic review, especially one providing a realist synthesis would have been better from this point of view.

Actual employment outcomes

Although the Innovation Vouchers did not include employment-related objectives, the measure contributed to generating some employment effects.

Regarding the employment effects on enterprises:

- The Enterprise Estonia 2017 mid-term evaluation showed an increase in the number of employees and remuneration (labour costs) for the enterprises supported by the Innovation Voucher measure. Additionally, the evaluation showed an increase in turnover and R&D investment. Analysis of the broader range of innovation support measures, including the enterprises that received Innovation Voucher grants, revealed that enterprises which received a grant(s) increased the added value per employee faster than the enterprises that did not receive any grants.
- The studies carried out cannot be used to make conclusions on whether the knowledge, skills and capacities of employees increased, although the way that the measure is intended to work, is through the development of knowledge, skills and capacities, so presumably there was some effect.
- Similarly, promoting labour mobility, improved working conditions and welfare are not among the measure's goals and neither do the studies of the measure monitor anything related to them, meaning that conclusions in relation to them cannot be drawn.

Complementarily, employment-related considerations can be seen also as regards the research institutions cooperating with the enterprises thanks to the Innovation Vouchers ('Innovation and innovation support for Estonian enterprises 2015'). Specifically, two of the biggest universities already earn 6% and 4% of their R&D budget from projects with enterprises and this can be assumed to have an impact on employment. Nonetheless, the gross revenue from individual

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projects, supported by the Innovation Voucher or Development Vouchers schemes is small – the University of Tartu earned € 1.2 million from 101 projects in 2011 and in € 2.5 million from 49 projects in 2014. At the same time, studies show that development projects with a low research intensity offer little motivation to scientists because their career advancement depends on work of scientific excellence in their field (and the number of publications).
Information sources *References* National Audit office of Estonia (2017), *Ettevõtluse ja regionaalarengu rahastamine Euroopa Liidu toetustest (EU support funding for entrepreneurship and regional development)* Liedemann, E. Matsulevitš, L. Hanni, E. Tammann, M. (2014) *Innovatsiooni toetusmeetmete mõju ettevõtete konkurentsivõimele* Impact of innovation support measures on competitiveness of enterprises: Liedemann, E. Hinno, M. Matsulevitš, L. (2010) *Riigi ettevõtlustoetuste mõju Eesti majanduse konkurentsivõimele* The impact of the state`s enterprise supports on the competitiveness of Estonian economy: Lee, U. Tõnurist, P. Liedemann, E. (2017) *EASi ettevõtlus- ja innovatsioonipoliitika meetmete vahehindamine,* Enterprise Estonia Mid-term evaluation of the business and innovation measures of EAS: Mihkelson, P. Rebane, T. Kitsing, M. Lember, K. (2014) *Ettevõtlus- ja innovatsioonipoliitika vahehindamine* (Mid-term evaluation of business and innovation policies 2014) Kaarna, K. Ojamäe, K. Lember, K. Welch, E. Fisher B. (2015) *Eesti ettevõtete uuendusmeelsus ja innovatsiooni toetamise võimalused (*Innovation and innovation support for Estonian enterprises Innovation Studies), Ministry of Economics and Communications Innovation Studies.
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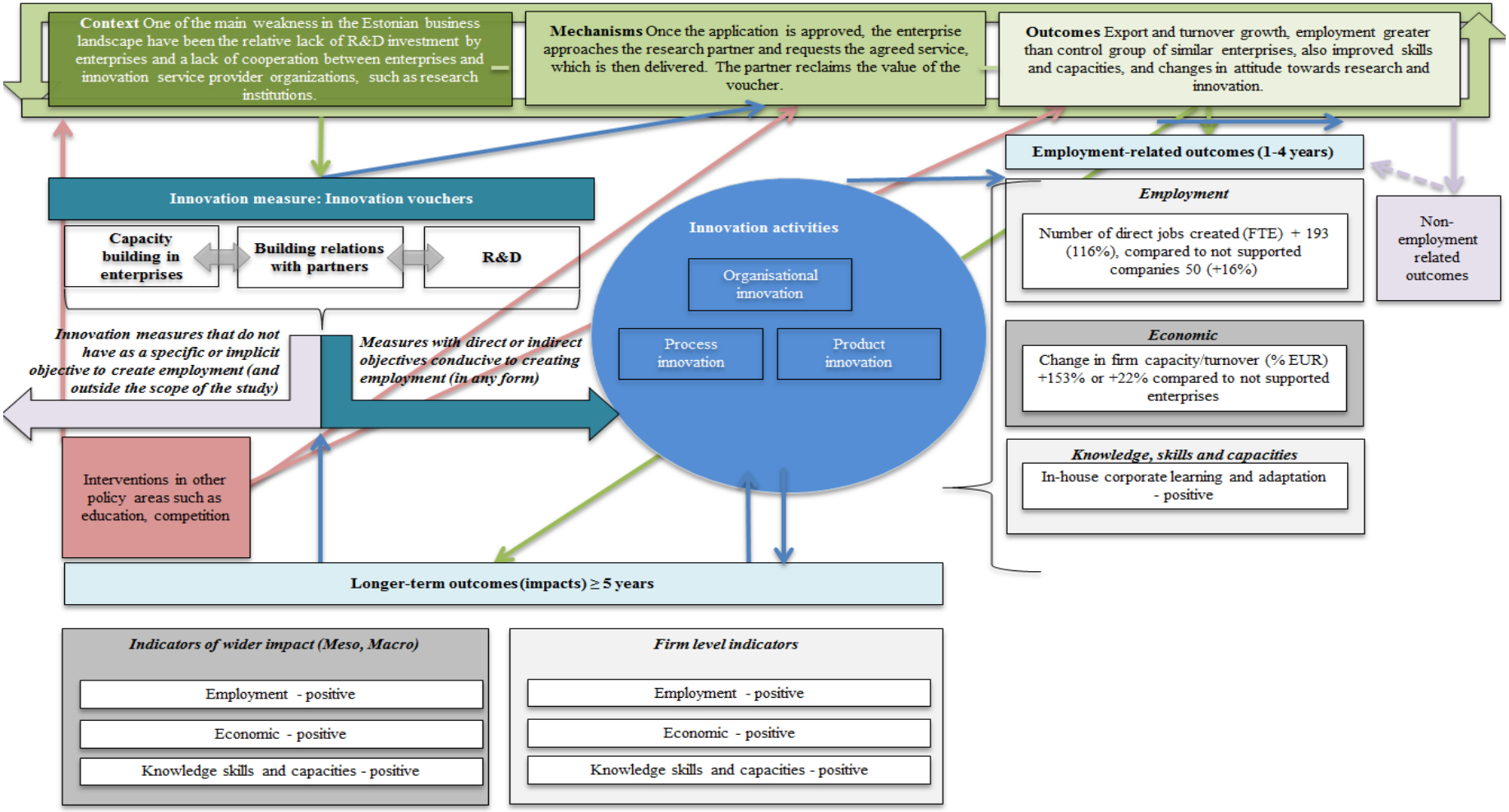
Graphic representation of the intervention logic of the measure



Smart&Start – Italy

Smart&Start – Italy	
Measure identification	**IT Smart&Start**
Name of the instrument	Smart&Start
Web link	http://www.smartstart.invitalia.it
Location	All Italian regions, especially southern ones
Starting year and duration	2014 – present (2018)
Name of the organisation providing measure	Established by the Ministry of Economic Development and managed by Invitalia (National Agency for inward investment and economic development)
Type of organisation providing measure	The Ministry of Economic Development has the overall responsibility for the project. The measure is managed and implemented by Invitalia, a private company owned by the Ministry of Economic Development.
Other contributions	€45.5 million, which is 47% of the total budget, comes from the Operational Programme 'Enterprises and Competiveness (Imprese e Competitività) 2014-2020' financed almost entirely by the European Regional Development Fund.
Total budget for the measure	€95 million for 2017 and 2018

Reason for highlighting this measure

This measure promotes research-driven innovation and fosters employment opportunities in a country where investment in research and technology are below the European average and the youth unemployment rate is among the highest in Europe. In particular, it provides funding and financial aid to start-ups, in a country where finance for this type of enterprise is still relatively underdeveloped, when compared to that available in other European countries. The measure is therefore illustrative of measures that are designed to promote innovation through the creation of new enterprises.

The policy context for this measure

The measure is part of a strategy that aims to provide support for investment programmes in small and medium-sized enterprises (SMEs) and large enterprises. As part of this strategy, a pilot project to support the creation and development of SMEs was initially implemented in 2013 in five regions in the south of Italy. Smart&Start can therefore be considered as the second phase of the measure, which extended the support across the whole country in 2014.

Looking at the wider context, Italy provides significant level of investment in Research and Innovation (R&I) through the Structural Funds. In addition to providing support through a mix of national and EU funding, recent reforms put in place have helped to strengthen framework conditions for innovation, even if there remain considerable challenges (described below). Italy also scores above the EU average in terms of SMEs introducing new marketing, organisational and product or process innovations.

According to the 2015-2020 National Programme for Research (p. 11), Italian SMEs are amongst the most innovative in Europe:

- The percentage of SMEs that has introduced an innovation in product, process, strategy or organisation is above the EU average (CIS, 2012);

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- Their contribution to the trade balance in terms of export of medium and high-tech products is above the EU average.

There are challenge in bringing about the necessary structural changes so that Italy becomes a more knowledge-intensive economy, given the relatively low level of R&I intensity. There are still some generally unfavourable framework conditions, for instance, in respect of the size distribution of enterprises and the large number of low R&I intensity[5] SMEs and micro firms and the lack of sufficient economic development in parts of Southern Italy.

Further challenges of the Italian R&I system relate to the lack of adequate human resources, the lack of sufficient private investment in R&I and the need to foster a stronger culture of entrepreneurship, among others. Indeed Italy is classed as a 'Moderate Innovator' in the 2017 European Innovation Scoreboard.

With regard to governance and the management of the R&I system and policies, whilst some positive reforms have taken place, due to frequent governmental changes, there has been a lack of stability in governance arrangements, which may have undermined the effectiveness of reform efforts. Italy is also amongst the Eurozone countries that have cut R&I budget more rapidly than other public expenditure.

The tight lending conditions and the small scale of the venture capital market (Italy ranks 18th in terms of venture capital as a percentage of GDP) (Nascia et al, 2016) are also considered to hamper innovation activities, especially for new, small, innovative firms. According to the Bruegel Institute (2015), in all four largest EU countries, internal funds represent over 80% of firms' R&D spending. However, in Italy the second biggest source of financing is bank loans (which fund slightly less than 10% of R&D spending), whereas – for example – in the UK this proportion is much lower (1%) and equity plays a more important role (Nascia et al, 2016).

Aims and objectives of the measure

Rationale, objectives and main elements of the support

The main aim of the Smart&Start project is to support the effective creation of innovative start-up businesses. The measure therefore supports the creation of new businesses that are either in the digital economy or are making use of the results of the research system. It does this by addressing the critical issues faced by new businesses (businesses established in the last 12 months) by providing access to finance and business support that ensures that they are able to develop the business management processes that are necessary for success. The measure can also be seen as a practical way of encouraging the transfer and commercial development of knowledge generated by research institutions and has special provisions to make it attractive to young and highly skilled entrepreneurs (details provided below).

The measure has no clearly articulated operational objectives, although evidently firm creation is the key aim. The measure is monitored at a project level through the collection of quantitative data. However, as far as the authors are aware there are no milestones or specific targets. The indicators used for data collection are listed in the section 'Summary of the main evidence available' below.

Target beneficiaries

The target of Smart&Start is innovative entrepreneurs and the intended beneficiaries are:

[5] In 2013 R&D intensity currently stands at 1.31% GDP, compared with an EU-28 average of 2.03% of GDP.

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- Start-ups that have a high-tech, innovative business idea;
- Start-ups aiming to develop new products and services in the digital economy; and
- Start-ups exploiting commercial opportunities resulting from research.

Those applying for support under the measure have to demonstrate to Invitalia that they comply with strict criteria (described below), which are designed to test the viability of the proposal.

Additional assistance is provided for people aged under 36 years, women and people creating start-ups in less developed regions.

Characteristics of the measure

Instrument type

Smart&Start is a measure that supports the creation of innovative start-ups by providing access to finance and a range of business support services.

Relation of the measure to other measures

The measure is a stand-alone measure, but is also one of a wider package of measures aiming to promote and encourage self-employment and business creation throughout the country. Smart&Start is one of the four instruments implemented in this policy area by Invitalia. The others include 'new firms at 0%' (nuove imprese a tasso 0), 'Selfieemployment' and 'Culture creates' (Cultura Crea). Although these measures support similar objectives and are in the same policy area, they are not coordinated within an overall policy programme, but in practice they may have a level of complementarity.

Furthermore, the Invitalia agency is tasked by the Department for Development Policies and Economic Cohesion (DPS) of the Italian Ministry of Economic Development (MISE) to implement Italy's smart specialisation strategy. This entails coordinating and supporting the regional governments in designing and implementing their own strategy through the possibility of sharing, at national level, experiences underway in different regions and avoiding overlaps between different levels of governance. However, interviewees were not able to comment to what extent there is a coordinated approach between these various instruments to support R&I.

Type(s) of innovation supported

This measure promotes product innovation through the development of new products or services and also process innovation. The measure also supports organisational innovation in the form of novel working arrangements.

Sectoral focus

The measure aims to support industrial innovation projects in the areas of energy efficiency, sustainable mobility, life sciences, 'made in Italy' and the development of innovative technologies making use of cultural assets and activities. These areas are enshrined in art. 1.842 of the legislation (law n.296/2006).

Regional specificities

The pilot phase of the measure was only implemented in southern regions. With the Ministerial Decree of 24 September 2014, the measure was extended to the national level. However, additional support is provided to start-ups located in Basilicata, Calabria, Campania, Molise, Apulia, Sardinia, Sicily and part of Abruzzo (see section on 'mechanisms used for the implementation' below).

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Funding available for applicants

The measure provides funding of between €100,000 and € 1.5 million per start-up. The budget available for 2017 and 2018 is €95 million. The budget is provided through a mix of national and EU-level funds. The funds available are regularly provided by the government through different sources of funding.

Time period over which the effects are expected to be felt

Given that start-ups take some time to get off the ground, and that the measure supports start-ups that are exploiting new technology, the main effects of the measure can be expected to be felt after four to five years.

How the measure is implemented

The instrument design

The measure is intended to create new innovative businesses, especially those that can exploit the results of R&D. It targets start-up enterprises that comply with defined criteria relating to the type of commercial activities they undertake and supports them in developing management capabilities and in gaining access to finance mainly in the form of interest-free loans. The support services make use of a variety of approaches to building capability, including mentoring.

Eligibility criteria and restrictions

Overall, the measure targets new innovative start-ups (established in the last 12 months). In addition, entrepreneurs intending to create a start-up are allowed to apply for funding, although support for successful applicants can only be released once the new start-up is established. Foreigners can also apply for funding, but non-EU citizens must hold the so-called 'Italia start-up VISA', an entry visa obtained through a simplified fast-track procedure intended to favour innovative entrepreneurs.

The measure also provides additional support for specific target groups, namely people aged under 36 years, women, and people creating start-ups in less developed regions (see section on 'mechanisms used for the implementation' below for more information).

In August 2017, the instrument was expanded in order to cover a larger number of start-ups and support a wider range of expenses (in particular marketing and web-marketing related expenses). This change was in response to requests received from potential applicants by Invitalia.

How the measure is accessed and delivered

The application process can only be conducted online and involves submitting a detailed business plan. This must address Invitalia's criteria, which include the innovative potential of the idea, the market potential and strategic positioning, the feasibility of the business plan, technological feasibility and operational coherence.

The funding decision is notified within 60 days after which the enterprise enters into a funding agreement with Invitalia. The funding is provided on a 'first come, first served' basis, that is, the applications are assessed in chronological order and the measure finishes once the total amount of funding available is allocated.

The mechanisms used for the implementation

If the applicant is successful, the start-up signs an agreement with Invitalia in order to receive financial support for capital expenditure and operating expenses. This is in the form of a government funded, interest-free loan that is intended to cover up to 70% of the expenses that qualify for funding. The agreement defines how the loan is disbursed and repaid and Invitalia provides a list of eligible

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expenditures. Funds from the loan are usually released as expenses are actually incurred, following a request from the start-up, for an amount not less than 20% of the eligible costs. In some cases, however, funds can also be requested in advance. If funding is granted to a start-up that has not yet been established, applicants will have 60 days to establish it from the date of the certified email.

The maximum repayment period for the loan is eight years and it covers expenses from €100,000 to €1.5 million excluding VAT.

Generally, as stated, the loan covers up to 70% of eligible expenses, but if the start-up's workforce is entirely constituted by women or people under the age of 36, or includes one Italian PhD researcher that has worked permanently abroad for more than three years, then the loan covers up to 80% of the expenses. Start-ups based in Basilicata, Calabria, Campania, Molise, Apulia, Sardinia, Sicily and part of Abruzzo are also awarded of a grant, so that they have to pay back only the 80% of the loan.

In addition to the loan, the enterprise is supported with technical and managerial mentoring provided by the Invitalia team. Part of the mentoring is standard and provided through methods such as webinars, seminars, etc. This training covers the basic skills set required by entrepreneurs and includes lessons on labour legislation and marketing. The second part of the mentoring is tailored for each start-up, based on a needs assessment made by Invitalia. A wide range of training services is provided, including the opportunity to meet venture capitalists and other relevant financial institutions. This aspect is particularly relevant since the overall funding available for start-ups at national level is limited compared to the European average.

How the measure is expected to generate its intended effects

The measure is intended to have a direct effect on the creation of new and sustainable start-ups by providing funding and supporting the development of the capacities of the entrepreneurs, including through mentoring. It therefore intends to support people with good ideas in their initial steps towards commercialisation, which is the period in which enterprises face particular challenges.

By favouring particular groups with additional assistance, the measure also intends to produce additional effects, partially of a social kind, by assisting women entrepreneurs, young people and entrepreneurs in less developed regions, but with the economic aim of promoting greater growth by attracting highly-skilled individuals and foreign investors, which could contribute to establishing innovation hubs (although this is not a formal objective per se, but rather an expected longer-term impact).

The intended general and employment effects of the measure

The priority of Smart&Start is to promote business creation and support the development of innovative start-ups. This includes helping people with good ideas in their initial phases and help making their business sustainable. As such, the creation of employment is not at the centre of this measure, but rather it aims to help create viable businesses.

The Smart&Start measure can also contribute to related economic development initiatives, such as the development of innovation hubs.

The intervention logic of the measure is set within the Italian policy to sustain the creation and development of SMEs and support entrepreneurship across the country. It is used to address market failures resulting from access to finance and lack of entrepreneurial competences for start-ups. Once the start-up is awarded, distortive market failure effects are reduced through a mix of funds and mentoring activities with the aim to bring an idea or business concept to higher innovation readiness levels. However, the measure is not based on a centrally coordinated policy programme and has not been developed as a result of a need assessment analysis. The intermediate objectives of the measure are not clearly structured and the coordination with other measures is mainly left to the judgement of

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the professionals involved. Despite these shortcomings, a monitoring framework is in place (see further the 'summary of the main evidence available section'), which measures employment creation.

However – as previously indicated – the measure does not have employment objectives. The business creation is clearly the main objective of the measure, which could perhaps be better achieved through the definition of intermediate objectives in the area of employment. In addition, the measure perhaps underestimates its potential in terms of wider indirect (and induced) employment effects, as these are not articulated either.

Summary of the main evidence available

Smart&Start has not yet been evaluated, but monitoring data are available.

In Italy, the Ministry of Economic Development monitors the administrative measures implemented to support economic activities. These activities are collected in a report that is presented every year to the Parliament. The latest annual report was published in 2017 and shows the monitoring results of all the interventions implemented by national and regional authorities to the productive sector between 2011 and 2016.

Project-level monitoring activities consist on a set of quantitative indicators for which data are systematically collected. The indicators aim to collect information in different areas, including:

- Volume – a factual description of the extent of services provided and the number of beneficiaries involved (this description includes information on age, gender, residence of the beneficiaries); and
- Bottlenecks – a description of the number of applications submitted, accepted but not able to complete the process, etc.

The performance of the Smart&Start measure is monitored and assessed in relation to a set of quantitative indicators, including:

- The number of applications submitted;
- The number of start-ups awarded;
- The sectors of the start-ups;
- The age and gender of the start-up owner; and
- The regional location of the start-ups.

Data are provided for all the stages of the measure and are sufficient to gauge the overall performance of beneficiaries. Data are reported by Invitalia to the Ministry on a regular basis and are summarised in quarterly reports.

The results of the assessment set out in the report were generally positive (see the section on Actual employment outcomes).

Quality of the evidence base

The monitoring report presented by the Ministry to the Parliament in 2017 cites the Smart&Start measure once. It provides information on the amount of incentives allocated and how this amount compares the total amount of incentives allocated by the central State in the productive sector. This seems to suggest that the Ministry tends to focus on the overall impact of its activities rather than on

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the impact of specific measures. In addition, no evidence is provided on the impact of the different type of instruments once the support is finished.

At project level, the evidence is collected through a number of quantitative indicators only partly publicly available. The quantitative indicators are reliable and provided systematically by Invitalia to the Ministry of Economic Development. In addition, Invitalia provides structured quarterly reports to the Ministry. However, the quantitative information provided is not part of a wider evaluation framework.

In general, the information available does not allow for the assessment of the performance of the measure using traditional evaluation methods.

For example, it is not possible to assess whether start-ups supported by this measure outperform similar start-ups in terms of growth in employment and turnover. This is due to the fact that monitoring data are not collected to describe specific outcomes but rather to show the quantitative performance of the measure (as outlined in the section on summary of the evidence).

This provides an initial picture but does not show in-depth information on qualitative aspects, such as barriers and problems encountered by start-ups during the process. The quantitative indicators help those implementing the measure to focus on the main achievements, but can distract attention from wider considerations that can be relevant. For example, it was not possible to obtain a clear explanation of the gender imbalance between people awarded (despite women entrepreneurs being a specific target group of the measure).

More generally, the lack of SMART objectives, as well as an unclear evaluation framework (it is not clear what general, intermediate and operational objectives are), makes it difficult to evaluate the measure in terms of its effectiveness and relevance. However, the current indicators do allow for an assessment of efficiency and coherence aspects. In this context, an additional challenge is that so far no impact evaluations have been carried out. Invitalia is expected to publish a report analysing the impacts of the measure in the coming years.

Actual employment outcomes

The data available show the direct employment effects of the measure: as of November 2017, the instrument has created 3,925 new jobs. People aged under 36 represent almost 40% of the start-uppers supported, just below people aged between 36 and 50 years that represent almost 45%. In terms of gender, only less than 20% of start-uppers are women – a specific target group of the measure. There does not appear to be any data on PhD researchers (another target group), although there are data on regional uptake.

Almost two-thirds of the start-ups funded are located in the Mezzogiorno, the least developed area of the country. The main reasons for this geographical concentration are the additional support provided to start-ups based in this and the limited funding otherwise available for start-ups located in these regions. In addition, the fact that the measure was initially piloted in the Southern Regions is likely to have played an important role in terms of its continuation and reach in that area. Overall, the highest number of start-ups supported is located in Campania (249), Sicily (130), Apulia (88) and Calabria (57). The total number of start-ups financed is 818.

In terms of sectoral focus, the highest number of start-ups supported by the measure is in the web-technology sector (357), followed by life science (83) and the hi-tech industry (82). A good number of start-ups have been created also in other sectors: IT and infrastructure (81), environment and energy (73), smart cities and services (72), and tourism and cultural heritage (53).

Given the nature of the support provided, firms awarded generally require highly qualified and specialised workforce. As a result the measure can also add value to local ecosystems, perhaps also

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leading to productivity and competitiveness growth of the area.

But ultimately – also due to the short implementation period – the impacts of the measure have not been thoroughly evaluated and assessed. The monitoring information currently available shows absolute increases in direct employment resulting from the creation and development of new start-ups. Cumulative positive employment outcomes can be expected over a longer period, however this cannot be currently validated by the evidence available.

Future positive effects are likely to arise from enhanced capacities of the start-ups, resulting from both the mentoring assistance provided and from the additional employment created by the introduction of new services (or goods) in the market. The inflow of highly skilled and qualified workers could support the creation of innovation hubs at local level and lead to multiplier effects in terms of employment opportunities in the local areas.

However there are also a number of long-term risks, one of which is the increase of geographical imbalances – innovative start-ups being created in areas where this set of skills and competences is already available and where there are already existing innovation hubs. It may be necessary that the measure continues to support the creation of business in less developed areas of the country. At the same time, long term negative employment effects may occur as a result of the introduction of innovation related to new or improved production methods. The evidence available does not provide any assessments in this regard; rather, it would be necessary to assess risks on a case-by-case basis.

Displacement effects are not expected in the short term. However, a potential future challenge may be to ensure appropriate skills levels among workers as the supported firms grow in staff number. Specifically, it may become a challenge to find suitably qualified and skilled candidates in some regions. Thus, in the longer term, reduction in employment of other firms arising from an increased competitiveness of the start-up assisted might occur, that is firms begin to compete for staff. However, given the high-innovative nature of the start-ups supported, of which many might not even reach the maturity level, it is not possible to obtain an estimate of the impacts of these possible effects.

Very little can also be said in terms of effects on working conditions since these aspects are not part of the measure design and monitoring tools. On the one hand, the quality of the workforce involved in this measure suggests that the working conditions of the people involved should be in line or above national standards. On the other hand, the intrinsic nature of start-ups suggests the use of atypical forms of employment, at least in the short term. Also in this regard, effects should be analysed on a case-by-case basis.

Overall, given the focus of the measure, employment effects are not a core element of the measure but an indirect effect of the creation of new businesses (which is the main goal of the measure). This view was also confirmed in the interviews undertaken. Wider employment aspects are not part of the measure objectives, and the focus of the measure is on the creation of start-ups. This, in turn, is likely to generate direct employment as a by-product.

Overall assessment

The Smart&Start project is an example of support for innovative start-ups. The evidence suggests that the project has been able to reach a high number of enterprises across the whole country, in particular in the Southern regions.

The Smart&Start measure accounts for less than 2% of the total incentives provided in the productive sector by central authorities. The measure does not play a key role in terms of employment contribution (at least at this stage), but it does represent a key element in the innovation support measures for promoting self-employment and business creation in Italy. In the author's opinion, this is the most relevant support measure for innovative start-ups. Despite the limited data available in terms of its overall employment effects, the measure is able to create highly qualified employment, usually

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able to address the fierce competition of the global economy.

In addition, the measure encourages the creation of business opportunities and therefore potential employment opportunities in the longer term. It also provides entrepreneurial skills and competences to participants, which is a key factor to ensure the growth potential for a highly risky activity such as innovative start-ups.

The measure has a clear focus and is able to reach an audience, namely innovative start-ups, for which it is usually very difficult to access funds. The measure is also transferable and can be used as an example in case a government plans to focus on business support for innovative start-ups. Key aspects to be taken into account to emulate this measure in a different context include:

- A clear definition of innovative start-ups. In Italy this is covered by national legislation. Decree-Law 179/2012, which is also known as 'Italy's Startup Act', provides a legal definition of a new innovative enterprise of high technological value, called 'innovative start-up' (Italian Ministry of Economic Development, 2017);
- Ensuring that access to funds is simplified as far as possible (this has been done through the 'first come, first served' mechanism).

A clear legislative framework is key to allow Invitalia to quickly identify the target groups. A simple process to access funding is pivotal for innovative start-ups, for which standard funding processes are too burdensome and long.

A developed, although partial, monitoring framework is in place. The Ministry has regular contacts with Invitalia. However, the use of mixed methods would enhance the quality of information collected. In particular, a wider use of qualitative methods (such as interviews, focus groups, etc.) would enhance the depth and richness of information available, allowing to identify causes that reduce the effectiveness of the measure and reduce potential unintended effects. In addition, the development of clear and coherent set of general, intermediate and operational objectives would help to evaluate the measure using standard evaluation methods.

It is too early to make considerations on its success to provide good return on investment of public funds, or to understand whether the failure rate of start-ups included in the programme is lower compared to those that have not received the funding. The planned evaluation should therefore use control groups to determine the overall performance of the measure.

Information sources

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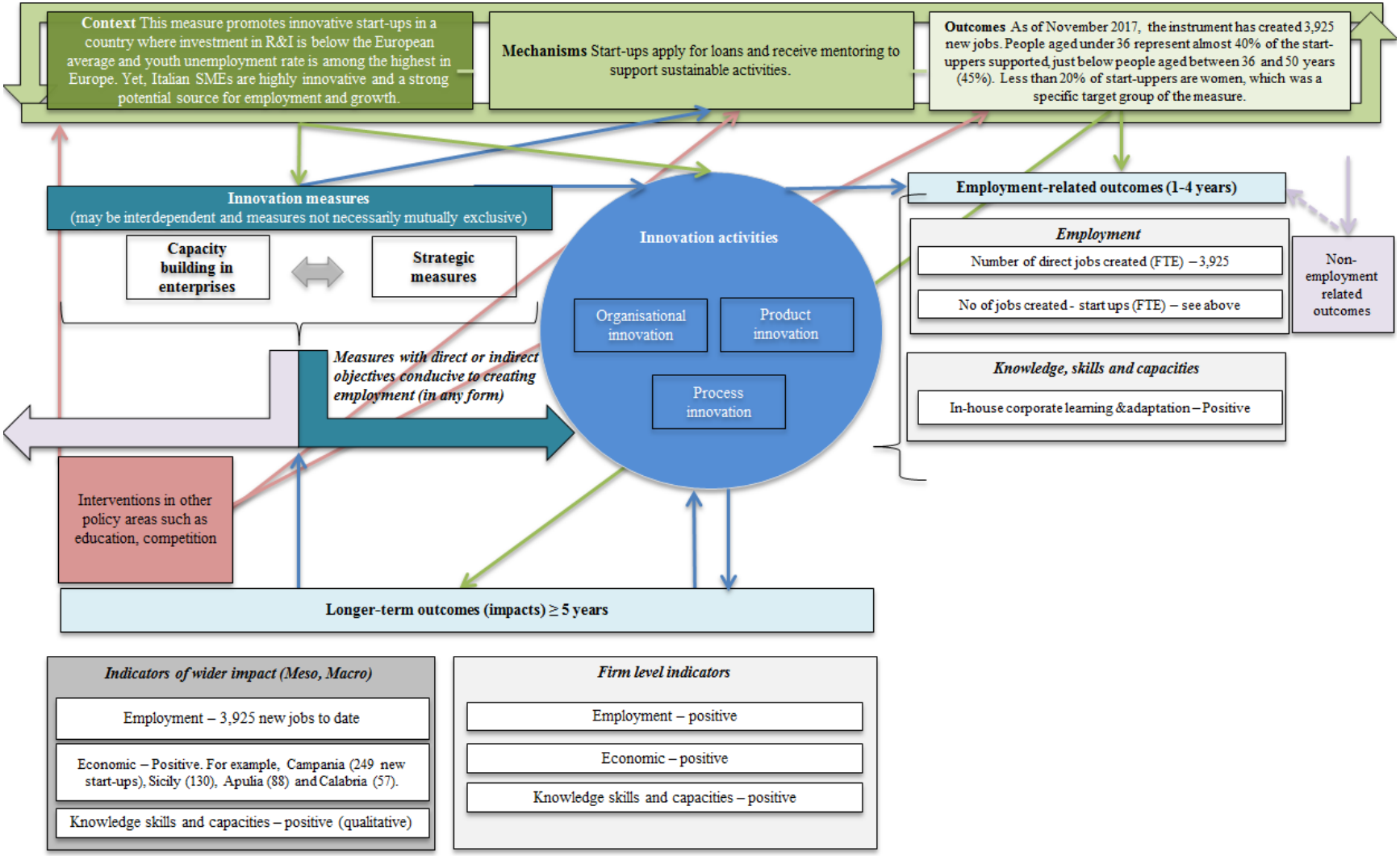
Report author Danilo Bianchini, CSES

Graphic representation of the intervention logic of the measures



Investment Incubators - Poland

Investment Incubators - Poland	
Measure identification	**PL Incubators**
Name of the instrument	**Initialising innovation activity (Inicjowanie działalności innowacyjnej) –** establishment and operation of investment incubators
Web link	http://poig.parp.gov.pl/index/index/589
Location	Poland - all regions
Starting year and duration	Implementation of the measure started in 2008 (1st call for proposals) and was continued through to 2013 (last - 4th - call for proposals). All the projects had to be completed by the end of 2015. Within that period 69 Investment Incubators were established. By now (2017/2018) most of them are operational – the incubators monitor their investment portfolio in start-up companies and undertake their first exits. Proceeds from exits have started building-up the investment incubators' capital, so that it can be re-used for continuing start-up incubations and equity investments in newly established companies.
Name of the organisation providing measure	Managing Authority – Ministry of Regional Development (Ministerstwo Rozwoju Regionalnego), Implementing Authority (2nd level Intermediate Body) – Polish Agency for Enterprise Development (PAED) (Polska Agencja Rozwoju Przedsiębiorczości).
Type of organisation providing measure	Public legal entity. PAED was nominated as the implementing institution for the implementation of Measure 3.1 'Initialising innovative activity' of the ERDF Operational Programme Innovative Economy (OPIE), 2007-2013 (Programme 3rd Priority – 'Capital for Innovation').
Other contributions	Measure funding: 85% European Regional Development Fund and 15% resources from the Polish state budget. No requirement of private contributions.
Total budget for the measure	€193.6 million, transferred to investment incubators in the form of grants for financing: (1) incubating activity and (2) equity investments in selected companies (start-ups) established as a result of the incubation processes. Approximately 80% of the budget was used for equity investments in start-ups.

Reason for highlighting this measure

The measure supported the establishment and operation of Investment Incubators - organisations of various legal types offering incubation services for the development of innovative business ideas and their further acceleration, with the support of equity investments from the incubators in the newly created companies – the start-ups, which were the result of the incubation processes. The activity of the Incubators led to the establishment and operation of numerous enterprises (final beneficiaries of the measure's support). Finally, development of the enterprises resulted in the creation of new jobs.

It was generally assumed that the creation, capitalisation and development of start-ups would lead to the creation of new jobs. This assumption was built into the project as one of the measure's indicators, which measured the number of new jobs established within the newly created enterprises. The measure therefore had an obvious and direct influence on employment, while at the same time the investments also promoted innovative ventures.

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In 2010 the implementation of the measure was evaluated. It was an initial on-going, thematic evaluation, commissioned to document the first results of the support. The second evaluation (Measure 3.1 ex-post evaluation) has recently been completed. Both evaluations were prepared by independent experts (evaluations were commissioned through public procurement).
The policy context for this measure The instrument was developed along the lines envisaged in the Strategy for Innovation and Effectiveness of the Economy 'Dynamic Poland 2020'. It was based on evidence showing the need to support the earliest phases in the development of innovative business ventures. At the time when the measure was designed, the business support system in Poland did not (or hardly) included institutional infrastructures offering incubation services for innovative businesses, nor did it offer capital for equity investment. In parallel the venture capital (especially early stage) segment was also underdeveloped and - in general - not ready to finance firms in their earliest development phases. Therefore, the strategy included an objective entitled 'adjustment of the regulatory and financial environment to the needs of an innovative and effective economy' and, within this, the Action direction no. 1.4 on 'Facilitating access to capital for enterprises in all phases of their development, with particular emphasis on venture capital and the SME sector'. Within the architecture of the EU Structural Funds in Poland, Measure 3.1 was intended to be complementary to a) Measure 6.2 of the Operational Programme Human Capital (ESF funding), concerning the support and promotion of entrepreneurship and employment, and b) all other measures of the OPIE included in its 3rd Priority 'Capital for Innovation' (measures relating to various financial instruments - debt and equity investments - supporting SMEs in their later development stages). Specifically, measure 3.1 was intended to supplement other financial instruments supported under the 3rd Priority of the OPIE.
Aims and objectives of the measure The Investment Incubators aim to assure the development of an equity investments ecosystem in Poland, which did not exist at the time when the Measure 3.1 was programmed. At that time business incubation services supplemented with equity investment were generally absent or only available in some circumstances. Studies had identified the existence in Poland of an equity gap (in terms of both available capital and an institutional infrastructure), especially in the financing of the early development stage of businesses (Tamowicz, P., 2005 and Tamowicz, P., 2007). Therefore, the necessity of supporting the creation and further development of vehicles that could offer incubation and business acceleration services became obvious. The Investment Incubators were looked upon as such vehicles. Measure 3.1, through the support for investment incubators, was intended to achieve two of the direct goals of the 3rd Priority of OPIE: • Increased access (of micro, small and medium size enterprises) to external sources of funding for innovative undertakings; and • An increased number of enterprises (micro, small and medium size) operating based on innovative models and solutions. The main goal of Measure 3.1 was to 'increase the number of enterprises operating based on innovative solutions'. The measure was tracked using three product indicators (number of supported projects – investment incubators; number of start-ups receiving equity investments; and number of incubated ideas) and four result indicators (value of private resources mobilised for financing innovative ventures; number of new job places in start-ups; number of start-ups supported up-to two years from their establishment; and number of SMEs supported functioning 18 month after receiving

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support).

The target group of Measure 3.1 was defined very broadly. Entities qualifying as beneficiaries of the intervention were various legal entities capable of setting-up Investment Incubators within their organisational structures. These were most often business support institutions such as technological incubators, entities managing science, technology and industrial parks, local/regional development agencies and - rather rarely - professional investors, VC funds or seed capital funds. There were no special restrictions on the kinds of beneficiary that could be supported.

The final recipients of the support (incubation services) were all physical persons – proposers of business ideas. After successful incubation, start-up companies were created, receiving capitalisation based on the Incubators' financial investment. Hence the final beneficiaries of the measure were start-ups.

Characteristics of the measure

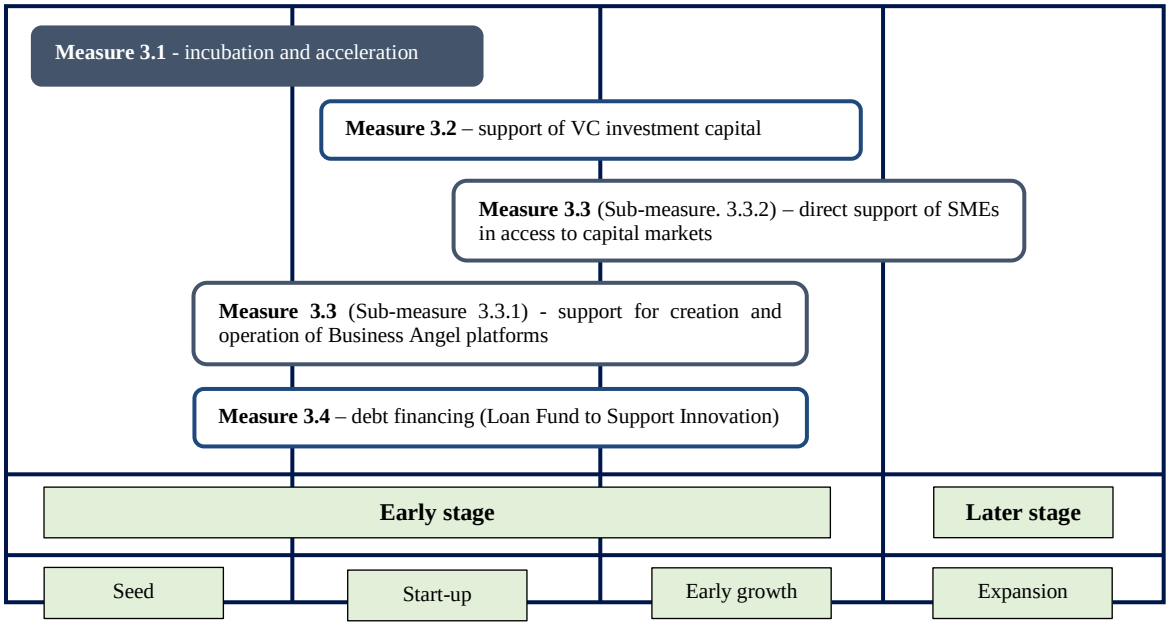
Instrument type

A combination of Finance for innovation and Development of innovative start-ups - establishment of equity investment facilities consisting of incubation services to develop business ideas and leading to the selection of innovative start-ups for equity investment (capital for business acceleration).

Relation of the measure to other measures

Measure 3.1 was an instrument complementary to other measures of the 3rd Priority of the OPIE. The Investment Incubators combined advice and business development with access to finance. The overall support architecture of the 3rd Priority of the OPIE included other measures supporting investment vehicles (or directly enterprises – such as in Measure 3.3), where support was provided for later development phases. In this respect Measure 3.1 complemented other support instruments envisaged within the 3rd Priority of OPIE. The idea was to create a whole path of public support at the various development stages of a business venture.

Figure 1: Measure 3.1 as an element of the 3rd Priority of the OPIE



Source: PAED (2017), *Incubation and what further - Evaluation of initializing innovative activity effects under support of 3rd Priority instruments of OPIE*', p. 14.

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The Measure 3.1 did not overlap any other instruments beyond OPIE – in fact, instruments addressing early stage investment finance were not in place at the time of Measure 3.1 implementation. All public support interventions concerning early stage investment finance were concentrated under the 3rd Priority of OPIE, and among them the Measure 3.1 was complementary to the others (as described above).

As depicted above, Measure 3.1 was programmed as a support element in a broader range of measures, aiming to develop an early finance capital market. The 'Capital for Innovation' Priority axis of the OPIE included four other instruments and it is the whole set that constitutes a coherent intervention mechanism. The thinking is that this kind of support measure cannot be developed as a stand-alone instrument. In the case of incubation and early stage finance, the issue is not only to supply developing enterprises with pre-revenue capital, but also to offer possibilities to acquire second and following rounds of finance. That is why, within the Priority axis, there were other measures supporting other kinds of financial intermediaries (or directly SMEs), that would offer subsequent financing rounds at later stages of the early development phase. This has been secured in the form of the different types of financial instruments supported, - both, of equity and/or debt finance. For example, Measure 3.2 supports the development of VC funds investing in early phases, Sub-measure 3.3.1 is directed at the mobilisation of private capital by supporting the creation and functioning of business angel platforms and Measure 3.4 - the Loan Fund Supporting Innovation - offers debt finance when accompanied by business angel or VC equity investment in the borrower's capital.

Type(s) of innovation supported

The measure did not restrict the investments by the Incubators to any particular type or scale of innovation. However, it stressed that Incubators' investment aims should be innovative to an extent that allowed start-ups to become competitive on the market.

Sectoral focus

Support under the measure (including investment activities) was originally not focused on any specific sector or branch of the economy. However, under the last call for proposals (the fourth - organised in 2013), the selection of beneficiaries included (for the first time) criteria giving preference to proposals of incubators declaring that they would concentrate activity on the development of ideas and the acceleration of start-ups in the following sectors:

- Biotechnology,
- Health and medicine,
- Environmental protection and energy renewable sources,
- Chemicals and
- Other spheres (broad definition, as per the Managing Authority's decision to leave flexibility).

An applicant could receive five points for declaring proposed activity in any of the spheres mentioned. A maximum of 25 points could be granted amounting to 25% of the total score for the - substance section. The other part of the score related to the technical merits of the proposal. Note that any proposals, including multiple proposals, relating to sectors other than the first four would be allocated to the 'other spheres' category. All the proposals allocated to this category could obtain a maximum of five points in total, restricting the scope for these activities in contrast to the others, though not eliminating them entirely. This resulted in directing part of the intervention to the

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specified sectors.

Regional specificities

The activity of the Investment Incubators was not tailored to any specific region. The incubation offer, assistance with start-ups and subsequent equity investments were made available to any business proposers offering interesting business ideas with a sound development potential (most often ideas or projects assessed as innovative and scalable - at least to the country level).

Funding available for applicants

The support for Investment Incubators varied according to the proposals submitted (and selected) under the calls for proposals. The average grant for an Investment Incubator amounted to approximately €2.5 million (the maximum grant amounting to approximately € 5.4 million and the minimum to €568,000).

The Incubators' equity investment in newly created companies amounted to a maximum of PLN 800,000 (approximately €200,000) for each investment target (start-up). As result of the investment the Incubator could become the owner of not more than 50% of the company's shares (registered capital). The rest of the shares had to remain in the hands of the venture proposers (who typically brought in-kind investment in the form of intellectual property. Usually this consisted of the business idea or business model).

Time over which the effects are expected to be felt

The regulations governing Measure 3.1 stipulate that exits from investments are to be no later than 10 years after the moment of each investment. Although the process of disinvestment has already begun (about 206 partial or full exits were executed by September 2017), the Measure's exit regulation will start to apply from November 2019 (for the first investments started in 2009) and last until the end of 2025 (for last investments in 2015). Therefore, the full results of the Measure will only be visible after 2025 (for the whole investment portfolio), although starting from 2019 partial results will gradually be revealed up until 2025.

How the measure is implemented

The instrument design

Measure 3.1 was designed as an instrument leading to the establishment of start-up incubation and investment facilities in the form of Investment Incubators, namely entities operating both as incubation service providers and financing vehicles, with the aim of supporting the development of innovative businesses in the earliest stage of their development.

The measure intended to increase the number of innovative businesses in the Polish economy and counteract the lack of institutional arrangements that could support start-ups in their seed and acceleration phases. Supported start-ups (those incubated and financed), implementing innovations or innovative business models, contribute to accelerating the growth of the economy.

Eligibility criteria and restrictions

At the level of the beneficiaries (Investment Incubators) the implementation rules of Measure 3.1 allowed support only for non-for-profit entities or entities allocating profits for purposes consistent with the tasks supported by the Measure (initialisation of innovative activity). The beneficiaries had to possess the necessary financial, technical, personnel and organisational capacity and experience, although experience in equity investment was not an obligatory pre-condition. Other conditions required the applicants to be capable of providing services relating to various technology transfer issues, services concerning the conduct of research and development (R&D), services concerning the

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development of innovative business solutions, marketing and searching for additional funding (from external sources). The eligible entities also had to possess personnel with qualifications and experience in the analysis and commercialisation of innovative solutions, technology transfer and (preferably) investment in companies. These elements formed the basic range of selection criteria in all calls for proposals organised relating to support from Measure 3.1.

As far as final recipients are concerned – meaning those benefiting from incubation services and equity investments - the Incubators could implement incubation services only for physical persons (proposers of innovative business ideas) and the equity investments could only be in newly created companies (limited liability or joint-stock, according to the Polish Commercial Code), that at the moment of the investment were micro, small or medium-sized enterprises.

The competition for support from Measure 3.1 should be assessed as moderately high. The success rate measured by the number of successful applications among all those submitted under all four calls for proposals amounted to about 34% (78 grant contracts out of 230 applications submitted) and similarly in terms of the value of proposals (36%).

How the measure is accessed and delivered

The access mechanism was based on calls for proposals. Throughout the implementation period of Measure 3.1, four calls of proposals were organised (in 2008, 2009, 2010 and 2013). The selection of applicants (legal entities setting-up Investment Incubators and applying for financing of their activity according to the rules of the Measure) was based on a set of criteria. For the first three calls the same set of criteria was used. In the case of the last call, the criteria were partially changed to introduce sectoral preferences. A panel of experts was in charge of the assessment of the applications.

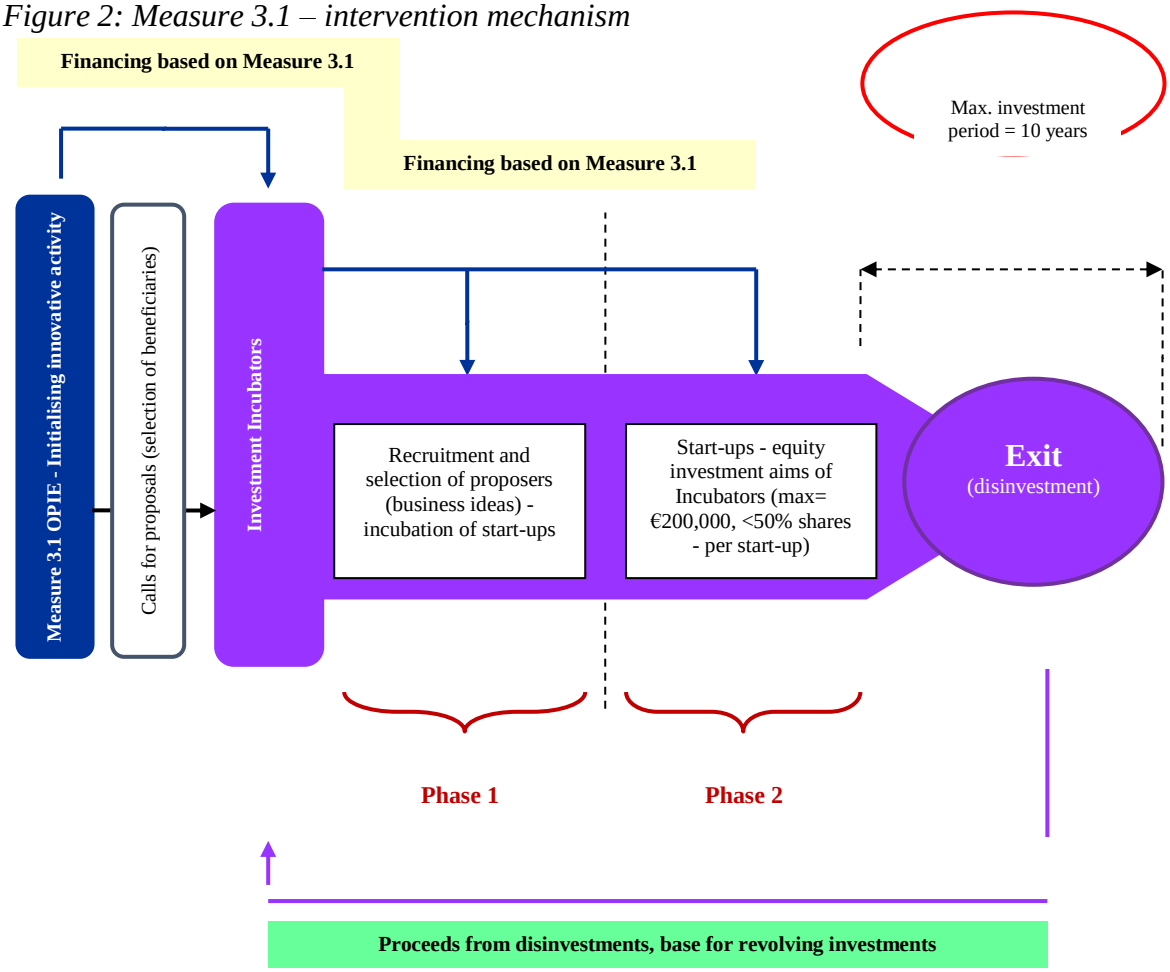
The Investment Incubators are located throughout the whole of Poland. They possess standard office premises that are easily accessible. Almost 60% of the Incubators are located in major cities: Warsaw (14 Incubators), Wrocław (7), Poznań (7), Kraków (5) and Katowice and neighbouring cities (Silesia region, 7). Services, including the arrangement of finance, are delivered through incubator staff. As a rule, the Incubators do not offer physical premises for start-ups, although there are a few exceptions. These usually involve the possibility of renting office space and, very occasionally, production or service premises.

The mechanisms used for the implementation

The intervention mechanism of Measure 3.1 is displayed in the following scheme:

Investment Incubators - Poland

Figure 2: Measure 3.1 – intervention mechanism



Source: PAED (2017), *Incubation and what further - evaluation of initializing innovative activity effects under support of 3rd Priority instruments of OPIE*', p. 19.

Once the Incubators are established, they select start-ups that apply business models that are based on innovative solutions. These start-ups then go through a period of incubation during which the business is developed so that it can operate on a sound basis. At the end of this process the Investment Incubator decides, on the basis of the results of the incubation process, whether to offer an equity investment to the particular business. The incubation process is therefore a key element in triggering the investment.

How the measure is expected to generate its intended effects

Measure 3.1 was designed as a tool to support a group of financial intermediaries (Investment Incubators) that in turn would invest capital received from the Measure in innovative start-ups possessing development potential and, afterwards, undertake exits that would generate proceeds allowing the continuation of the incubation and investment activity. Therefore, the instrument was intended to be of a recurrent type.

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The logic behind this foresees equity investment leading to the creation of sound companies that succeed on the market as a result of their innovative ideas and business models. This should results in an increase of innovative firms within the economy and, as a result of successful exits; the Incubators would increase their capital allowing their recurrent incubation and investment activity to continue.

An important factor of the Measure was the combination of incubation process with equity investments. It was assumed that the investments (with the participation of the business idea proposers) would be done only in start-ups that were also supported by the Incubators in terms of advice and orientation. This was intended to secure the feasibility of the business ventures supported (at least by stimulating the interest of business idea proposers in managing the development of start-ups).

The intended general and employment effects of the measure

The intended general effect of the measure was to create a revolving incubation and investment facility, supporting the development of innovative businesses (start-ups). The intention was that in the long run the Incubators should become financially self-sufficient, generating proceeds from investment exits to an extent that allows a continuing process of start-up incubation and acceleration (based on the financial investments of the Incubators). The 'innovativeness' of the start-ups had a special importance. Only ventures based on innovation could secure the market scaling required to allow successful exits.

Measures which support the creation of the new enterprises generate new jobs by definition, but the creation of new jobs was seen rather as a by-product of innovative businesses acceleration - the main intended result from the Incubators measure. The provision of grants to the Incubators was not subject to a requirement of generating a specific number of new job places, neither at the level of incubators nor at the level of the start-ups. It was assumed nonetheless that new job places would appear in line with the development of the start-ups supported by the measure. Only one indicator (number of new job places created within start-ups benefiting from equity investment) was established to assess the measure's results in respect of jobs creation and it was set at a very moderate level (750 new jobs – comparing to 850 planned equity investments in start-ups; 0.88 job place per start-up – in the authors' opinion, it would have been much more reasonable to set this indicator as 1.5 to 2 job places per company).

Consequently, the measure was not intended to play a role as an instrument supporting the creation of employment nor were employment-related effects specific objectives of the measure. However, employment results would inevitably arise as an indirect effect of start-up development, initially as business proposers became co-founders of the start-ups and then as additional staff were hired as management, various kinds of specialists and supporting personnel. Also, in most of the cases, the jobs created were typically of high quality, due to the innovativeness of the business. These were mostly posts related to development and implementation of the start-up business models (company development managerial functions), product development and prototyping, setting-up co-operation and distribution links and similar, activities characteristic of the early commercialisation phase of newly created firms based on innovative solutions.

Summary of the main evidence available

The main source of evidence is an ex-post evaluation completed in 2017 (commissioned by the Polish Agency for Enterprise Development). This is supplemented by information on monitoring data obtained also from PAED.

The ex-post evaluation mentioned above was based on evidence gathered through the following methods:

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- Desk research;
- Individual in-depth interviews (23 interviews with representatives of supported Investment Incubators, project proposers and experts);
- Telephone in-depth interviews (1 foreign expert interview);
- Computer Assisted Web Interviewing (CAWI) survey (N=69, response rate of approximately 64%) covering all supported projects (69 Investment Incubators);
- Computer-Assisted Telephone Interviewing (CATI) survey (N=1224, response rate about 20%) – start-ups which benefited from investments from Investment Incubators, and
- Benchmarking survey of existing public support systems supporting the development and acceleration of start-ups (Poland vs. selected EU countries).

The evaluation reported that Measure 3.1 had supported the establishment of 69 Investment Incubators (77 grant agreements in total – 8 entities received two grants; one grant agreement was terminated).

The Incubators invested in 1,226 companies (start-ups). The total number of incubation services amounted to 3,276 processes (data as of 30th June 2017). By the end of 2017, 1,071 companies were included in the active investment portfolio (in the case of 155 companies, the Incubators have implemented full exits, including liquidation exits).

The most important conclusions from the ex-post evaluation on Measure 3.1 are the following:

- Measure 3.1. was the first public programme in Poland supporting equity investments in the seed and start-up business development phases. Implementation of the measure should be assessed as a success in its quantitative aspect. Both, the numbers of incubation processes (3,276) and capitalised companies (1,226) were much higher than initially expected (the targets were respectively, 1,800 and 850).
- A positive assessment was also expressed in relation to the support mechanism, covering the incubation phase. Therefore, the measure's intervention logic should also be positively assessed, along with its coherence in reflecting the assumptions and aims of the whole 3rd Priority of the OPIE, and its achievements in supporting innovative start-ups.
- Some deficiencies in the incubation processes were identified, mostly in relation to supporting business initiators in the marketing side of their projects, legal support concerning the protection of intellectual property rights and the delivery of some types of technological advice. These were judged not to be especially serious.
- The positive effects also include ‘personnel’ and ‘reputation’ results. A few hundred people gained investment experience; and some beneficiaries gained recognition as institutions running investment incubators and/or equity investment activity.
- The support appeared to be less effective as regards development of the institutional side of the VC market in Poland. The chances of establishing sustainability in this respect were diminished because some support was given to extremely small incubators (which ultimately implies low levels of investment capital) and also because of the application of low level

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requirements in relation to the investment experience of the teams managing the incubators' activities.

- The implementation mechanism of Measure 3.1 lacked a good monitoring system (the system does not allow timely and precise information to be gathered on exits and their financial efficiency; what is more, it is not supported by formal regulations that are strong enough, obliging the incubators to report on portfolio management effects). As a result, the existing reporting system is of low quality. All this makes it very difficult to monitor the situation and measure the investment effects, including employment effects.

In addition, interesting observations result from the analysis of some foreign experiences concerning seed finance support. The analysis indicates the existence of five tendencies in the organisation of early stage investment support programmes, namely:

- It is becoming more common to delegate implementation processes to specific bodies operating on business terms (the situation where the implementing institution is an administrative or quasi-administrative unit is becoming less popular);
- Support programmes should be extended over time or have their successors, so that support is available on the market for a longer period;
- Programmes should offer support packages addressing not one but several phases of enterprise development, in this way making it easier to obtain subsequent rounds of funding;
- Programmes should be clearly oriented towards specific high-tech industries that are to be developed according to strategic goals, and
- Finally, the support delivery mechanism should be based on criteria referring to the quality and professionalism of management teams, the investment strategy and rules of day-to-day operations, including regulations preventing conflict of interest.

The findings referring to international experience and practices form an important and useful indication for developing policies concerning support for early stage finance and innovation. The evaluation includes several recommendations, which are, however, very specific, directly addressing the mechanism of incubation and the investments of the Incubators. One of them, however, is of a special importance for future monitoring of results of this kind (and similar) support measures. This regards the modernisation of the overall monitoring system, with an emphasis on monitoring exit results and the sustainability of Incubators and their investment aims.

Since the evaluation does not comment on employment effects, information on monitoring data has been sought directly from the Managing Authority (PAED).

The data have been collected from 61 (out of 69) Investment Incubators. The employment results are the following (jobs created within the start-ups financed):

- New jobs created (permanent work contracts): 1,404, of which 552 occupied by women;
- Employment under other forms of contract (temporary – task based): 1,991; and
- The employment indicator for Measure 3.1 was 750 new job places, so 187.2% of the target value was achieved, only taking permanent jobs into account.

An interview with a manager of one of the Investment Incubators, with a portfolio of around 20

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investments, confirmed that most of the jobs created were at a high-skill level, while the evaluation also mentioned that the availability of personnel with the required professional skills was one of the most important criteria for deciding on equity investment.

However, in the short run, there is a very high cost per job created: approximately €138,000 per permanent post and about € 57,000 per job in total. These indicators are likely to gradually decrease as the start-ups develop.

In addition, there were posts created in the Investment Incubators themselves (in order to manage the incubators' activities).

Quality of the evidence base

The ex-post evaluation of Measure 3.1, was prepared by independent evaluators and is based on empirical evidence gathered with the application of the techniques set out in the previous section.

The evaluation considered employment effects only to a very minor extent. The empirical surveys did not cover this issue directly and consequently the subject was omitted from the analysis. This is because the main focus of the evaluation was on the effectiveness of the measure in creating start-ups and a viable market for start-up financing, as a significant contribution to encouraging a greater degree of innovation in the national economy. In these terms the evaluation provides a good assessment of the measure's effectiveness and efficiency. In addition, the evaluation commented on the relevance, coherence, value-added and sustainability of the intervention and was generally of a high standard, certainly in terms of the quality of data collected and the comments and interpretations made. Even so, the failure to consider the employment effects of the measure must be considered as a serious omission, even in terms of the evaluation's own objectives. Apart from other considerations, this type of evidence would be useful for assessing the sustainability of the start-ups created and the measure as a whole.

In addition, there was no counter-factual element in the evaluation. A comparison of the investment achieved could have been made with that of similar start-ups developing without the support of incubation services. For these reasons, the evaluation fell short of a more comprehensive review.

Data on the employment effects of the measure have, nonetheless, been collected for the needs of the present analysis through interviews with staff from the PAED and with the Investment Incubator managing team representative. This information is judged to be reliable.

Actual employment outcomes

Strengths/success factors of the instrument from an innovation and employment perspective

The measure is not designed to create employment as such, but rather to create innovative start-ups. Nonetheless employment outcomes are part of the success of the measure in incubating over a thousand enterprises.

The longer-term employment impacts of the measure strongly depend on how the supported companies develop their business. Many of the newly created companies supported are likely to go bankrupt or will continue, but without substantial development. In both cases employment outcomes will be neutral or even negative. In case of the companies that expand, however, the outcome can be substantial, both within and outside of the enterprise. In addition, since many of the expanding companies cooperate quite closely with research institutions, there may also be positive employment effects within the R&D sector. Furthermore, because the start-ups supported generally have an innovative character, the employees are developing new skills and experience and are becoming more mobile in the labour market.

A more general long-term outcome of the measure has been the contribution to the creation of the

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Polish start-up ecosystem, including the development of financial mechanisms to support innovative start-ups and numerous support schemes based on both financial instruments (pre-seed and seed capital investment) and grants. In both cases such schemes have a very positive employment effect especially over the long run. It is not, however, possible to quantify this effect.

Because the incubators' investments followed a period in which innovative businesses were supported in developing their business models and products or services, it may be assumed that the majority of new jobs appearing are of high quality, demanding a strong commitment and special skills and competences, depending on the sector the firm operates in. This was confirmed in interviews. Many of the new jobs also concerned relatively young people, many of whom were university graduates.

On the other hand, there may be labour market constraints on the future development of the enterprises concerned, since it is already evident that there is a lack of highly skilled potential employees in the Polish labour market – a matter that the incubation process will have to address.

Based on the elements mentioned, it can be more generally concluded that instruments supporting the development of innovative start-ups are likely to result in the creation of new, high quality jobs, in the form of both, permanent and temporary posts.

Overall assessment

Strengths of the instrument from an innovation and employment perspective

As a result of supporting the creation of new enterprises, the measure finally leads to the creation of new jobs. Typically, within newly established enterprises, new job places will be created for the proposer of the business idea (managing or co-managing the start-up) and for operational staff. However, it should be remembered that the employment effect was not the direct objective of the intervention: new jobs are rather a by-product of the intervention, whose main goal is the activation of new innovative enterprises. Notwithstanding this, a special strength of this kind of a measure is that supporting the development of start-ups will inevitably generate employment effects. However, sustainability of the job places in the longer run is not evident and depends on the final development path of start-ups. For sure, some of them will not survive. In this case the job places created will disappear. On the other hand, some of the ventures may develop very successfully resulting in the creation of many new jobs. Ultimately, the balance of these effects becomes an important assessment indicator. At this stage, however, it is still too early for such a final count because the investment portfolio is still too young – the incubators are obliged to disinvest within 10 years after an investment – the majority of exits are therefore due within the 2020-2025 period).

The operation of new business entities will also give rise to demand for products and services, creating further possibilities of employment in the economy. However, the multiplier effects are difficult to measure and, most probably, are not substantial, given the scale of the intervention. Over a medium and long range (3-5 years) due to the high failure rate of newly created firms, the net number of job places will be lowered to some extent. However, this will most probably be compensated by an employment rise in expanding enterprises.

Another issue is the level of innovation of supported the final recipients of the intervention - the start-ups benefiting from incubation and equity investment. In this measure, the requirements concerning level of innovativeness were not clearly stated. This left a large degree of flexibility to the investors - the Incubators, which could decide on what kinds of venture to incubate and invest in. This flexibility may be considered to be a strong point of the intervention but may also be looked upon as a failure to direct public support to the specific targets that are most in need. The discipline of needing to exit successfully from an investment, however, means that funds are directed to ventures that are considered to have a high chance of success.

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All this suggests that the measure (or similar ones) needs to be considered as an element of a broader intervention concept, and specifically as a contribution to the broader range of measures supported by the 3rd Priority of the OPIE. Together these measures, which were generally successful have contributed to the creation of an innovation environment in Poland that is much more positive and perhaps it is this development which will have the most effects on the levels and nature of employment in the future. Certainly, the specific measure under consideration resulted in the establishment on the market of a group of specialists in business incubation and early equity finance which had previously not existed.

Weaknesses of the instrument from an innovation and employment perspective

A measure of this kind is oriented to the economic efficiency and competitiveness of newly created companies. This may not necessarily be in line with strong and positive employment effects. Some employment results may be assumed but rather as a by-product of the main goal, which is the development of a start-up leading to a high level of competitiveness. As regards innovation effects, incubation and equity investment support is much more likely to be an effective tool in realising innovation potential. However, one must consider limitations resulting from a vague definition of innovativeness in the practice of a start-up venture. To reduce the problem, at least, support in the form of equity should be directed to specific high-tech and knowledge intensive economy sectors. In the case of Measure 3.1, the distribution of support turned out not to be in line generally with the intentions of the programme implementing agency (PAED). Almost 60% of final recipients of the support (start-ups) were developing businesses in the field of ITC and internet portals. Companies developing products in such sectors as biotechnology, chemistry, health and medicine, environmental protection and renewable energy sources amounted only to about 17% (both, in terms of investment numbers and value). The change of selection criteria in the last call for proposals for incubators was introduced too late and was probably not selective enough (and could not change the investment tendency built up from the beginning of the implementation period of Measure 3.1).

A specific weakness of this kind of intervention is that incubation processes and early stage finance are complex issues that must be planned with a great consideration of both the local circumstances and the broader economic context. The complexity of the intervention stems from the fact that the delivery mechanism takes the form of a transfer of support to intermediary organisations (in the case of Measure 3.1 - the Investment Incubators) and only then to the final recipients. Ultimately, a lot depends on the quality of the intermediaries and their operations and on the market success of the start-ups financed. Of course, the whole process and its outcomes are very risk sensitive.

An important pre-condition factor for the transferability of such a measure is the existence of investment intermediaries with the potential and skills to support the incubation of ideas at the earliest phase – proof of principle. On the level of the support distribution mechanism, a programme managing entity must be able to put in place an effective selection system, allowing the selection of intermediaries that are capable of delivering high quality 'proof of principle' services and – later on – mobilising private sources of capital to secure the second and further rounds of finance that promising start-ups need. And finally, in the short run, the intervention is rather costly and does not guarantee high economic efficiency – a lot depends on the market success of the start-ups supported, which will always be (by its nature) unknown at the investment stage.

Finally, in case of Measure 3.1, the initial cost of the measure per job is rather high, though it is premature to make conclusions on the efficiency of the support in this respect, since most investments still have some time to run.

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Investment Incubators - Poland

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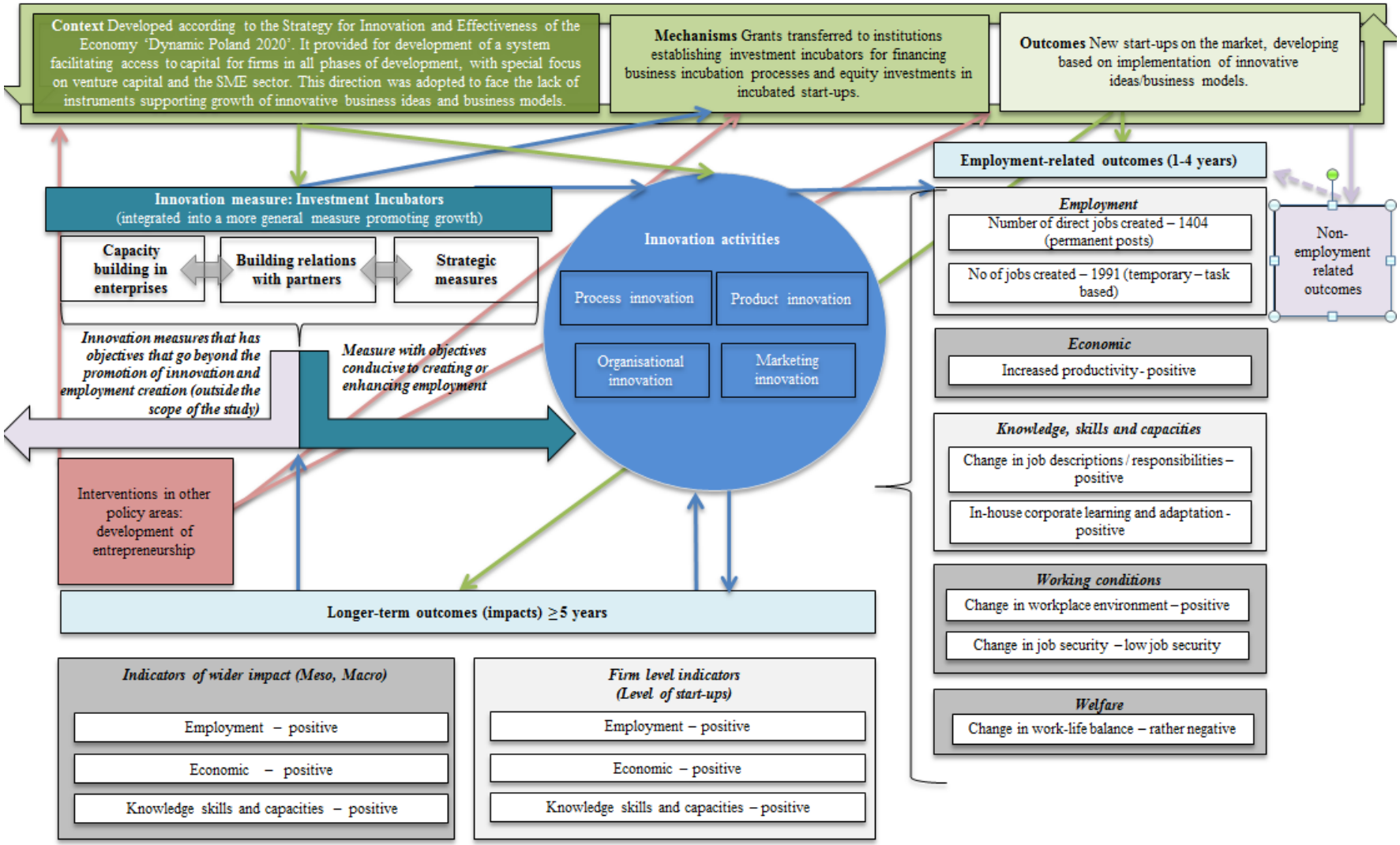
Graphic representation of the intervention logic of the measure



Growth Houses - Denmark

Growth Houses - Denmark	
Measure identification	**DK Growth Houses**
Name of the instrument	Growth Houses - Væksthuse
Web link	https://erhvervsstyrelsen.dk/vaeksthusene (in Danish)
Location	Denmark – all regions
Starting year and duration	Five regional Growth Houses were established in 2007 and have operated since that time.
Name of the organisation providing measure	The Danish Business Authority (Erhvervsstyrelsen), a government agency, has overall responsibility for the Growth Houses, but each of the five individual Growth Houses is actively managed by its respective regional Growth Forum.
Type of organisation providing measure	Each of Denmark's five regions has a Growth Forum, which has been given responsibility for the development and management of the regional economic strategy, subject to the approval of the Regional Council and the Danish Business Authority. This includes the responsibility for the Growth Houses, which provide support to enterprises with the potential to grow. The Growth Fora are made up of representatives of the Regional Council and local authorities, the business community and social partners, knowledge and training institutions and financial organisations.
Other contributions	The European Structural and Investment Funds contribute to the funding of the Growth Houses, depending on the priorities of the regional Growth Fora. Enterprise clients of the Growth Houses are also expected to contribute to the cost of advice services, after the initial free consultation to make a growth assessment.
Total budget for the measure	The Growth Houses are financed by the local authorities, which in turn receive a grant from the government specifically for the Growth Houses. In total, in 2017, this grant was DKK 105 million (€13.7 million).

Reason for highlighting this measure

Direct business support services, providing information, advice, business coaching, training and networking support, are a common feature of public and semi-public business and innovation support across Europe. In Denmark, the emphasis with this kind of support is on assisting enterprises with the ambition and potential to grow and the Growth Houses have a central role in delivering it. They therefore represent a form of direct business support that is particularly orientated to supporting innovation. However, it should be noted that innovation support in this case is integrated into a broader approach to promoting business growth.

The policy context for this measure

Denmark has developed a series of strategies for growth, research and innovation, participation in the knowledge economy and globalisation in the past decade. The 'Growth and development in the whole of Denmark' strategy ('Vækst og udvikling i hele Danmark'), published in 2015, emphasised promoting regional growth and development through 'regional smart specialisation'. The Danish Growth Council advises the Danish government on developments in its growth strategy.

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The establishment of the Growth Houses in 2007 as a regional system of business support coincided, and was partially inspired by, a re-organisation of local government in Denmark and the creation of 5 new regions. Each region established a Growth Forum, made up of regional stakeholders to develop and implement the respective regional economic development strategy, subject to the approval of the regional council and the local authorities. Each region has a Growth House, which is answerable to the Growth Forum and public authorities and is expected to respond to local and regional needs as well as national targets. This system of enterprise support is integrated into the approach of the Danish Operational Programmes under the European Structural and Investment Funds.

Aims and objectives of the measure

The Growth Houses were established to provide a reliable 'sparring partner' to collaborate with enterprises and employers with an evident growth potential and ambition. The aim is to provide an appropriate range of business support services to address identified weaknesses in their capabilities and to nurture future growth.

These services have to be seen in a broader context. National policy aims to promote an effective division of labour in, and co-operation with, the whole of the business and innovation promotion system. Within this system, the Growth Houses are perceived to have an important role as a focal point and catalyst for all the other elements of private and public support for businesses at a regional level.

Growth Houses therefore work with local business support offices, networks of knowledge institutions and private business consultants to ensure that there is a comprehensive business support system provided on the ground across the regions of Denmark, in order to build the capabilities of their enterprise clients.

They begin with a diagnosis of the growth potential of their clients and also identify areas of weakness. They then propose a growth plan, which can involve working with private consultants or a wide range of other agencies, including knowledge and research institutions, the Patent and Trade Mark Office, the Growth Fund, Denmark's Export Council or the Danish Design Centre.

Growth Houses also provide a range of other services: awareness raising and business information, specialised sectoral support or help with addressing particular business issues, including a special 'early warning' programme to assist enterprises that are beginning to run into business problems.

The aims and objectives of the Growth Houses are set out in a five-year framework document entitled 'Agreement on the Framework for Growth Houses 2016-2020' (Aftale om rammerne for vaeksthusene). Specific targets are agreed on an annual basis. The most recent targets are set out in a National Agreement for Measuring Growth Houses in 2017 (National aftale for Mål for Væksthusene i 2017). Further detail on these targets and the results for 2016 are given in the Summary of the main evidence available below.

Characteristics of the measure

Instrument type

The Growth Houses are a classic example of a business advice and direct support measure, where a business support organisation adopts a capacity-building approach to enterprise support. Both in-house and in conjunction with other support service providers, they offer a range of services aiming to help individual enterprises grow, depending on the need of individual businesses. This includes services that help enterprises to innovate.

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Relation of the measure to other measures

The Growth Houses offer a package of support services both in-house and through associates, which are tailored according to the most pressing needs of the client enterprise. A capacity-building approach is therefore adopted, in which the most appropriate service is selected. The Growth Houses generally have the role of co-ordinating the provision of business support for growing enterprises, both start-ups and established enterprises, and ensuring that an effective range of services is offered either by the Growth Houses themselves or by other organisations in the region.

Type(s) of innovation supported

The full range of innovation developments can be assisted, depending on the needs of the enterprise, but product and process innovation are the most common forms supported.

Sectoral focus

There is no specific sectoral focus, but given that the objective is to help enterprises grow, there is self-selection among clients and enterprises that are in more dynamic sectors or that are the focus of regionally-based specialisation tend to make greater use of the services. Specific Growth Houses also tailor their support for sectors that are especially important for their regions.

Regional specificities

Each Growth House answers to a regional Growth Forum, which requires it to respond to regional needs as well as the overall national targets. The services of each Growth House are therefore tailored to meet regional circumstances, especially in supporting regionally important sectors.

Funding available for applicants

The initial consultation is provided for free. Costs of subsequent assistance vary depending on the nature of the service and where it is delivered. Some services are provided for free. Others, especially where support is provided by private consultants, can be subsidised up to 50%.

Time period over which the effects are expected to be felt

Two years are given as the period over which an impact is expected on the enterprise's growth in terms of employment, turnover and exports. The effects are likely to continue after this period, but they are not systematically followed up in evaluations or studies.

How the measure is implemented

The instrument design, and intervention logic

The measure is intended to have a direct effect on those skills and capabilities of a client's management team that are necessary for the client enterprise to grow, through the provision of advice and skills development in sessions with the firm's management staff. In particular, the Growth Houses and their associated advisers develop a growth plan and help to implement it, either by addressing knowledge or skills gaps or by developing appropriate networking with other enterprises and helping to create and strengthen supply chains or by building links with research institutes, or businesses or agencies that can help with technical development, marketing, IP management, further training, finance etc.

The intervention logic starts with a clear objective of promoting growth in enterprises and the targeting of enterprises with good growth potential (see below). It then envisages the development of a clear growth plan and support in the implementation of this plan, particularly by helping to strengthen aspects of the firm's management where there are weaknesses. Innovation is seen as an

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important way to achieve growth, but that has to be supported by the strengthening of capabilities.

Eligibility criteria and restrictions

The main target group is private-sector SMEs with the potential to grow by 20% in 3 years, but other enterprises are also assisted. Enterprises are assessed for growth potential in an initial advice session, before they progress to services designed to help them grow. Usually, only a small proportion of enterprises are not given the opportunity of taking up specific development services or else withdraw themselves.

How the measure is accessed and delivered

Each of the Growth Houses has a physical location in its region, usually with one or more sub-offices. They are easily accessible by phone, electronic communication or personal visit and the services are widely advertised in the business press. Services are delivered either at the Growth House premises, at those of the client or virtually. Clients meet with qualified advisers, initially from the Growth House for the diagnosis. Subsequently, they can take advantage of in-house services or be referred to services provided by private-sector consultants.

The mechanisms used for the implementation

Each of the five Growth Houses has its own range of services provided in support of growing enterprises. The Growth House South Denmark, for instance, with offices in Odense and Esbjerg, offers support for general business growth to ambitious enterprises, for example with a course in 'Leadership, organisation and growth', a tailored development programme in 'Strategic competence building', coaching on financial matters and help with developing an export strategy. However, this Growth House also has more specific tools for assisting with innovation, often in relation to advanced technologies, where it assists enterprises with accessing a range of programmes: Automation Boost, Digitalisation Boost, Digitalisation Lift, Business Partnership for Advanced Production and Scale-Up Denmark Robotics. The details of these programmes are to be found through the Growth House South Denmark website, but it is clear that the programmes involve a range of advanced technologies.

The other four Growth Houses offer similar services, although each Growth House tailors its provision according to local needs, including the sectoral composition of each region and the funds made available locally (including EU funding). Many of the services involve advice from consultants about aspects of business development. Mid Jutland, for instance, offers 'Product development' and 'Process optimisation' services on this basis. Some of the services offered, such as 'Digitalisation Boost', are local variants of a national scheme and all of the Growth Houses offer assistance with gaining access to finance and developing better IPR management and protection. Most offer assistance with developing new ideas. For instance, the Capital Growth House has an 'Innovation and new thinking' service, with an 'Enhancing Innovation Management Competences' component. North Jutland offers an 'Innovative growth' advisory scheme and a graduate placement scheme called 'Growth via knowledge' and the Capital Growth House offers a set of courses entitled 'Network-driven innovation leadership' that encourage enterprises to work with others to increase their knowledge and innovation potential. Other services, however, are only offered by one of the Growth Houses, usually in response to an issue of regional significance. The Sjælland Growth House, for example, offers support for the growth of experience economy and tourism enterprises, while the Capital Growth House offers a 'Green growth and Green business models' service.

How the measure is expected to generate its intended effects.

By selecting enterprises that have the potential to grow and then focusing on the factors that will allow the firm to achieve this growth, but also by encouraging links with other enterprises, clusters and relevant research institutes, the measure delivers growth (including employment growth) not

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only for the client firm, but also for the regional economy.

The intended general and employment effects of the measure

The measure aims to promote growth, especially among SMEs. This includes growth in turnover, employment and exports. One of the central aims of the measure is therefore the creation of employment. As will be seen, this employment growth is assessed two years after the measure begins to be applied. Since a growth in turnover over the same period is also an aim, a growth in productivity and hence competitiveness is also implicit in the objectives and is generally realised whenever the rate of turnover growth exceeds the rate of employment growth.

However, the intention of the measure is to achieve this growth through a broadly-based improvement in clients' capacity across a range of managerial functions. It is thus a prime example of the application of the capacity-building approach to enterprise support. Depending on the needs of each client firm, this can involve building skills and competences within enterprises or helping them to employ talent from outside the firm. In addition, given Denmark's commitment to flexicurity, there is also an implicit aim to help develop the skills and competences of enterprise employees and new staff.

Growth Houses can also help their clients contribute to related economic development initiatives, such as cluster development or assisting with participation in EU programmes.

The intervention logic of the measure is clearly located in the Danish policy to ensure competitiveness in a global economy through innovation and skills development, in order to promote economic growth, prosperity and welfare. The provision of information, advice and related support in a coherent package is part of a response to market failures resulting primarily from information asymmetries, but also from underexploited positive externalities. Distortion of the market is reduced by the (subsidised) involvement of private sector advisers, once the initial assessment has been undertaken. Near-market mechanisms in the form of business services are therefore the primary process by which the measure is delivered, although there is recourse to public sector provision in addressing other market failures relating to research and development and, to a certain extent, under-exploited positive externalities from the operation of clusters etc.

The intended outcomes are defined in relation to growth indicators, relating to growth in turnover, employment and exports. These are defined in the National Agreement on the Growth Houses. Specifically in relation to employment, the target requires participating enterprises to increase employment by at least 10 percentage points more than enterprises in a control group over the two-year period 2014-2016. Further details are provided in the section below.

From the point of view of the overall intervention logic, however, the intermediate outcomes in the form of the enhanced skills of those who receive the advice and other capacity-building services of the Growth Houses tend to be under-emphasised. There appear to be few intermediate objectives and the appropriateness of the services used is largely left to the judgement of the professionals involved, although they are subject to a feedback review after the support programme has been completed.

The measure can be said, therefore, to have some explicit employment objectives, but perhaps to underestimate the significance of the processes leading to these objectives, both from the point of view of enhancing the efficiency of the whole measure and as intermediate outcomes, whose benefits over the long term may well go beyond the immediate outcomes. The full employment and employment-related effects are therefore likely to go beyond those that are the specific objectives of the measure.

Summary of the main evidence available

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The principal evidence on the performance of the Growth Houses is the annual report on their performance and periodic evaluations, the last of which was conducted in 2013.

The latest annual report is entitled 'National Agreement on the Growth Houses in 2016: Statement of the Results' (National aftale for Væksthusene i 2016 Opgørelse af resultatmål). The 2013 evaluation is simply entitled 'Evaluation of Growth Houses' (Evaluering af Væksthusene).

There is also analysis of the effects and client perceptions of specific services provided by the separate Growth Houses. Finally, there is on-going monitoring which produces up-to-date data on performance.

Overall assessment

As part of the government's review of the national business promotion and innovation system, an analysis of the performance of the Growth Houses is set out in the report on the National Agreement on the Growth Houses in 2016. This analysis aimed to establish the results achieved in three areas:

- Volume – a factual description of the extent of services provided and the number of clients involved
- Quality – an assessment from the clients' perspective of the quality of the services provided
- Effect – the effects that can be attributed to the Growth Houses of their clients' growth in terms of employment, turnover and exports.

The performance of the Growth Houses is then assessed in relation to nine specific indicators. Data are provided on both the overall performance of the Growth Houses as a system and, where appropriate, on the relative performance of each of the five separate Growth Houses located across the Danish regions.

Establishing this assessment relies upon a series of distinct methodologies:

- An examination of the data in the Growth Houses' Client-Relations-Management systems
- Interviews with clients and a survey conducted by external consultants
- An statistical exercise conducted by Statistics Denmark in order to determine the impact of the Growth Houses on enterprise growth in terms of employment, turnover and exports.

Statistics Denmark carries out analyses of enterprises that are registered in Denmark. Each enterprise has a unique identifying number that allows the statistical office to collate data from many different sources including tax returns. With suitable safeguards to ensure anonymity, this enables it to assemble data on enterprise characteristics and performance and to categorise similar enterprises in terms of a range of characteristics - regional location, age, sector, size (persons employed or turnover) and previous growth. With respect to any particular measure that Statistics Denmark examines, it is therefore possible to establish a matched control group of enterprises not supported. In the particular case of the Growth Houses, it is of course a matter of comparing those enterprises that received assistance from the Growth Houses with a set of enterprises that did not.

It should be noted that while the 2016 report made use of data on current clients for the first two elements in the investigations, for the statistical exercise on the effect of the Growth Houses on enterprise growth the firms examined for the 2016 report are those that had sought assistance from the Growth Houses in 2014. This is because it is thought that the actual effects in the form of growth in employment, turnover and exports only become apparent after some delay. The two -year

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gap therefore allows consideration of the effects in the medium term.

The results of the assessment set out in the report were generally positive.

The Growth Houses undertook a growth assessment with 2,146 enterprises in 2016. 88.2% of these were referred for further advice sessions with private sector business counsellors or public sector specialists. There were also other interactions (attendance at events, etc.). A further 3,181 enterprises had been involved in the activities of the Growth Houses.

These figures represented a small rise over the corresponding figures in the previous year (0.5% increase in growth plans; 1.5% increase in referrals for further assistance; 0.3% increase in more general interactions).

Enterprises were asked to assess the assistance after receiving it. 93% said that there had been a high of middle range effect on their firm's development.

In general, the assessment showed that enterprises using the Growth House services continued to outperform the similar enterprises that did not, in relation to growth in employment, turnover and exports, though the difference between the two groups had narrowed in comparison with the previous year for the first two variables. Moreover, the effects were more diffuse. 60% of enterprises using the Growth Houses experienced growth in employment – 10% more than in the control group, while in relation to turn over the difference was 5%.

In 2015 a new indicator was introduced concerning the overall economic effect of the measure. The 2016 report shows that for every krone invested in the Growth Houses, 5.64 kroner (€0.73) were generated in the form of the value creation of the enterprises using their services. This represented a small increase (0.56 kroner - €0.07) over the amount in the previous year when it was first estimated.

The more detailed results are considered in relation to specific targets, set out in the National Agreement on the Growth Houses (targets one to five):

1. An investment of DKK 99,408,000 (€12,923,040) in 2014 led to an estimated net value creation (growth in turnover) in 2016 of DKK 560,702,000 (€7,289,126), giving a factor of 5.64 (against a target of 3). This estimate allows for a selection bias (–50%), a displacement effect (-36%) and a multiplier of +50.
2. On the basis of entries in the client register system, all five Growth Houses met their targets in relation to delivering 2,146 growth assessments (target 2,000) and 3,181 involved in conferences, workshops etc. (target 2,000).
3. On the basis of enterprises responding to the user evaluation and recorded in the client management system in 2016, 88.2% of the 2,146 growth assessments were referred on and of these, 73% were referred to private advisers (as against targets of 80% and 70% respectively).
4. 93% of enterprises responding indicated that the interaction with the Growth House had a high or middle level effect on the firm's development (target 70%).
5. All Growth Houses achieved more than the target 60% 'Net Promotor Score' (the difference between the percentage of respondents saying that they would be prepared to recommend the Growth House and those who would not) and the average for all Growth Houses was 73.1 %.

Targets six to nine need a little more explanation. The first of these, target six, was that enterprises that have had a growth assessment or growth plan in 2016 and that participate in the user evaluation

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should increase employment by at least 10 percentage points more than enterprises in the control group of similar enterprises over the two-year period 2014-2016 .

The assessment is based on a comparison of the growth in employment of enterprises taking part in the user evaluation in 2014 over the two year period from mid-2014 to mid-2016 and similar enterprises in the control group with a weighting corresponding to the clients of the Growth Houses in terms of region, size and sector. The only enterprises included were those that had been in business over the whole period, had less than 250 persons employed and had a minimum of a 0.5 full-time equivalent person or a turnover corresponding to this amount.

Table 1: Employment growth in Growth House client enterprises compared to a control group mid-2014 to mid-2016

	Half year 2014-2015			Half year 2014-2016		
	Clients	**Control group**	**Difference in % points**	**Clients**	**Control group**	**Difference in % points**
Capital region	5.71	2.83	2.89	12.07	8.39	3.68
Mid Jutland	4.81	2.41	2.4	12.43	4.31	8.12
North Jutland	0.93	3.22	-2.29	11.86	5.88	5.98
Sjælland	1.97	-0.34	2.31	8.44	2.07	6.37
South Denmark	3.84	2.58	1.26	9.64	4.18	5.46
Whole country	4.08	3.01	1.06	11.35	8.23	3.12

Over the two year period, there was a clear difference in the growth of employment across the whole country of Growth House clients as compared to the control group, though the extent of the difference varied markedly across the regions and the difference in the first year was a lot less marked. In North Jutland, in the first year the performance of the control group was actually greater than that of the Growth House clients, but this was reversed in the second year and elsewhere the Growth House clients clearly outperformed those that did not receive assistance. However, the performance of each Growth House and the Growth Houses together fell short of the target. No further explanation was given of the variation in the growth rates across the regions and between the two groups (clients and control group), except that a distinction is made between the growth in employment of Growth House client start-ups (18.6% over the two-year period) and that of client established enterprises (11.0%).

The number of start-up clients assisted over the two-year period (255) was significantly smaller than the number of established enterprises assisted (1,153). The growth of employment in the start-ups was from 1,277 in 2014 to 1,508 in mid-2016, while that of established enterprise clients was from 18,413 in 2014 to 20,437 in mid-2016. Overall therefore, the increase in employment in enterprises supported by the Growth Houses over the two-year period was 2,255.

Target 7 related to turnover. It was that enterprises that have had a growth assessment or growth plan in 2016 and that participate in the user evaluation should increase turnover by at least 15 percentage points more than enterprises in the control group of similar enterprises over the two-year period 2014-2016.

Using the same methods, a similar but more marked difference is shown in relation to the turnover of the client enterprises of the Growth Houses as compared with the control group. The former's turnover grew by 7.77% in the first year and 19.27% over the two years, while the turnover of the

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control group grew by 4.90% in the first year and 9.35% over the two years. The Growth House clients' turnover therefore grew by 2.87 percentage points more in the first year and 9.93 percentage points more over the two years, a positive result, although lower than the target. It should be noted that turnover growth of the Growth House clients was considerably greater in both periods than their employment growth (probably suggesting an increase in productivity), while turnover growth was also higher for the control group in both periods than employment growth, but not to the same extent.

Again turnover growth of start-ups among Growth House clients was much greater (65.69%) across the whole country than among established enterprises (16.49%).

Target 8 related to exports. It stated that enterprises that have had a growth assessment or growth plan in 2016 and that participate in the user evaluation should increase exports by at least 10 percentage points more than enterprises in the control group of similar enterprises over the two-year period 2014-2016.

Again using the same methods, a greater growth in exports is shown by the client enterprises of the Growth Houses as compared to the control group. The former's exports grew by 10.08 % in the first year and 28.87% over the two years, while the exports of the control group grew by 7.56% in the first year and 11.33% over the two years. The Growth House clients' exports therefore grew by 2.52 percentage points more in the first year and 17.54 percentage points more over the two years, comfortably exceeding the target. The export growth of both groups exceeded their growth in either employment or turnover in both periods, though the export growth of the Growth House clients is quite remarkable over the two years indicating a considerable improvement in international competitiveness.

Derived from a recommendation of the 2013 external evaluation, an overall growth target was established for the four-year period 2013 to 2016. This states that the annual growth in the turnover of enterprises with at least 10 persons employed at the beginning of the period should reach at least 20% in two successive years. Furthermore, target 9 states that 'the share of Growth House clients that achieve the growth target shall rise by 15 percent'.

The target has been modified for Growth House clients to cover the five-year period, 2012–2016.

The result for the whole country was that there was the rise in the number of enterprises reaching the 13.2% target growth rate was below the target. The target was met in North and Mid Jutland and in South Denmark, but fell short in the Capital region and in Sjælland.

The 2016 report concluded that the Growth Houses operate as a focal point in the business support system in Denmark and successfully bring together specialised services for growing enterprises. This is supported by clear evidence that Growth House clients perform better than the control group, even if not all the targets were met.

By way of summary of the most significant results for the study, the 2016 overall report establishes that a direct and positive impact on employment is created over a two year period in the enterprises that are supported by the Growth Houses. Enterprises which had undertaken a growth assessment in 2014 had created 2,255 jobs by mid-2016, an increase of 11.35%. This performance is clearly better that that of the control group of similar enterprises that had not made use of the services of the Growth House (8.23%). The growth in turnover and exports was even more marked and the difference between participants and the control group greater. This would suggest that participation contributed to an increase in productivity, although this is not certain since conceivably the increased output might have been achieved by increases in other factor inputs and the report does not comment on this consideration.

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Assessment of specific support services

In addition to the overall assessment of the performance of the Growth Houses against their targets, the individual Growth Houses undertake assessments of the effectiveness of some of the specific services that they provide. The South Denmark Growth House, for instance, publishes reports on its introductory 'sparring' service and particular subsequent services that the clients make use of, such as the 'Power Push' programme, explained below.

Those making use of the sparring programme in 2016 reported a growth of 493 jobs which, representing a rate of 10%, was more than twice the growth rate of similar firms that did not use the service. Similarly, clients increased turnover by DKK 1,430 million (€185.9 million), an increase of 17% compared with 7% for those not using the service. Nine out of 10 clients in a 2017 survey expressed themselves inspired and motivated by the growth consultants at least to some degree, while 48% said that they had been inspired and motivated to a high degree.

The Power Push programme operated from 2012 to 2015 and offered courses, other forms of training, mentoring and networking. Participating enterprises were surveyed after the end of the programme to estimate the effects over the three year period. The enterprises' expectations were that their turnover would be increased by DKK 571 million (€74.23 million), 256 new jobs would be created and exports would increase by DKK 93 million (€12.1 million) over the three years. These figures have been adjusted to exclude outliers and selection bias. The participants estimated that at least 57% of the anticipated growth could be attributed to their participation in Power Push. 93% of participants were highly satisfied with their participation in the programme and it was estimated that the competence level of the participants had increased by 24%.

Assessments of specific services offered add extra detail on the effectiveness of particular aspects of the overall service. The assessments are generally positive, but mainly rely on surveys of clients and are not systematic. Only some of the specific services are assessed and this appears to be in relation to a desire to know about their effectiveness and, since there is continuous evolution in service provision, a number are no longer provided.

Quality of the evidence base

The report establishes the main results by a robust comparison of the employment performance of enterprises receiving support with that of a matched control group, with similar characteristics that had not made use of the services of the Growth Houses.

Although full details of the methodology employed are not revealed in the report, there are indications that Statistics Denmark have approached the exercise with the care that would be expected of such an institution. Notes provided on the calculation of the 'economic value creation effect' in relation to the first target, referred to above, show that an adjustment had been made for selection bias (–50%), a displacement effect (-36%) and a multiplier of +50. These address three well-known problems in relation to economic interventions of this kind.

Selection bias arises because enterprises that are intrinsically more likely to grow are also more likely to seek support and the matching of control group members cannot correct for this. An additional correction has to be introduced and in this case it is relatively large. Similarly, it is generally recognised that supporting firms through public interventions may have the effect of displacing the outputs of other firms, which have been made to be relatively less competitive through the intervention. Any observed increase in turnover, employment etc. of the enterprises making use of the intervention has to take account of decreases in the corresponding outputs of other firms. In this case a displacement effect leading to a correction of -36% has been calculated. On the other hand, the direct impact of an intervention on the enterprises assisted does not take account of the knock-on effects – known as 'the multiplier'. An enterprise employing more people will not only increase its own activity, but that of other businesses through the expenditure of the

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additional wages created etc. A positive adjustment is therefore introduced in the estimation of the economic value creation of the Growth Houses' interventions.

The adjustments referred to are clearly used in the case of the estimation of economic value creation in relation to target 1, as has been stated, and it is assumed that the same adjustments are made in relation to other relevant targets, but it is not clear that this is definitely the case.

Assessments of client satisfaction with the services of the Growth Houses were made through interviews with clients and a survey. Clients were asked to rate their satisfaction over a range from 'not at all' to 'a very high degree'. This provides an important indication of the extent to which clients' expectations and needs are being met.

More generally, however, there does appear to be a problem, even in assessing the overall effectiveness of the measure, in that the report focuses exclusively on assessing the performance of the Growth Houses in relation to their main targets. This can arise as the result of the development of a target culture. Targets obviously help those implementing the measure to focus on the main achievements needed, but they also can distract attention from wider considerations that can be relevant. In this case the intermediate outcomes in the form of developments that strengthen the growth capacity of the enterprises assisted are not assessed. Over the longer term, these outcomes are important for the continuing success of the enterprises supported and for the general growth capacity of the economy as a whole, including its openness to innovative approaches.

Some insight into these intermediate outcomes is provided by the analysis of specific instruments by particular Growth Houses. The examples cited do comment on the effectiveness of particular instruments and in one case estimate the extent to which enterprise skills and capacities have been improved. However, they only present a partial picture and, given that the instruments are being continuously revised and updated, tend to comment on instruments that are no longer in use in the original form. They therefore represent only a partial contribution to an understanding of the instruments that deliver the headline outcomes.

Consequently, it can be said that there is good evidence, which is updated each year, on the effectiveness of the measure, namely on the principal effects of the Growth Houses in the form of positive impacts on growth of turnover, employment and exports. There is also an overall measure of the efficiency of the measure in the form of a positive return on public investment that is well above the target level, plus indications that the measure delivers services that are perceived to be relevant by the Growth Houses' users. These all suggest that the measure is sustainable over the medium term. However, although the measure appears to be well integrated into other business and innovation support, there is no direct evidence of policy coherence and the main report's concentration on the relationship between a narrow range of defined objectives and the corresponding outcomes means that the assessment methodology neglects other positive (intermediate) aspects of the measure that are of considerable significance. Overall, this case represents a good example of the 'black box' approach to evaluation, concentrating on the relationship between objectives and outcomes, that is criticised by the realist theory-based school. There is a weakness, in spite of the good data and strong analysis of impacts, in that the policy context is not explored and there is little consideration of the mechanisms that deliver the outcomes. To this extent, it cannot be said that there is a systematic analysis of the measure.

One final comment on transferability is that, although there are a number of lessons from the way that the Growth Houses operate for any country that has a well-developed system of direct business support services, the focus on businesses with a strong growth potential is likely to raise problems for those who believe that such services should be open to all enterprises.

Actual employment outcomes

The full range of direct employment outcomes includes absolute increases in employment from

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both start-ups and existing enterprises and growth in productivity – all over a two year period after the measure starting to be applied to particular enterprises. Growth over a longer period may also be anticipated, although this is not assessed in existing evaluations. This can arise both from the continuing effects of enhanced enterprise capacities resulting from assistance under the measure and from additional employment associated with the positive effects of any innovations introduced as part of the growth process.

Some displacement effects, including reductions of employment in other firms, are anticipated, arising from the increased competitiveness of the firms assisted. The estimates of employment effects include an allowance for such displacement, though obtaining an accurate estimate of the impacts of these effects is difficult.

The effect on working conditions are less visibly modelled in the measure design, though the measure intrinsically depends on the enhancement of the skills, competences and capacities of the enterprises involved and especially on management skills and, over the longer term, these may be the most significant of the employment effects. This is because these effects may be expected to be long-lasting, both on the enterprise concerned and over a more extended period with staff mobility having an effect, on the economy as a whole.

It is not possible to determine other employment-related effects, such as distribution between male and female persons employed, their age distribution or the involvement of excluded individuals and communities, nor is it possible to determine impacts of other aspects of working conditions, such as work intensity, job satisfaction, the health of employees and their general well-being etc.

In as far as the delivery mechanisms of the measure include encouraging and developing links with other players relevant to the growth prospects of the enterprise, such as other enterprises in the sector or within clusters, research institutes and specialists in areas such as marketing, finance and IPR management, it is likely that there are knock-on employment effects of the firm's development and growth. These are captured in an assessment of the multiplier effects of the intervention.

Overall assessment

Growth Houses are a good example of a common form of business support that often includes support for innovation. However, the strength of the Growth House measure is its focus on assisting enterprises that are capable of growing and its integration of steps to encourage innovation into a more systematic approach to building and sustaining growth. In other words the Growth Houses illustrate a coherent approach to making a success of innovation, by incorporating the process of building the strength of a range of management functions into the approach to exploiting innovations and thus preparing the conditions for a successful outcome. A major strength of the measure is therefore its holistic conception of the growth process. This means that all aspects of growth are taken into account and the promotion of technical innovation is integrated with a corresponding development of the human resources that are necessary to deliver the fruits of the innovation successfully.

In effect, because the measure embeds innovation processes into the other aspects of business development that are necessary for successful growth, it equally encourages a balanced approach to innovation, is orientated towards resolving implementation problems as they arise and generally provides a better chance of creating positive impacts from innovative changes within the enterprise.

As representatives of providers of business support services, Growth Houses illustrate a key element in the range of innovation support measures and make a significant contribution to employment enhancement. The evidence suggests that they are successful in achieving their objectives and provide a good return on the investment of public funds, but their status arises not only because of their track record in creating employment, but also because by strengthening the competiveness of enterprises, the measure creates the best kind of employment – employment that

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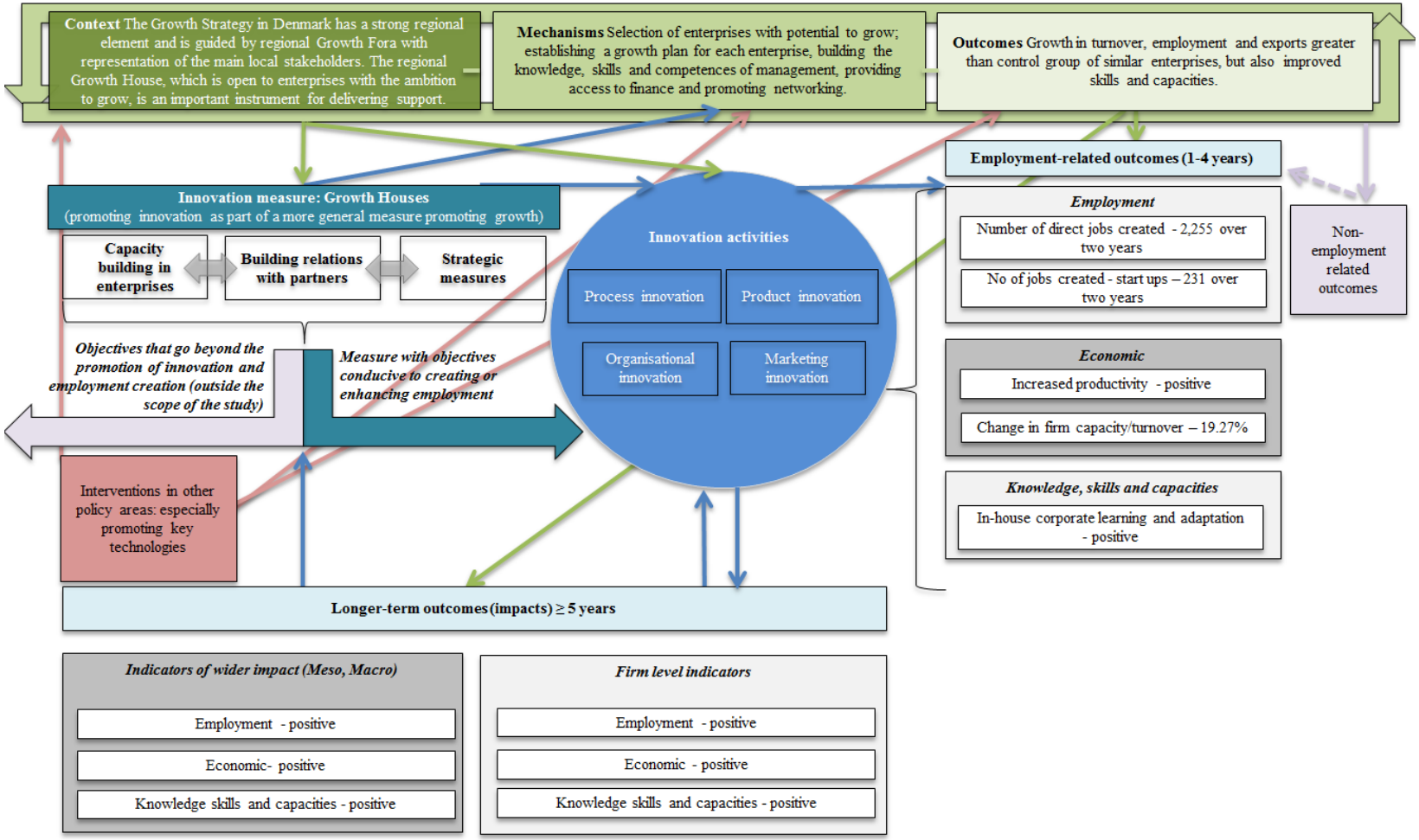
is sustainable, better able to deal with the vicissitudes of global competition and is based on a strengthening of the growth capacity of the enterprise. The measure is also transferable, assuming a political decision to focus attention in business support on enterprises that are capable of growing. It would be a matter of adapting support services that exists elsewhere to emulate the good practice features of this measure. Growth Houses are a central feature of the Danish business support and innovation system and also provide a regional focal point for this system, contributing to its overall coherence and co-ordination. They also act as a natural channel for access to other parts of the innovation system, notably cluster promotion and the research and development infrastructure.
Information sources *References:* 'National Agreement on the Growth Houses in 2016: Statement of the Results' (2017). (National aftale for Væksthusene i 2016 Opgørelse af resultatmål). IRIS Group 2013 'Evaluation of Growth Houses' (Evaluering af Væksthusene) OECD (2013). *'An international benchmarking analysis of public programmes for high-growth firms'* Væksthusstatistik (2016) *Links:* https://erhvervsstyrelsen.dk/vaeksthusene
Report author Anna-Maria Krarup, Mike Coyne, CSES

Graphic representation of the intervention logic of the measure



Enterprise Value: People - Germany

Enterprise Value: People - Germany	
Measure identification	**DE Enterprise value: people**
Name of the instrument	Enterprise Value: People - UnternehmensWert: Mensch
Web link	http://www.unternehmens-wert-mensch.de/startseite/
Location	All regions of Germany, but with some differences in target groups, depending on the region (see below)
Starting year and duration	The measure began as a pilot project, with ESF support, in the period between October 2012 and December 2014. It was then scaled up to the national level from the summer of 2015 until August 2020, again with ESF support. A special version with a focus on IT, known as UnternehmensWert: Mensch Plus, was introduced in 2017.
Name of the organisation providing measure	The German Federal Ministry for Labour and Social Affairs coordinates the programme, in conjunction with ministries of the Länder and approved business advice organisations. The measure is administered by the Bundesverwaltungsamt (Federal Office of Administration).
Type of organisation providing measure	Public institution
Other contributions	The European Social Fund provides support through the regional Operational Programmes relating to the different *Länder*.
Total budget for the measure	Unknown but the total cost of consultation for the first 2,979 firms benefitting from the programme was €28,904,719. Extracting information from the regional ESF OPs returned 2,022 project entries totalling with a total eligible cost of €11.876.678 and an average co-financing rate of 56%, suggesting that the measure is quite dependent on ESF funding in the current programming period. The fact that a new version of the programme was just launched in 2017 suggests that the measure is not going to come to an end any time soon.

Reason for highlighting this measure

This measure aims to promote modern human resources practice in the small and medium enterprises (SME) sector as an element in the national strategy 'New Quality in Work' (Neue Qualität der Arbeit). As such, it aims to help SMEs adapt their workforce to the demands of change and innovation, arising in a modern competitive economy.

This measure is therefore a good example of addressing the employment side of innovation as part of a more general innovation strategy.

The policy context for this measure

The national strategy and consultation process 'New Quality in Work Initiative' (Initiative Neue Qualität der Arbeit) provides the general framework for the design of this measure. This strategy aims to promote a new work culture and personnel policy across the German economy, placing an emphasis on work quality as the basis for innovation and competitiveness. It brings together all the major stakeholders in employment policy and has been looking at the relationship between working conditions and business success for the past 15 years.

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At a more operational level, the German Government has launched a Qualified Professionals Initiative (Fachkräfte-Offensive), of which this measure forms a part. This initiative brings together two national ministries and the Federal Employment Agency and aims to develop concrete approaches to ensuring that the German economy has the access to the skilled labour that it needs. This focus on skills and retraining skilled personnel (as envisaged by the programme) reflects the situation of the German job market, where unemployment is very low, and the more urgent political priority is to ensure that the lack of skilled personnel does not have a negative impact on economic growth and firms' capacity to deliver on contracts.

The measure also indirectly contributes to Germany's High-Tech Strategy, which acknowledges the link between innovation, value creation, competitiveness and employment. It has the goal of supporting an employment-strong industrial sector. In this strategy, the Government is focusing on the workplace challenges that technological change is bringing, including in labour markets, the protection of health, safety at work and training.

As explained in the European Commission's Joint Research Council country report for Germany, one of the key R&I policy challenges in Germany is to reinvigorate innovation in SMEs, since the contribution of SMEs to overall business R&D expenditure has been declining for years, partly due to a shortage of human resources. In response to this, the Ministry of Education and Research in 2016 adopted a ten-point programme 'Priority to SMEs' increasing funding available to SMEs and addressing the shortcomings of previous funding programmes. The measure 'Enterprise Value: People' directly contributes to these goals, by helping SMEs adapt their workforce to the demands of change and innovation. Indeed, the measure is regarded as part of the national SME support policy.

Aims and objectives of the measure

Rationale, objectives

The aims of the measure are:

- To support the inclusion of employees in sustainable learning and change processes within enterprises, in order to address the impacts of changes in the economy and identify needs for action in HR policy;
- To improve working conditions; and
- To promote growth and wellbeing.

These aims are translated into more operational objectives:

- To enable enterprises through initial and process consultations to identify objectives and measures and develop tailored solutions to ensure their implementation and sustainability;
- To make management familiar with sustainable HR policy approaches that truly focus on the needs of employees; and
- To enable firms to adequately react to future challenges related to changes in the world of work and production and demographic changes.

Ultimately, the measure should help SMEs retain skilled personnel and thus reinforce the position of SMEs within Germany's economic system.

Main elements of the support

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The support comes in three phases.

In the first phase, a firm visits an approved advice agency for a free review of the firm's personnel needs and a check of its current situation with regard to the need for change in the four fields of action (see below), together with an assessment of eligibility for the second stage. This first consultation is free and available for all SMEs interested.

In the second phase, the firm's management and staff work in-house with an adviser chosen from an approved list. Together the management and the adviser work out and then implement a strategy for personnel development in four different areas: leadership, equality and diversity, health and well-being, and knowledge and competences. These are the core areas of intervention of this programme. This should take up to six months.

In the final phase, three to six months after the completion of the second phase, the results of the process are reviewed and, if necessary, further advice inputs arranged.

In total, the process takes around nine to 12 months.

Target beneficiaries

SMEs based in Germany in line with the EU SME definition. Larger enterprises are excluded. In practice, many participating firms are micro enterprises with fewer than 10 employees (please see below for more information on eligibility criteria). The programme manager stated that one challenge relating to this, and similar programmes, is that it is difficult to reach all SMEs, in particular in rural and remote regions where the business density is low.

There are no restrictions as regards compliance with standards relating to working conditions.

Characteristics of the measure

Instrument type

Human Resource Development, as a capacity-building measure. The measure is intended to support and work alongside other innovation measures that are anchored by the New Quality in Work Initiative. The Initiative links up a wide range of individual support projects around four types of services: 1) status quo check and action guide, 2) Top 100 – good practice impulse examples, 3) consultation and audit and 4) networking (INQA).

Relation of the measure to other measures

This measure is part of a package of measures subsumed under the term 'Qualified Professionals Initiative' (see above). This in term is part of a wider set of measures ranging from labour market analysis and communication of labour market issues, to practical assistance for enterprises in developing skills and recruiting.

Type(s) of innovation supported

In seeking to change the skills and knowledge base of enterprises, the measure is promoting a kind of organisational innovation. However, this is usually done in preparation for other types of innovation and change that could involve product, process or marketing innovation. In the area of process innovation, the measure supports innovative human resource policies in enterprises, in order for them to be able to retain skilled workers, transfer knowledge to a younger generation and recruit needed staff (against the background of a shrinking labour force in an ageing society).

Sectoral focus

There is no sectoral focus but four areas of action are specified:

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- *Strategic HR management*: covers leadership, communication, participation, motivation, work organisation, working hours;
- *Equal opportunities and diversity*: covers work-life balance, demographics, inclusion, support of women;
- *Health*: covers organisational and individual resilience, physical and mental health; and
- *Knowledge and competence*: covers employee development, lifelong learning, and knowledge transfer.

Regional specificities

The measure covers all regions of Germany, but with some differences in target groups, depending on the region. Generally, the advice agency for the first consultation must be based in the same Land as the beneficiary firm. In Leipzig, Lüneburg and the metropolitan region Rhein-Neckar, advice agencies can only support firms from these places. In the Länder of Brandenburg, Baden-Württemberg, North Rhine-Westphalia and Saxony-Anhalt, only firms with up to 10 employees can be supported. For larger firms, regional programmes are available.

Funding available for applicants

The initial session is provided free of charge. For the second phase, advice lasts for a maximum of 10 days and with a maximum of €1000 per day cost. Firms with less than 10 persons employed can have 80% of the cost covered by the measure. Those with 10 to 249 persons employed receive a refund of up to 50% of the advice costs.

Time period over which the effects are expected to be felt

The results discussion takes place three to six months after the process consultation, meaning that by then effects are expected. The focus of this last consultation is to secure the benefits arising from the consulting service in the long term.

How the measure is implemented

The instrument design

The instrument is designed as an SME subsidy for consultations with an authorised adviser, with a view to improving the firm's internal processes (see the four areas of action introduced above) and with the ultimate goal of retaining skilled personnel making the firm better able to face the future. The assumption, and hence the intervention logic underlying the programme, is that improved skills and working conditions enhance adaptability and business success.

Eligibility criteria and restrictions

The initial advice session in an advice agency is free for any enterprise. To identify the companies eligible for the support provided in the second phase, the agency also checks that the following criteria are met:

- Enterprises established and with employees in Germany;
- With at least two years in existence;
- SMEs, according to the strict EU definition;

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- With at least 1 full-time employee or equivalent; and
- With turnover of less than €50 million or an annual balance sheet total of less than €43 million.

In Baden-Württemberg, Brandenburg, Sachsen-Anhalt und Nordrhein-Westfalen, support is only available for enterprises with less than 10 persons employed. However, other similar measures are available in these Länder for SMEs with more than 10 employees.

Advice can be provided for a maximum of 10 days and cost a maximum of €1,000 per day.

The EU's *de minimis* rules apply.

There is no direct competition among applicants, but some SMEs may be easier to reach than others (see also section on target group).

How the measure is accessed and delivered

The measure is well-advertised but relies on SMEs proactively approaching business advice agencies and asking for a first consultation. The second phase advice sessions are delivered through vouchers for approved consultancy services, which then provide the advice on the firm's long-term human resource strategies. The consulting services cover communication, work organisation, health support and knowledge transfer.

Private sector consultancies can apply through open calls to become an authorised adviser.

The mechanisms used for the implementation

Firms interested in participating in the programme receive a first consultation where the eligibility of the firm is checked for participation in the subsequent stages, but information is also gathered on the context in which the firm operates and the nature of any special challenges that the firm faces. This first consultation also serves to identify in which of the four areas of intervention there are particular challenges for the firm, in order to determine the focus of the subsequent consultation process. This first consultation is carried out by organisations such as chambers of commerce, business educational facilities and others present across all of Germany. On average, there are two such institutions in each of the 16 Länder. Individual organisations apply to for the status of advice agency in the context of this measure.

The actual implementation of the consultation is then carried out by an external management or process consultant. This is either an individual or a boutique consultancy with one-two members of staff that are anchored in the region of the beneficiary and are accredited by the programme to provide such services. In this process, specific measures are developed that trigger a change in procedures at the enterprise level. The exact process by which this happens varies in each case. However, there are three key steps in the process consultation period common to all projects:

1. Analysis of strengths and weaknesses of the enterprise as regards the areas of intervention identified in the first consultation;
2. Development of actionable objectives and measures to establish a binding action plan at firm level that supports the anchoring of a sustainable HR strategy in the enterprise; and
3. Initiation of the process of change and development of a concept to accompany the measures with the aim to develop routines at firm level and support the actors in the first steps of implementation.

Individual training measures such as leadership training or coaching that are not embedded in the

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consultation process must not make up more than 40% of the total support provided to a beneficiary firm.

The external consultants are supported by materials and guidance provided by the programme and an online platform for exchanging experience with other consultants.

The project manager stressed the logic of the intervention, whereby the consultation is supposed to lead to better internal procedures in the participating firms which in turn increases their competitiveness and success, thus enabling them to create new jobs or retain skilled personnel. The key is that the programme funds consultations that most beneficiaries would not otherwise have carried out, as confirmed by discussion between the firms and the programme manager. This is because of the small size of most participating enterprises. Larger enterprises are more likely to draw on external consultants even without public support.

How the measure is expected to generate its intended effects

Despite being delivered over a maximum 12-month period, the programme adopts a long-term perspective, aiming to transform beneficiary firms' thinking and organisational management. The result should be a HR policy orientated towards the employees, and an increased ability of firms to take up the challenges presented by a changing work and production environment as well as by demographic change. Moreover, the conditions of production and work within the enterprise are to be designed in a way that fosters employee's health and innovation and facilitates the hiring and retention of skilled personnel.

The intended general and employment effects of the measure

This measure aims to promote modern human resources practice in the SME sector. This concerns the inclusion of employees in developing a HR strategy, and an emphasis on diversity and gender equality, lifelong learning and work-life balance. As such, it aims to help SMEs adapt their workforce to the demands of change and innovation. It is therefore expected that the measure also contributes to the firm's competitiveness and raises skills levels. By retaining skilled personnel, it may also help keep older people in the workforce.

The measure does not directly aim to increase employment as an immediate outcome. The main expected employment effects are job retention and job security, although higher employment rates might be anticipated over the longer term. This could happen for instance in industries undergoing a transformation because of innovation processes and economic change, through the process of up-skilling, which is central to the measure's objectives.

Effects also include a better work environment and a focus on skills development and training provision, less physically demanding tasks or workplaces and better mental well-being, and greater diversity and inclusion. These effects are part of another feature of the measure, which is that it helps SMEs to retain skilled labour in a market where larger firms may appear to offer better conditions and prospects.

According to the programme manager, it is unlikely that any measurable employment effects are generated in other organisations beyond the enterprises involved. This is because most beneficiaries are too small to have an impact on bigger supply chains.

Summary of the main evidence available

An external evaluation of the pilot phase of the measure has been undertaken and a summary of the findings published (Kowalczyk et al, 2015a). The study was commissioned by the programme manager (the Ministry of Employment) and carried out by Ramboll. The full report has not been published, though sections of it have been provided for this study.

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The evaluation's aim was to assess the state of play with regard to the implementation of the pilot programme and assess its effectiveness and efficiency. The guiding research question was: how were the primary and expert consultations in the pilot programme implemented and what were the results on part of the SMEs? In addition, the evaluation was intended to uncover success factors and develop recommendations on how to further develop the programme with a view of a relaunch in 2015.

The methodology consisted of qualitative and quantitative opinion surveys and case studies. Specifically, the evaluators conducted telephone interviews and online surveys with the advice agencies, a total of 1,302 advisers responded to the interview request, representing a return rate of 70%. Moreover, the evaluators conducted 924 interviews with SME clients (representing a response rate of 84%). In addition, six case studies were undertaken, using guided interviews with advisers, management personnel and employees of beneficiary firms. Each case study focused on a different model region. This served to trace the consulting processes and results achieved in detail and bring in the different perspectives of the actors involved. Finally, monitoring data collected as per the ESF rules were also analysed.

The study found that between October 2012 und December 2014, 30 pilots were implemented in 36 regional advice agencies. 3,000 enterprises received the initial advice and around 95% of these proceeded to the next stage. Participants in the scheme included SMEs from all sectors and all the Länder of Germany. Half of the firms had between 10 and 49 employees and it was estimated that 100,000 employees were involved. Micro enterprises were underrepresented compared to their economic importance, possibly due to capacity constraints. In terms of sectors, the largest number of beneficiary firms in the pilot phase operated in services, health and social care, processing industries and trade.

About 2,000 professional advisers were trained in order to deliver the measure.

Around 95% of the companies who presented themselves for a first consultation free of charge, also went on to phase two and three and received an in-depth process consultation as described further above.

The majority of firms consulted for the evaluation stated that they made use of the services in order to deal with challenges in the areas of work organisation, knowledge and competence management and acquisition and retention of skilled personnel. In comparison, firms showed a far lower expectation of their participation in consultation to make it easier for them to hire new skilled personnel. This is problematic since seven out of 10 enterprises participating had had difficulties finding qualified personnel. It also suggests that any effects of the measure in terms of job creation may only occur in the longer term, once modern procedures and organisational structures have fully been internalised by firms.

In terms of the areas of action offered by the measure, 'HR management' and 'knowledge and competence' were used more often than 'health' and 'equal opportunities and diversity'. This may have been the case because 'HR management' can be regarded as essential and instrumental to delivering results in the other areas.

Overall, beneficiary firms approached for the evaluation were satisfied with the consulting services received (94% stated that they had fully met their expectations).

Another key finding of the study was that the expert consultations provided triggered further changes in participating firms and thus led to sustainable developments in procedures. Indeed, the sensitisation of firms for further consultation processes at their own cost is a key success factor of the measure. The evaluation found the measure to be effective in that it triggered additional consultations being sought by beneficiary firms, this time paid for fully by the firms themselves. 68% of phone survey respondents stated they were planning further measures over the next 12

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months that were triggered by the consultants' advice and that these would consolidate the process and generate lasting changes in their HR management policies. These changes concerned restructuring plans, such as a realignment of responsibilities, and the introduction of new HR policies, such as coaching, training and feedback discussions. Thus, the measure's success in improving work procedures and skills development were key factors in achieving a sustainable HR policy in beneficiary firms.

In terms of cost effectiveness, the study found little 'windfall effect' in that very few firms would have made use of the consulting services without the public subsidy. The cost per SME to achieve a tangible effect was calculated to range between € 10,100 for improved work organisation and €12,400 per firm for an increased success rate in hiring talent. The cost items were calculated based on a total cost in the pilot phase for consultation of €28.9 million divided by the number of firms which stated that their participation led to improved work organisation (2,870 firms) or a higher success rate in hiring skilled personnel (2,338 firms) – here, all firms were added up that gave a value of higher than three on a scale of six, with six being the most positive option (for instance the question would have been: On a scale from one to six, to what extent did your participation in the measure lead to improved work organisation within your firm?). The number of firms was estimated based on feedback from the online survey. The costs per objective were considered to be proportionate by comparing these costs to the overall cost per consultation. This link is not further analysed in the evaluation.

Apart from the formal evaluation, monitoring systems have been implemented across the programme as part of the data collection requirements related to the ESF co-funding of the programme. These data have to be sent on a regular basis to the European Commission and inform on indicators such as the number of firms reached and the amount of money spent. Other than that, the programme manager holds data and records of the consultations carried out which are checked by the Federal Administration Office. This data was not disclosed, however.

The evaluation makes a range of recommendations relating to programme design. It concludes that changes in processes are applied sustainably in the firms supported, principally in the programme's four areas of action. It also highlights that the programme triggers knock-on effects in that firms make increased use of consultation after they have participated in the programme. The main benefits identified include improved skills, work processes, training and sustainable HR policies.

The authors claim that the windfall effect of 20% identified in the study could be reduced by limiting the 80% co-funding rate, which is considered as rather high, to micro enterprises, and introducing a lower cap for SMEs. The authors do not further explain why they assume this to lead to a reduction of the windfall effect.

Quality of the evidence base

The evidence on this measure relates only to the pilot phase and no further information is currently available on how the measure has operated since 2015. Furthermore, it should be remembered that the aim of the evaluation was to contribute to a decision on whether to continue the measure after the pilot phase. It therefore concentrated on the shorter-term outputs and assessment of the experience of participants rather than longer-term outcomes. This approach also explains the evaluation's methods, which were the use of an extensive opinion survey, a large number of interviews and case studies, leading to a qualitative assessment. As a consequence the analysis is strongly process-oriented, examining how the measure has been delivered and the perceptions of the support provided on the part of clients and other parties involved in the programme's implementation.

An additional consideration is that, in the absence of a framework for assessing the enhancement of skills and competences achieved or characterising related changes such as improvements in

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working conditions, this evaluation relied heavily on the views of beneficiaries rather than the more objective indicators of performance that would have been available, if the measure's objectives had been framed in terms, for instance, of enterprise growth or jobs created.

In these circumstances there was little attempt to provide quantitative assessments and there is no counterfactual information and no control group, although the programme manager does try to identify cases of windfall effect (the extent of firms using the money to carry out consultations they had planned anyway) through surveys of participants.

On the other hand, the evaluation is very transparent in setting out the guiding research questions, the methods for data collection, the results, and how these translate into the conclusions. The very high response rate of the telephone survey and the number of interviews conducted also means that the feedback is solidly representative of the total population of beneficiaries. In addition, the case studies served to increase the understanding of the mechanisms by which consulting services created the desired results. This all contributed to a convincing assessment of the relevance of the measure, though little consideration is given to its coherence with the other measures that form part of the German government's Qualified Professionals Initiative.

In terms of effectiveness, the evaluation reports positive results based on survey feedback as described in the previous section. The report claims some interesting effects, but these are only characterised in qualitative terms and no considerations are given to the likely longer-term effects. Similarly, the assessment of efficiency in terms of cost effectiveness is fairly superficial, consisting mainly of a calculation of the average cost of a consultation as outlined in the previous section. These cost items are then linked to an assessment of their effects which is solely based on survey feedback on whether the consultation achieved its aims. Thus, the conclusion that the measure is highly efficient and effective is not well substantiated or elaborated.

Overall, the evaluation of the pilot phase is detailed and based on an extensive exercise of information collection. It provides some useful data on outcomes and is strengthened by the fact that it draws on multiple data collection methods and sources. The high response rate to the survey and interview programme means that results are representative of the global population of beneficiaries. These considerations lead to a conclusion that it uses a robust methodology.

However, given the objectives of the measure and the difficulty in measuring its outcomes and the concentration on processes and outputs, reinforced to a certain extent by ESF reporting requirements, the evaluation does not provide clear evidence on the important labour market changes that it aims to promote, especially in relation to the nature and extent of the skills and competences acquired, the extent to which working conditions improved, the contributions to general welfare and the enhanced attractiveness of the SMEs involved in the labour market for skilled talent.

The evaluation concluded that the pilot phase had demonstrated that the measure was cost-effective and sustainable, and it has then been rolled out across Germany, including additional features to increase its impact – notably with the introduction of UnternehmensWert: Mensch Plus with its focus on IT skills. It would appear that the measure is also transferable to other countries, although it would be necessary to replicate the network of advice agencies and approved consultants in order to implement it elsewhere.

In general, the evidence provides some support to the idea that measures that aim to assist enterprises to develop the skills and competences of their employees can create better working conditions, and enable firms to better compete in a changing economy. However, assessment is needed over the longer term of the nature and extent of the improvements in skills and working conditions and on the impacts on further innovation, job creation and growth performance in the participating enterprises, especially in more quantitative terms. This could include collecting

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monitoring data on metrics such as business turnover, workforce size, patents filed and new products created.

Another evaluation is not explicitly scheduled yet, but a small-scale one may be carried out in the near future.

Actual employment outcomes

The aim of the measure is to assist German SMEs to adapt to economic change by enhancing the skills of their workforce, improving working conditions and attracting new talent.

Improvements in working conditions include longer-term health and welfare improvements, especially for those enterprises that opt for advice under the 'health' part of the programme, where resilience and anti-stress training are provided which can raise both skills levels and well-being.

Around two-thirds of the enterprises that participated in in-depth consultation in the pilot phase stated afterwards that they had initiated or were planning to initiate human resource measures (paid for by themselves), in order to consolidate the process and generate lasting changes in their HRM policies.

Now that the measure has been rolled out across Germany, it is expected that a much larger number of enterprises and employees will be affected and that the measure will have a considerable impact on the skills and competence base of SMEs and on the flexibility of employees.

Three to six months after the conclusion of individual projects, the entity providing the first consultation meets again with beneficiaries and asks them if any jobs have been created or existing ones saved. Many firms confirm this, but the programme manager does not hold any hard data on this.

Consequently, the impacts on employment as such will be both direct and indirect, arising from a more flexible working and successful adoption of other types of innovation, but it is difficult to establish the actual employment enhancement effect in terms of number of jobs created.

Overall assessment

The measure was launched as a pilot project, and subsequently transformed into a long-term measure, with ESF support. It aims to promote modern human resources practice in the SME sector. This should help SMEs adapt their workforce to a changed external context and allow them to attract and retain the talented people they need to remain competitive. This measure is therefore a good example of addressing the employment side of innovation as part of a more general strategy. The measure is also interesting in the sense that it focuses on advice services rather than financial support (although it does pay for part of the consulting services).

Strengths/success factors of the instrument from an innovation and employment perspective

In terms of employment effects, the measure focuses on improving working conditions for skilled people, which in turn should allow SMEs to compete with large firms as attractive employers. As a side effect, the measure also trains HR advisors.

Employment enhancement is an explicit goal of the measure. One of the key success factors of the measure is that it takes a holistic approach covering job security and retention, attractive working conditions, health and safety, diversity and inclusion. While job creation is also relevant, the measure reflects the situation in Germany where unemployment is low, and the acquisition and retention of talent by firms is a more important policy issue than the creation of new jobs.

The main findings relate to survey feedback from the evaluation that states that participation in the programme triggered long-term changes in firms' work organisation and culture. The structuring of

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support around four areas of intervention among which beneficiaries could choose is a key success factor in ensuring maximum effectiveness through a tailored approach. Another key success factor is that the extensive support triggered long-term changes in participating firms that oftentimes went on to take up further consultation at their own cost, suggesting the change initiated by the measure is sustainable.

The case studies revealed that many SMEs first need to lay the foundation in the area of 'Strategic HR management' before being able to tackle more specific challenges. This explains why this area of intervention proved particularly important among beneficiary firms.

The evaluation of the pilot phase shows positive results based on an opinion survey, interviews, a set of explorative case studies and a cost effectiveness estimate. Nonetheless, the evidence is not particularly strong, being mainly focused on processes and outputs (such as the number of firms reached) and the amount of money spent, rather than assessing the skills enhancement and improvement in working conditions achieved.

Weaknesses/bottlenecks of the instrument from an innovation and employment perspective

One weakness is some degree of windfall effect (firms using the money to carry out consultations they had planned anyway), which was linked in the evaluation report to the rather generous co-funding rate.

Implementation requirements and its degree of transferability

In terms of implementation, eligibility criteria vary slightly across different regions, which could be confusing for some applicants. Moreover, firms need to proactively apply for an initial consultation with an advice agency and may not be aware of this opportunity or struggle to do so if based in a remote location.

The German national government seems to recognise the importance of improving SMEs' contribution to R&D expenditure in Germany and this measure is well anchored in national strategic frameworks.

The measure is already being implemented all across Germany and should be applicable relatively easily in other European countries, given the involvement of ESF funding, where the arrangements for initial access and advice consultants can be replicated. Given that the measure is already co-financed by national and regional sources, it should be possible to replace the ESF co-financing in the next programming period if necessary.

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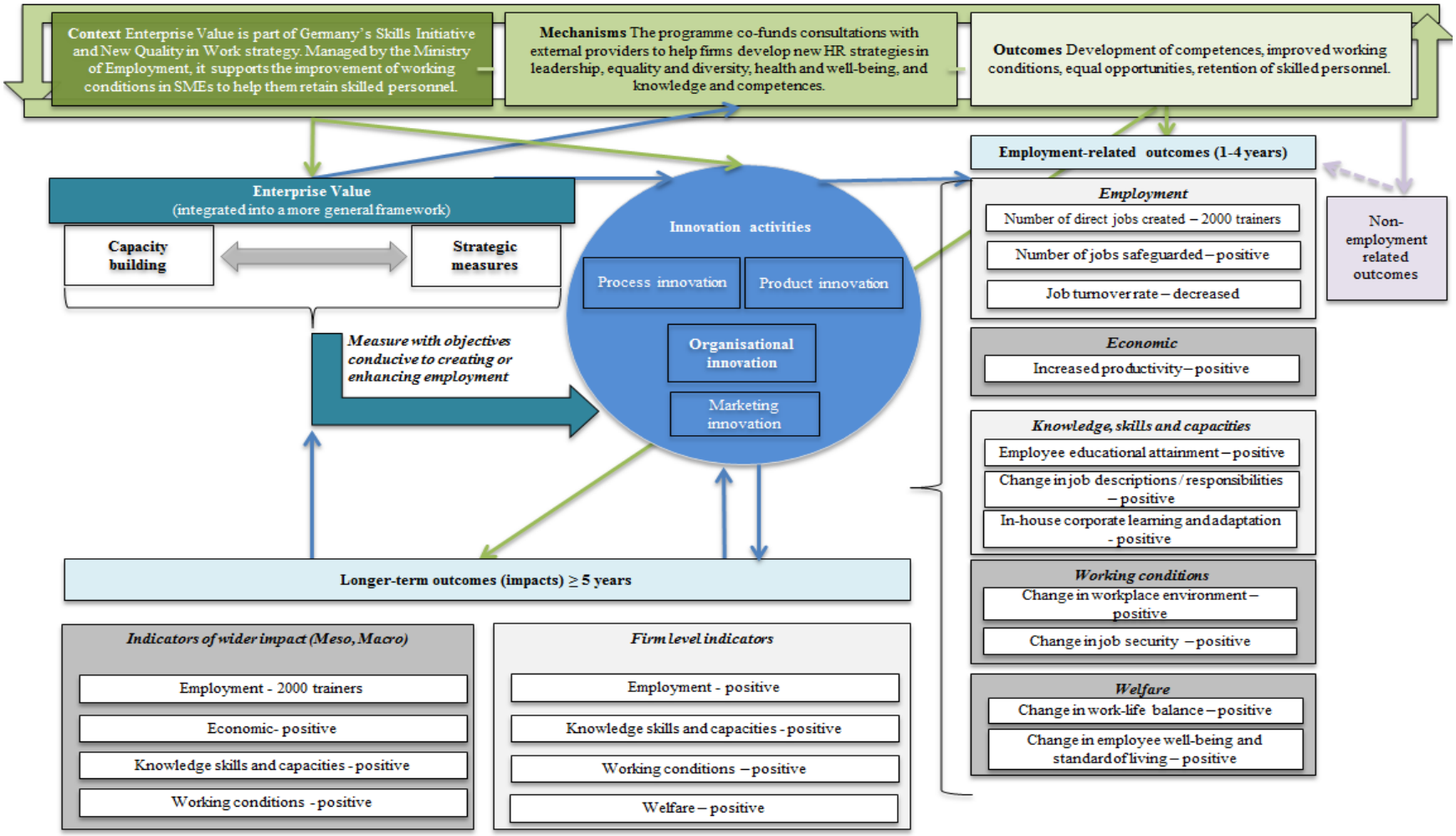
Report author Stephan Kreutzer

Graphic representation of the intervention logic of the measure



Knowledge Transfer Partnerships – UK

Knowledge Transfer Partnerships – UK	
Measure identification	**UK KTP**
Name of the instrument	Knowledge Transfer Partnerships (KTP)
Web link	http://ktp.innovateuk.org/
Location	UK (There are local Knowledge Transfer Advisors in ten regions of the UK)
Starting year and duration	The KTP programme has been running in its current form since 2003. However, similar programmes have existed for more than 40 years. Each KTP partnership lasts between 12 and 36 months and typically runs for two years.
Name of the organisation providing measure	Innovate UK – the UK agency for innovation - leads the KTP. It is a non-departmental public body reporting to the Department for Business, Energy and Industrial Strategy (BEIS).
Type of organisation providing measure	Innovate UK is a non-departmental public body. It works in partnership with the Research Councils, the UK's devolved administrations, the Department of Health, Department for Environment, Food and Rural Affairs and the Nuclear Decommissioning Authority and the former Rail Safety and Standards Board. These organisations provide funding for the programme. Funding is provided in Scotland by the Scottish Funding Council (SFC) and in Northern Ireland by Invest Northern Ireland.
Other contributions	European funds account for 1% of the budget detailed below.
Total budget for the measure	Just over GBP 648 million (€737 million) has been committed to the KTP programme over the last 27.5 years (to December 2014 – latest available data). The average annual cost of each KTP is approximately GBP 75,000 (€85,000). Public sector investment is approximately GBP 30 million (€34 million) each year. The majority (GBP 29 million, corresponding to €33 million) comes from Innovate UK (WCED, 2015).

Reason for highlighting this measure

The Knowledge Transfer Partnerships are a long-term programme of intervention by Innovate UK to link innovative businesses in the UK with research organisations and academic institutions (referred to as knowledge base organisations). The KTP programme provides and develops highly skilled personnel, while increasing the innovative capacity of host businesses. The KTPs have contributed to significant increases in innovative output, economic growth, and high value job creation in innovative industries. In addition the KTP programme contributes to improved understanding of the commercial environment and knowledge to support research and teaching, staff development and academic publications within the knowledge base/ academic institutions. The KTPs provide a good example of a 'mobility' scheme bringing well-qualified graduates into industry, though unlike many other mobility schemes, the KTPs generally do not lead to further academic qualifications.

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The policy context for this measure

The KTP programme is based on a longstanding aim of innovation policy to improve the links between research institutions and industry and particularly to encourage knowledge transfer.

KTP was born out of the UK national Teaching Company Scheme (TCS) which was set up in 1975 and aimed to provide new graduates with industry placements combined with grants for further training. The KTP programme replaced this scheme in 2003. It was significantly scaled up and is now one of the largest employers of graduates in the UK (see below).

The main difference between the two schemes is that the TCS focused largely on engineering disciplines whereas the KTP has a broader scope including but not limited to arts, digital, technology, media, social, health and environment issues. In addition the TCS encouraged and facilitated graduates to pursue a higher degree with the KTP counting as academic credits. However, the KTP focuses primarily on developing skills in enterprise and innovation rather than further academic study.

There is a very supportive policy environment for the KTP Programme at a European and UK level. While the KTP is a stand-alone measure, the programme is included as one of a suite of measures in the Innovation and Research Strategy for Growth of the UK's Department for Business, Innovation and Skills (2011). According to the KTP programme manager, between 2015 and 2017, there has been increased integration of the KTP programme as a central pillar in innovation policy, strategy and implementation.

KTPs are also recognised within the Dowling Review of Business-University Research Collaborations (2015) as a crucial element of the business-academia collaboration landscape. The government recognises that excellent research is vital to tackling the productivity gap in the economy and that university research collaborations have a vital role in providing business with new processes and technologies, highly skilled people and access to world-leading experts. The report recommends that additional funding be invested in the KTP programme.

Aims and objectives of the measure

Rationale

The KTP programme is a longstanding programme which aims to help businesses improve their competitiveness and productivity through the better use of knowledge, technology and skills that reside within the UK knowledge base.

Economic policy consistently prioritises innovation as a driver of growth, and encouraging knowledge transfer between research institutions and business is a near universal feature. The rationale for the KTP programme reacts to the existence of market failures affecting innovation and knowledge transfer in the form of under-developed markets in intellectual property rights and information asymmetries. The KTP Programme is but one mechanism that is better suited to businesses with a degree of existing innovative capacity and the resources to commit. It should be seen as an important part of a broader system of innovation support and connections between the knowledge base and the wider economy (EKOS, 2015).

Objectives

KTPs aim to:

- Stimulate innovation, Research and Development (R&D) and creativity so that the private sector grows and the export base is widened and deepened.
- Encourage Small and Medium Sized Enterprises (SMEs) to undertake collaborative

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Research and Development and Innovation (R&D&I) activities for the first time, thereby increasing the proportion of innovation active firms and contributing to a step change in the culture, priorities and performance of SMEs in respect of innovation.

- Contribute to skills development amongst associates and in turn to their employability.
- Support a culture of collaboration across industry and academia, with businesses taking a leadership role and academia working to inspire innovation through high quality R&D, knowledge creation and workforce preparation.

Main elements

The KTP links businesses with research and academic institutions to help them recruit a suitable graduate to work on a business innovation with the potential to go to market. Businesses contribute to the costs of the programme depending on the size of their operations.

The KTP Programme has a clear and well-defined role within a wider landscape of co-operation between businesses and research organisations. The relationship formed between the business and the knowledge base partner, facilitated by the associate (on a project of up to 36 months), allows the transfer of knowledge, technology and skills to be embedded within the enterprise - this is considered to be the KTPs' differentiating and unique selling point. The principle that knowledge transfer is embedded in people is considered to be a strength of the KTP.

While some associates may be pursuing advanced degrees using their experience as a research topic, most associates focus on industry relevant training and career progression in industry.

While not a direct objective of the measure the KTP has emerged as one of the largest graduate employment scheme in the UK, having employed more than 10,000 graduates over the lifetime of the programme.

Key elements of support include:

- A partnership between a knowledge base partner (education institution, college or research organisation) and an enterprise partner (business, not-for profit, Local Authority or education organisation). Partners work together on a project of commercial benefit to the business in which capacity was previously lacking.
- One or more appropriately qualified individuals (with at least a Bachelor's degree), referred to as 'associate(s)'. They are recruited by the partnership, employed by the university but embedded in the business to work on a full time contract.
- Associates are provided with an intensive, high level training course in business skills, project management, business strategy, budgeting, marketing, etc. The company receives a GPB 2000 (€2,260) allowance for relevant industry specific training, conferences and networking events at the discretion of the company. This funding must be applied for by the company.
- The KTP associate is supervised by an academic supervisor who is expected to spend one half day per week on the business premises in order to assist the associate with the knowledge and expertise required by the business.
- The KTP associate is also allocated a business supervisor to ensure that they have access to the resources they need and to be accountable for the performance of the business's obligations on the project.
- Finally, each associate is assigned a local KTP advisor who in many cases acts as a source of

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support and mentorship throughout the partnership.

The costs of the project are supported by a grant that may come from one or more of Innovate UK and the other funding organisations mentioned above - depending on the subject area or location of the project (determined as the location at which the KTP associate will be based).

Target groups and intended beneficiaries

The measure provides support to SMEs in any sector if they can make a strong case for this support. It gives opportunities to graduate students in the UK, who become associates. Associates are recently qualified university graduates - bachelors, masters or PhD, or, individuals who have completed post-doctoral research or are recently qualified to at least NVQ level 4 or equivalent in an industry relevant subject and also 'have the potential to be a business leader of tomorrow' (interview). For the partnership to be successful the knowledge base partner (university/ research institution) must also constructively benefit, potentially through developing new areas for research, teaching materials and publications.

Characteristics of the measure

The main characteristics of the measure are summarised under the following headings:

Instrument type

The measure is an example of Industry-Academic Co-operation, taking the form of a 'mobility' scheme, which involves an employee from one type of organisation (usually a research institution) working in another (for example, a business).

The KTP works by providing skilled human resource capacity for businesses, developing innovation and linking businesses to academic and research institutions. The KTP aims to embed innovation capability within organisations so that they can innovate beyond the period of the partnership. The KTP project is led by the business rather than the knowledge base partner, thus increasing their capacity to innovate and compete.

Relation of the measure to other measures

The KTP is stand-alone but is part of a suite of Innovate UK programmes such as:

- Grants for research and development for innovative businesses;
- The Knowledge Transfer Networks which connect businesses, universities, funders and investors;
- The Small Business Research Initiative which provides public sector contracts for innovation and R&D; and
- Catapult Centres which provide access to product design and development and business advice, guidance on routes to market and investment support among other services.

Although these measures have complementary value, interview evidence suggests that there has in practice been very little synergy between the KTP and the measures mentioned above.

Type(s) of innovation supported

This measure is concerned with human resource development and capacity building. It can be used to enhance all areas of the innovation process in the business including the development of products and processes, but also organisational changes and marketing innovation and, depending

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on the specific needs of the business, social innovation. It usually consists of R&D support.

Sectoral focus

There is no sectoral focus, although the programme appeals more to SMEs who require knowledge support at the initial stages of product and process development.

Regional specificities

There are no regional specificities.

Funding available for applicants

The average annual cost of each KTP is approximately GBP 75,000 (€85,000). SMEs contribute one third of the costs (approximately GBP 27,000 - €30,000) and larger companies contribute up to one half of the costs (up to GBP 40,000 - €45,000). The precise amount is determined by annual turnover. The rest of the funding is provided by the scheme for a duration of between 12 and 36 months. A grant of GBP 2000 (€2,260) is provided for networking, events and industry-relevant training.

Time period over which the effects are expected to be felt

A typical KTP is between 12 and 36 months in length. During this period the associate is expected to have a direct effect on the host enterprise, researching and developing products, processes and systems, in a way that the effects are expected to continue after the KTP closes. Indeed the idea is that the research and innovation capacity of the enterprise will be permanently strengthened. The average length of a KTP is 24 months and significant impacts have been seen on the commercial viability of the businesses involved. The impact in terms of enterprise growth is usually seen at between three and five years after the start of the KTP. There are obvious effects on the career progression of graduates within the 24 month period however, including skills development, increased salaries and the development of a broadened professional network. The KTP also enhances the employability of the associate, who is frequently recruited by the host business at the end of the KTP placement - in 52% of cases (WCED, 2015).

How the measure is implemented

The instrument design and intervention logic

The measure is representative of certain features of 'mobility' schemes between industry and academia in that it encourages the transfer of knowledge between the knowledge partner and industry by means of the placement of a well-qualified employee for a period of up to three years.

The measure is designed to be a mutually beneficial partnership and a knowledge transfer process from an academic institution to a business with a need for an innovation input. The process includes initial guidance from an experienced knowledge transfer adviser, a matching process to provide a suitable academic partner and potential candidates for the associate position, the appraisal of a detailed project proposal, the development of a strong partnership approach, including the designation of experienced persons in the firm and the research institution with responsibility for ensuring the success of the project. These processes are based on extensive experience with this type of measure over many years and they ensure that there is a clear pathway from the measure's overall objectives to the achievement of innovation leading to commercial success, along with the career progression of graduates within the business and industry sector.

Eligibility criteria and restrictions

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A full list of eligibility criteria can be found in the Overarching Criteria document. In summary, the partners must be:

- A UK-based business of any size or a not-for-profit organisation in any sector. Note that the programme is designed to encourage SMEs to benefit (not least through a higher level of support), but organisations of all sizes are able to apply. The business must have a strong commercial plan, with an understanding of its market and how to reach it;
- A UK-based academic or research organisation (university, college or research and technology organisation); and
- A university graduate (bachelors, masters or PhD), with the capability to lead a strategic business project.

The degree of competition is reasonably low, since the business is seeking a specific skills set and the research partner is able to proactively select candidates in relevant fields. This can be a masters or PhD graduate with specific know-how.

How the measure is accessed and delivered

In order to apply for a KTP, a business must contact their local KTP advisor to discuss the idea and feasibility of the project and find a suitable research institution as a partner. The business and the research institution then work together to develop the proposal, which is submitted by the academic partner. Once a grant is awarded, recruitment is undertaken jointly by the academic organisation and business partner. Posts are advertised and potential associates apply. An interview and selection process takes place. The associate's contract of employment will be with the academic organisation. They are provided with an academic and business supervisor for the duration of the contract.

There is some evidence to suggest that the KTP has been overly bureaucratic which has made it less accessible to smaller SMEs who not have the time or skills to go through the process. The Dowling Report (2015) unearthed concerns from businesses and universities regarding the bureaucracy, length of the proposal and time associated with applying for the scheme. The report recommends that the application process should be proportionate to the size of the grant.

The mechanisms used for the implementation

The KTP is designed to enable universities and research institutions to play a role in the innovation, development and growth of a local enterprise of any size and stage of development by applying academic knowledge to develop innovative and commercial products or services and to contribute to their commercialisation. The measure ensures a strong business/ research institution partnership in the design of the brief in collaboration with knowledge transfer advisors at a local level. The university plays a key role in identifying suitable potential KTP associates with requisite qualifications and experience.

In the design phase the project must prove that it adds value to, and has clear strategic relevance for the business. It must also provide a challenging learning experience for the associate and have clear benefits for the knowledge base.

How the measure is expected to generate its intended effects

Through providing a placement in the business over a period of between 12 and 36 months, the business receives knowledge that could not have been generated with a short-term consultancy.

The intended general and employment effects of the measure

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The intended effects of the programme are:

- Promote knowledge transfer to, and innovation in, businesses, leading to improvements to the products or services of an innovative business. This usually results in tangible progress towards taking the product or service to market, generating additional investment, or creating high-quality employment;
- Positive development of the skills and experience of the associate, with clear career progression including, for example, a permanent job in the enterprise; and
- new research findings generated by knowledge base partners leading to publications, improved teaching materials and staff development.

In addition, the purpose of the measure is to enhance mutual learning, which strengthens the skills and capabilities of the business, the associate and the research institution, which is expected to learn valuable lessons in terms of the practical application of theoretical knowledge in a real business situation.

In as far as the measure also promotes a change in the culture of the host business, it may be said that it also has an impact upon the working conditions of the firm. This is particularly in relation to an increased income level of the associate and other employees, increased job security, training and skills development, the alignment of work with a particular niche area of expertise perhaps leading to improved job satisfaction. There could also be impacts on working hours, flexible working and enhanced work-life balance. However, there is no direct evidence on these possible effects.

Summary of the main evidence available

The most rigorous and recent study relating to the measure, offering an in-depth analysis of employment effects is: WCED (2015), *KTP Programme, The Impacts of KTP Associates and Knowledge Base on the UK Economy*, Warwick Economics and Development, Birmingham, UK.

This independent study by Warwick Economics and Development was commissioned by Innovate UK to evaluate the economic impacts and other benefits, arising for the UK economy from the participation of the KTP Associate and Knowledge Base partner in the KTP programme. The study focussed on the overall economic impact of the programme, and the impact on KTP associates and knowledge base organisations. A notable omission is that the report did not assess the impact on the individual participating enterprises.

The methods

The methods used in the study were as follows:

- Interviews with senior members of staff in key stakeholder organisations including Innovate UK Lead Technologists, the Research Councils, the Higher Education Funding Council in England (HEFCE), the Scottish Funding Council, the Welsh Government, Invest Northern Ireland, KTP Advisers and the KTP National Forum.
- A workshop with KTP Advisers.
- Extensive review of KTP databases.
- High-level descriptive analysis of key KTP facts and figures.
- KTP logic models depicting pathways to impacts arising from participation in the KTP for both the associate and knowledge base partners and a comprehensive evaluation framework.

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- Surveys with KTP associates and the knowledge base institutions, collecting qualitative and quantitative information about financial, organisational and career benefits for participating individuals and organisations.
  - The associates questionnaire was sent to 3,249 individuals out of approximately 9,800 individuals who had participated in the programme; 264 responses were received (5% sample gives 90% confidence).
  - The knowledge base questionnaire was sent to academic supervisors in 137 institutions responses were received from 72 institutions.
- Self-assessment of the programme's added value for participants based on their experiences of participation and perceived benefits generated for them and their organisations.
- More detailed desk-based review and discussions with seven knowledge base organisations, involving interviews with management staff at University and Divisional/Departmental level, KTP/Knowledge Transfer/Knowledge Exchange staff and KTP Associates in some cases.
- Extensive desk-based review of Labour Force data, including age profile and graduates' average salaries and length of time graduates stay at firms.
- Descriptive analysis of survey findings and case study material and of key KTP facts and figures.
- Economic impact analysis drawing upon the survey findings and background research.
- No major statistical analysis (nor econometric analysis) of the KTP databases was undertaken.

The findings

Based on data available from 1982 up to 2014, there had been 7,412 completed and ongoing projects which had involved 176 research organisations/ universities; 5,559 businesses had benefited. This is equivalent to 32 businesses on average per participating research organisation over this 32-year period.

The study found significant benefits for participant associates in terms of strengthening their access to employment, increases in salary, ability to develop skills, career progression, and in terms of their personal and professional development in general. It also found significant benefits for the research organisation in terms of consulting income, job creation and the ability to leverage additional funding for new research projects.

The results of the survey of associates (264 respondents out of 3249 surveyed) plus those from the 72 responses to the survey of knowledge base institutions found the following employment related outcomes:

- Age and gender profile of associates
  - KTP programmes mostly focus on engineering disciplines (for 42% of all KTP associates). Other disciplines such as design, information technology and business management have increased over the last ten years.
  - 74% of associates are men with only one quarter being female. There is no indication in the literature that there is an intention to ensure a more equal gender distribution in the programme.

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  - The average age of an associate is 27 years. 47% hold a post-graduate qualification, with an increase in the number of PhD graduates over the last ten years.

- Salaries
  - Associates' KTP salaries were on average 43% higher than their last job just before the KTP engagement.
  - There was a 27% increase in average salary from their KTP salary in their first job following completion of their KTP.
  - The average annual salary in 2014 was estimated at GBP 40,000 (€45,000).This is approximately GBP 6,000 (€ 6,780) higher than the average graduate for those aged under 40 and around GBP 2,700 (€3,051) higher for those aged over 40.
  - The total (additional) contribution of the KTP to a KTP associate's salary over the 10-year period following the completion of the KTP is estimated at GBP 50,200 (€56,726) per KTP associate.
- Job satisfaction and skills development
  - For 50% of respondents, the main reason for getting involved with the KTP programme was to get employment; over a third (35%) were looking for a career enhancement.
  - Overall, 84% stated that they would not, or would have been unlikely to be able to access a similar programme involving both academia and business in the absence of the KTP.
  - Post-KTP, there has been a significant move of associates from full-time studying to employment in businesses, in academia or setting up their own businesses, although the research does not make clear the exact numbers or percentages of KTP associates who have made these transitions.
  - Over half of respondents were employed by the KTP partner business immediately after the KTP had finished. They improved their ability to work collaboratively (52%) and work with the industry (58%). Over a third got employment/fast-track job (38%) and acquired higher qualifications (35%).
  - 75% felt they would not have achieved the same results within the same time period and to the same level in the absence of the programme, with most believing that the speed of skill development was particularly unique to the programme.
  - 94% of KTP associates reported that participation in the KTP programme had resulted in a positive impact on their overall personal and/or career development – with over a third of these respondents stating that the impact of the KTP has been transformational for their development and career.
  - 84% of KTP associates were in employment immediately after completing their KTP. In 2014, at the time of the survey, 98% were in employment, including self-employment and running their own high growth businesses.
  - 50% of respondents at the knowledge base partner stated that skills and qualifications of associates are extremely important for leveraging additional funding with an additional 35% rating these skills and qualifications as important.

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The overall additionality of benefits for KTP associates from participation in the KTP programme is estimated at 75%, meaning that only 25% of KTP Associates would have achieved the same or better results if they had not participated in the programme.

A 2007 review of the impact of spending in the Regional Development Agencies (RDAs) shows the additionality created by RDA programmes. The study assessed additionality of outputs generated by various RDA interventions, and namely the extent to which outputs would not have arisen without the RDAs' interventions. The study found that additionality in terms of assisting people into employment was 51% and 62% for skills development. As mentioned, overall additionality of benefits for KTP associates is estimated at 75%. This suggests that the KTP is a particularly successful programme when compared to the employment and skills enhancing effects of other similar programmes such as those delivered by the RDA (DBERR, 2009; WCED, 2015).

An interview with the KTP programme manager revealed that the age profile of staff in the enterprises involved is impacted by the KTP. Many applicants are not typically employers of recent graduates as they are SMEs and do not have graduate programmes. The integration of a graduate, who is typically under 30 and who integrates more modern and innovative practices, tends to make the company more attractive to younger professionals therefore lowering the age profile of the company.

Comments from previous KTP associates demonstrated some key benefits generated by the programme, including opportunities to liaise and network with senior members of staff in both the industrial partner and the academic partner. The discretionary training budget also allowed for additional skill development (such as leadership and management), partnership and network creation, and personal development for the associate.

Other positive employment effects can be assumed from the length of time that KTP associates remain at KTP enterprises, with the majority accepting full-time employment following the end of the KTP contract. These include training opportunities (a budget is provided by the scheme), international travel, networking and profile building, leadership skills, confidence and self-esteem development, clear career progression opportunities, and the ability to employ academic skills and knowledge in their careers.

The analysis of the results indicates that the cumulative impact on KTP associate salaries (as compared to average graduate salaries in the labour force survey) over the period studied is GBP 376 million (€427 million). Of this total, GBP 254 million (€288 million) have been paid to associates who were not offered or did not take up a contract with the KTP partner business, after participating in the programme.

Salary information provides an indicator of wealth generated by the company and therefore the economy. It is used to estimate the impact of KTP on company Gross Value Added (GVA). Based on the associate salary information, the study estimated that the overall direct contribution to the GVA of these businesses is GBP 462 million (€524 million). Increased GVA would certainly mean that businesses would be able to employ more staff, develop more in-house skills and provide better working conditions, probably including flexible working and overseas travel among other conditions.

Overall economic benefits of the KTP programme include:

- The total net contribution to UK GVA secured by the KTP is between GBP 1.97 and2.17 billion (€2.23 – €4.46 billion) over the period 2001/2–2014. This takes into account the findings of an earlier study which estimated the net additional impact secured by KTP between 2001/2 and 2007/08 to be between GBP 1.6 and 1.8 billion (€ 1.8 and 2 billion) (Regenesis, 2010, WCED, 2015).

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- KTP associates working in non-KTP participating businesses have generated an additional net direct and indirect contribution to UK GVA of between GBP 933 million and GBP 968 million (€ 1058 and € 1099 million) over the 30-year period 1984-2014.
- Approximately GBP 7.5-8 (€8.5 – €9) of net additional GVA is generated for every GBP 1 (€1.135) of KTP grant funding invested (WCED, 2015).

The knowledge partners reported the main benefit of the programme to be the contribution to the research strategy, improved teaching material and closer industry partnerships. Managing the KTP has also improved the skills of academic staff (spending one half day per week at the business site working with the associate). Specifically:

- The key benefit generated was from knowledge partners' closer partnerships and from a better understanding of the industry (82% and 69% of the respondents respectively).
- 77% of the respondents said the KTP programme is important for developing general staff skills and the skills of the KTP associates – with 26% considering it extremely important.
- 66% said the KTP programme has an impact on attracting new talent to their department or specific area of work.
- 75% stated that their KTP participation led to further financial benefits for them. These benefits include consultancy income, new grants, patents and licensing income and spinouts.
- The KTPs have led to an increase in direct employment in the knowledge base (WCED, 2015). Assuming that a supervisor spends one day every two weeks with each KTP associate. This represents 0.1 FTE per KTP associate (10%). It is estimated there has been an average of 667 active KTP associates each year. The programme is therefore estimated to have supported an average of 66.7 FTE supervisor jobs across the knowledge base per year. On this basis, in total between 1982 and 2014 the KTP is estimated to have supported 1,690 years of FTE employment within the knowledge base (WCED, 2015). Some qualitative evidence from the evaluation has highlighted the importance of 'developing understanding and more focus in how research is applied [in commercial settings]'. One academic respondent said: 'this is one of the most valuable funding schemes that government puts money into. It helps train academics to work with industry'.
- There are some difficulties with skills shortages causing delays in finding suitable candidates and this may indicate that universities are unable to keep up with the speed of commercial timeframes.
- 46% of respondents said they would not have been able to achieve the level of additional research funding that they had without the KTP. The research suggests that almost GBP 60 million (€68 million) of new funding was generated through the KTP, as well as almost GBP 8 million (€9 million) of new consultancy income, which would lead to additional employment and skill development.

Over 95% of all people surveyed would recommend the scheme to academic institutions, graduates and businesses and would like to see the programme continued, replicated and scaled up.

Given the proven impact the KTP associate can have on the business and, by association, on the economy, the study recommends that the investment made on the KTP associate is well thought through – for instance, the recruitment process needs to be rigorous, the compensation package market-competitive and the training/skills development fit for purpose and value adding.

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Furthermore, dedicating administrative resources to incentivise the academic community to participate in the programme may improve participation.

Other studies

Cogent Management Consultancy (2016), *Knowledge Transfer Partnership Programme Interim Evaluation - Final Report*, Northern Ireland. Funded by Invest Northern Ireland (NI) to understand the impact of the KTP programme in Northern Ireland from 2010–2014, the interim evaluation report presents only the intermediate position of the KTP Programme's potential ultimate impact. It looks at the net increase in sales, GVA, jobs created (10 in total) and safeguarded (16) and additional R&D expenditure among 44 businesses interviewed. It evaluated additional income to the knowledge base organisation and additional research papers produced. 90% of associates cited an increase in skills with 100% of enterprises saying they had benefited from knowledge transfer and skills development.

EKOS (2015), *Impact evaluation: Knowledge Transfer Partnership Programme in Scotland*, EKOS Limited. An impact evaluation of the Knowledge Transfer Partnership (KTP) Programme in Scotland which was undertaken for the Scottish Funding Council (SFC). It aimed to assess the quantifiable (gross and net) economic impacts of the programme over the 2010-2014 period and make recommendations. Interviews were conducted with a total sample of 50 businesses. Over 90% of associates reported increased technical skills, management skills, improved career prospects and exposure to a commercial environment.

Innovate UK (2014), *Knowledge Transfer Partnerships: Achievements and outcomes 2013 to 2014*, Innovate UK, London gives an internal overview of the impacts of the programme in one year. The study estimated that for every GBP 1million of government money invested: 25 new jobs were created (including associates employed after their project completed), 353 staff were trained, GBP 2.2 million (€2,5 million) was invested in plant and machinery, and GBP 3.06 million (€3,46 million) was invested in R&D. One KTP typically results in three new staff being employed, including the associate, and 31 staff being trained.

Regenesis Consulting (2010), *Knowledge Transfer Partnerships strategic review 2010*, London This study was conducted for Innovate UK to review the outcomes of the KTP programme from 2001-2002 to 2007-2008. It found that the net overall additional impacts secured by KTP were GBP 4.2-4.6 billion (approximately € 5billion of new sales, GBP 1.6-1.8 billion (€2 billion) of GVA and 5,530–6,090 jobs. The report highlights some of the drawbacks of the KTP for knowledge base organisations, including the high burden of work in relation to reward, when compared to raising funding from elsewhere, and local KTP office saturation.

There have been a number of case study evaluations of individual KTPs. An example is Daykin, N. et al. (2013), which provides a qualitative evaluation of a specific KTP project using interview techniques. Several case studies are also documented on the Economic and Social Science Research Council website.

These studies all tend to confirm the generally positive assessment reported by the WCED, (2015) report , in terms of the employment outcomes for the associates and knowledge base organisations, higher earnings and improved career prospects, but also a positive impact on turnover and GVA and overall a good return on public investment in the scheme. The only concern with the programme emerging form the research was the level of bureaucracy, length of proposal and time taken to establish the partnership which creates a barrier for smaller SMEs (Dowling report, 2015).

Quality of the evidence base

KTP programmes are monitored on a regular basis by local KTP Advisors. The KTP Advisors support the supervision and mentoring of the associate and conduct monitoring visits with the

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company once every four months. Findings are reported to Innovate UK.

The main study taken into consideration in this assessment is the 2015 review of the impacts on KTP associates and the knowledge partners. The main results reported are based on surveys of associates and knowledge partners though not the participating businesses. The surveys provided the largest sample size of all the studies referred to, drawing information from 264 associates and 72 knowledge base organisations. The results are significant at the 90% confidence level. Information was also derived from KTP management databases, from interviews with a number of stakeholders and a workshop with KTP advisers.

There are some limitations with the data in that surveys rely on opinion and do not give an unbiased view of effectiveness and efficiency of the measure achieving the desired objectives, or the extent to which it achieves other unexpected ones. Nonetheless, these results do provide evidence of the relevance of the scheme in the eyes of its users.

The main focus of the surveys and analysis is the impacts of KTP on the employment and salaries of associates and some of the implications of this for other jobs. Using salary increases as the main indicator, the study estimates the contribution of the KTP to GVA and therefore the return on the investment represented by the expenditure on the KTP programme. This method of calculating GVA is limited to an extrapolation from salary data and would have benefited from additional information such as firm level turnover and profit data. The fact that individual firms were not surveyed, means that it is not possible to establish the full position in terms of impacts on GVA.

Some counterfactual evidence is provided by asking associates to self-report whether they would have achieved the same results in terms of skill development, career progression and increases in income if they had not participated in the KTP, or whether they would have but this would have taken longer.

In addition, counterfactual evidence is presented through a comparison with the impact of spending on similar schemes by RDAs' interventions (DBERR, 2009) and by examining average graduate salaries in the labour force survey (WCED, 2015).

The study has a greater number and broader range of respondents than other studies that have only reviewed one or a small number of KTPs. On this basis it attributes effects to the KTP by extrapolating the survey results to the entire population. These are largely confined to the effects on associates and to a lesser extent knowledge partners. The broader impacts on the firm and the economy more generally are limited to an estimate of the scheme's contribution to GVA, based on evidence of increased salaries. Although making good use of available data, the salary information can only provide a partial view of the overall impact of the scheme on GVA. Furthermore, the length of the programme and the use of a number of data systems over that time may have led to inconsistencies in the use of the data.

While commissioned as an evaluation by Innovate UK, the independent nature of the research consultancy undertaking the project suggests an unbiased view. Internal reports may have an element of research bias, focussing on reporting only the most positive impacts of the intervention.

Looking at the standard criteria used in evaluations of policy measures, which assess their relevance, coherence, effectiveness, efficiency and sustainability, this study provides a comprehensive overview of the *effectiveness* of the measure – the study documents the relevant outcomes (that is, those intended by the measure), notably the impacts on the associates and the knowledge base, and the economy as a whole (through the indicators of contribution of salary increases to GVA). It also shows a high degree of additionality of the measure when compared to similar schemes. However, the study does not look at the impact on firms.

The study also measures the *efficiency* of the measure by extrapolating the GVA data to estimate

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the return on investment generated by the measure for each GBP invested. This is seen to be positive.

The study reports positively on the *relevance* of the measure, in terms of meeting the needs of the parties involved by setting out the views of associates and knowledge partners of what they have gained by participating, but again there is no indication of the extent to which the needs of businesses are being met. Moreover, this aspect of the measure is not considered explicitly.

The *sustainability* of the measure is implied through the analysis of positive benefits to the economy, the conducive policy environment and additional funding committed by government.

The measure is also seen to have a high degree of *transferability* given its focus on placing graduates in businesses and the support mechanisms for associates that have evolved over many years. Although this aspect is not specifically addressed by the study, but was confirmed in the interview with the KTP Programme Manager.

The internal and external *coherence* of the measure is not addressed and there is no information on the way in which the programme operates in a wider context or its fit with other innovation measures, graduate employment or training schemes or academic/ industry partnerships.

Similarly, the studies in Scotland and in Northern Ireland have a high level of rigour, but have a much lower sample size (approximately 20% of the size of the WCED 2015 impact review). However, they offer some excellent insights and both confirm results found in the 2015 study helping to corroborate the evidence presented.

Overall the quasi-experimental approach used in the WCED study is nonrandomised, but provides some original data with a counterfactual element and also some grounds for calculating the direct returns on the investment in the scheme. This evidence establishes that the main operational objectives of the scheme are being achieved efficiently, with data on employment created and sustained, and on enhanced salaries and career prospects. This all suggests that the KTP is sustainable and also transferable, although since there are already a considerable number of mobility measures at both EU (Marie Skłodowska-Curie Actions) and national levels, transferability is more a matter of adopting aspects of the operational design, such as its simplicity in comparison with other mobility scheme, than of the concept as such.

The focus of the investigations, however, does mean that they are not able to shed light on some of the broader aspects that would be revealed by a systematic review. For instance, issues such as the coherence of the measure with other innovation promotion measures and in particular with the need to address a range of human resource constraints on innovation within a commercial setting are not considered. In short, although there is evidence on the effectiveness, efficiency and sustainability of the measure and, to some extent, its transferability, there is little information on the coherence of the measure and the whole study has a major element missing, in that the impacts on the participating businesses are not directly considered.

Actual employment outcomes

There are three types of beneficiary of the measure: the business, the associate and the knowledge base organisation.

For the business, the intended benefits of the programme centre on the contribution of the partnership and the role of the associate to increasing the productivity of the business demonstrated by the increase in sales, GVA, job creation and the salary of the associate in place.

Employment effects are recorded mainly at the level of the associate. The direct benefits are their

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experience of working in a commercial environment and the opportunity to gain additional business and project management experience and workplace skills and qualifications. An intensive eight-day high quality business training course contributes to this.

In turn the business experience and skills enhancement contribute to an improved earning potential, employability and career progression. These direct benefits have the potential to then impact upon the economy though jobs, wages, research income and business creation. It is worth noting that any wage increase would also indicate growth/improved productivity (WCED, 2015).

According to the KTP Handbook, a combination of KTP participants' existing academic qualifications and their work as a KTP Associate should entitle them to become a member of the professional institution most relevant to their specialism. For example, engineers will be able to join one of the engineering institutions (such as the Institution of Engineers and Technology), physicists can join the Institute of Physics, marketers can join the Chartered Institute of Marketing and IT specialists can join the British Computer Society. Participants in the scheme are encouraged to join the professional institution most appropriate to them to open up networking and educational opportunities. This should contribute to enable participants to start gaining professional recognition, which requires proof of knowledge and professional experience. Experiences gained by working on their project may well count towards the professional experience required to join a professional organisation. However, there is no data on the extent to which KTP associates have joined and maintained their memberships to professional institutions.

Employment effects are also demonstrated in the knowledge base organisation. Most associates (70–80%) enter private sector employment, with 10-15% remaining in academia. For those continuing in academia the pathways to impact would include enhancing their earning potential, employability and career progression but also publications, research and teaching material (more/higher quality) and follow-on research and commercialisation income. These direct benefits have the potential to then impact upon their academic/research establishment's income and potentially the economy and society.

The pathway to impact for the knowledge base organisations also includes improved understanding of the commercial environment and knowledge to support research and teaching, staff development and academic publications.

Overall assessment

Strengths/success factors of the instrument from an innovation and employment perspective

The KTP Programme is a highly successful programme for fast-tracking business innovation in the UK. There has been a considerable increase in GVA directly attributable to the programme as reported in the WCED evaluation. The scheme's strengths are also indicated by the continuously high levels of funding invested by the government (an additional GDP 30 million (€33,9 million) was secured for the programme in 2015, 2016 and again in 2017). The programme has clear merits from an employment perspective as it directly supports associates to fast-track their careers in innovative industries with more than 50% staying on at the firm involved. Improved business performance as a result of the KTP has also supported additional recruitment into the firm, and enabled training for staff. The KTP programme is very conducive to career enhancement, additional industry related training, and indirect employment is brought about by improved business performance. Success factors include the mutually beneficial relationship between the business and the knowledge partner and the incentives and imperatives for academic institutions to become more integrated in industry.

Weaknesses/bottlenecks of the instrument from an innovation and employment perspective

Initially the programme was considered to be bureaucratic which made it inaccessible to smaller

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SMEs with the highest need for trained personnel. The programme has been made more accessible since 2015 so that now smaller companies are applying. There are no barriers to exploiting the innovation created by the programme.

Implementation requirements and its degree of transferability

The programme is highly transferrable, and a range of universities have co-operated with this way of working with businesses across the UK Innovate UK are in discussion with innovation teams in Canada and India who are interested in implementing a version of the scheme in these contexts.

Although the programme forms a part of an integrated suite of innovation measures in UK innovation policy, it is designed to be implanted as a stand-alone measure. The measure has been used in some cases in conjunction with Innovate UK business innovation loans and grants where the two programmes are complementary and do not duplicate efforts.

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Links:

The KTP programme: http://ktp.innovateuk.org/

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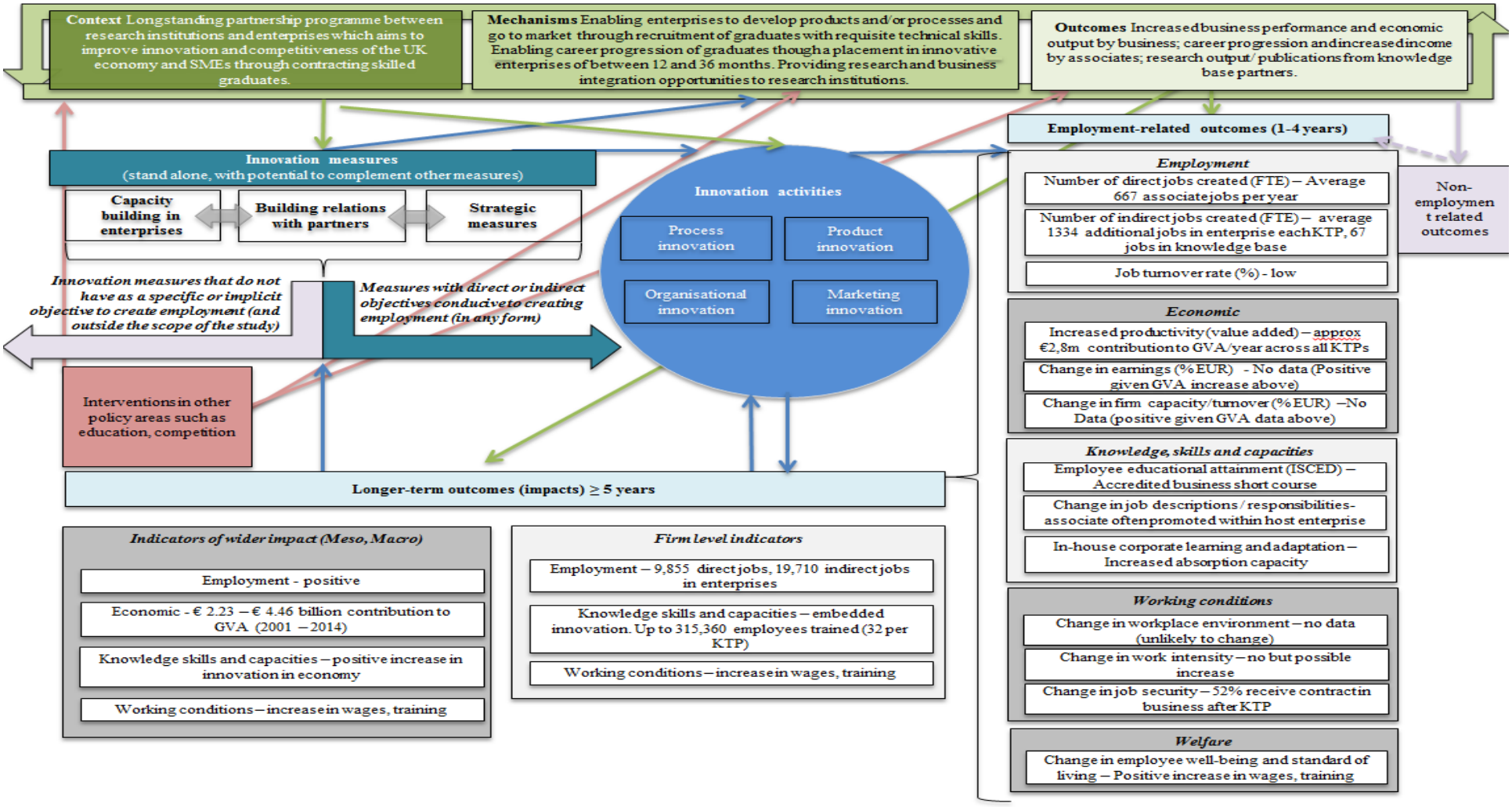
Graphic representation of the intervention logic of the measure



Laura Bassi Centres of Expertise - Austria

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Measure identification	**AT Laura Bassi Centres**
Name of the instrument	Laura Bassi Centres of Expertise - Förderung Innovation und Beschäftigung
Web link	https://www.waff.at/unternehmen/foerderung-innovation-und-beschaeftigung/
Location	Austria, nation-wide
Starting year and duration	From 2009 to 2017-2018
Name of the organisation providing measure	Launched and funded by the Ministry for Science, Research and Economic Affairs (BMDW). The Austrian Research Promotion Agency (FFG) manages the application appraisal process and helps with the implementation of the programmes and the projects selected for funding.
Type of organisation providing measure	Public institution
Other contributions	Business partners: 35%, research partners: 5% co-funding
Total budget for the measure	€25.5 million over a 7-year period.

Reason for highlighting this measure

The measure aims to support innovation and has an important employment dimension in that it targets female scientists and thus contributes to gender equality in terms of career opportunities. Furthermore it does this by systematically taking the Human Resources dimension of research and innovation into account, when planning the development of research centres.

The measure is also well-documented (although not all data are publicly available) and has been evaluated. One aspect that sets this measure apart from others in Austria is the long-term perspective it takes in that it not only supports specific and narrowly defined research projects but also seeks to bridge the gap between the research and business communities. This is one of the most important incentives for stakeholders in the area of innovation. The measure provides the flexibility to change topics throughout the project duration, for new parties to join at a later stage, and for others to leave the project.

An innovative approach is the future potential analysis emphasised in the appraisal process as opposed to more traditional selection processes, where researcher applicants would have typically been assessed largely based on their past experience and track record (see below for further information).

The policy context for this measure

The aim and activities of the measure contribute to Austria's overall research and innovation strategy. The measure's goal of exploring ways to increase collaboration between the research and business communities is reflected in Austria's Research, technology and innovation (RTI) strategy, which refers to a systemic approach of collaboration and coordination and sets out a vision for 2020 where close collaboration between science, business and society and excellent research innovation will be the usual practice in Austria, as opposed to the exception as it is today. The RTI strategy also refers to strengthening the 'knowledge triangle' (education, research and innovation). (Federal Chancellery, 2011) The BMWFW included an impact orientation in its budget, which includes a

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goal to reach a share of female leaders in all programmes it supports of 15% by 2020. The measure contributes directly to this goal. The measure is too small, however, to make a meaningful contribution to Austria's employment strategy.

The measure is part of the BMWFW's w-fFORTE programme 'Economic Impulses by Women in Research and Technology', which aims to create equal opportunities for men and women in scientific and technical work environments and thus has an employment-related focus.

The activities of w-fFORTE include the implementation of the Laura Bassi Centres, but also cover:

- **Career training for women in research and technology**: Helping women to enhance their strategic career skills and providing an opportunity to ask experts individual questions. The focus is on topics such as strategy, team leadership and development, dealing with power, work-life balance and much more.
- **Leadership workshops for men and women in cooperative research**: The management of research projects across different institutions, locations and disciplines is a particular challenge. Project managers do not only face challenges with regard to their professional expertise, but also when it comes to issues such as team leadership, the management of cooperative projects, career development and diversity management. The aim is for the participants to introduce this knowledge into their daily work and their organisation and to learn from each other. In order to foster a working culture in which women and men are able to develop equally, the workshops are open to women and men.
- **Studies, knowledge transfer and events**: w-fFORTE commissions studies that shed light on the existing structures in research and technology and that identify requirements for change.

The Laura Bassi measure is administered by the FFG but is also actively promoted by the BMWFW in Austria and beyond. Thus, the Ministry organises workshops with the FFG to diffuse the knowledge gained by running the programme. Other programmes operated by the FFG have been modified as a result. The programme has contributed to a cultural shift in the country's research community. Policy makers in Germany and Switzerland have already taken note and are considering setting up similar programmes.

Aims and objectives of the measure

Rationale, objectives

The measure aims to promote Innovation through diversity. It is a response to a problem identified by the Austrian government: Female researchers are greatly underrepresented at the nexus of the business and science communities. Moreover, the business and science communities were quite separated in the past (this changed to the point where now the situation in Austria can be considered good practice).

In 2004-2005, the BMWFW noticed that hardly any research centres had female managers. They wanted to change this without having to resort to quotas. Rather, they wanted to find out why relatively few women applied to manage research centres. Possible reasons they identified included the extra strain put on female researchers who have a family, and the fact that female researchers tend to have lower publication rates than men. The latter aspect meant that women fell behind where performance of researchers was exclusively linked to the number of publications. The Ministry believed that this was not a good indicator for assessing the future performance of a manager of a centre linking science with industry. Instead, they decided to assess the *future potential* of applicants in a hearing where applicants were invited to present their plans for a centre

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running over 7-8 years. This was a novelty in Austria in that applicants not only had to present their scientific goals but also outline how they intended to manage the research project. Each Centre needs to develop an adequate HR concept. Moreover, the measure also looks at the way that employees at centres are treated and is intended to contribute to team members' career development through international exposure and contacts with industry. This thinking led to the ambition to create a new research culture, responding to developments in science, which increasingly operates on the basis of transdisciplinary and interdisciplinary research, with a focus on team orientation, interaction with industry partners, targeted personnel development and an efficient management culture. This environment is much more conducive to the involvement of female researchers. Furthermore, eventual employment of centre staff in industry is one of the programme's longer-term objectives, improving gender balance in the industrial research sector too and contributing a wider range of talent. The Laura Bassi Centres facilitate this development.

The measure focuses on gaining a better understanding of different research cultures in the research and business worlds regarding issues such as research management, team work, work-life balance, mobility, career models, remuneration and financing. The centres are led by excellent female scientists and are situated at the interface of science and the business world in the area of applied and basic research. By establishing the centres, the government hopes to support a modern research culture that is attractive both to men and women and demonstrate its value. The emphasis here is put on team orientation, project management and communication skills. The measure should also increase the visibility of excellent female researchers and the team members at the nexus of science and industry.

Main elements of the support

The measure supports the creation of new centres of innovation and knowledge where scientists work with small and medium-sized enterprises (SMEs) and large firms, universities and other organisations to research innovative ideas. The instrument thus aims to build the careers of individual researchers and enterprises by funding facilities. It also supports building relationships between firms and other partners, with a focus on industry-academic co-operation. In total, eight centres have been funded, mostly in the fields of biology and medicine, and in materials research:

- Centre for Visual Analytics Science and Technology (CVAST);
- Plantproduced BioPharmaceuticals (PlantBioP);
- BioResorbable Implants for Children (BRIC);
- Diamond and Carbon Materials in Life Science (DiaLife) (discontinued after the midterm evaluation);
- Quality Engineering Lab (QE LaB);
- Center for Optimized Structural Studies (COSS);
- Ocular Vaccines (OCUVAC); and
- THERApeutic application of neuroPEPtides (THERAPEP).

The long-term perspective of the Laura Bassi Centres provides a degree of flexibility which is the main driver for participation. The specific research topics of centres can change over the seven-year funding period, and new enterprises can join at a later stage, while other firms can leave the project, but the overall configuration remains in place.

The scheme funds centres of competence involving partners from academia and industry. Researchers physically work in the centres, and often this involves temporary transfers of

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researchers between the partner organisations. Each centre has its own legal structure and employs the core team members directly. Centres are owned jointly by the key project partners, typically a combination of universities and businesses. It is within the centres where information exchange takes place. In addition, public (research) institutes are encouraged to cooperate with the centres. Businesses can get reimbursed for both material and human resource expenditure.

Target groups and intended beneficiaries

The beneficiaries are primarily the leaders of the Centres, and on a second level the employees, as well as the SMEs and large firms, universities, colleges, centres of competence, research facilities, start-ups and NGOs participating in the Centres. Excluded are male Centre leaders, but employees of the centres can be female or male.

Characteristics of the measure

Instrument type

This one-off instrument focuses on human resource development and capacity building through funding the creation of innovation and research centres led by female researchers with great future career potential and supported by a transdisciplinary team.

Relation of the measure to other measures

As described in the context section, this measure is a major element of the BMWFW's w-fFORTE programme 'Economic Impulses by Women in Research and Technology', which encourages participation by women in research and technology, by offering workshops on career strategies providing targeted information on career development and highlights the successes of women in research and technology. It thus represents an 'impulse' measure that creates learning going beyond the programme itself. The w-fFORTE programme acts as a framework in which pilot initiatives such as the Laura Bassi Centres are devised and launched. The Laura Bassi Centres can be considered the 'flagship project' within the w-fFORTE programme.

Type(s) of innovation supported

The measure supports all types of innovation, but with a focus on organisational innovation and social innovation. Innovation is supported through trans- and intradisciplinary approaches. The latter means that not only are scientists from related disciplines brought together, but teams also include members who are not scientists but have research management experience.

Sectoral focus

The research topics supported include information technology, careers in research, life sciences, materials and production, mobility, security, environment and energy and space.

Regional specificities

Laura Bassi Centres are located across Austria. Partners can come from any country. In practice, most partners are European. This depends on the project and research topic. Sometimes, partners from the USA and Asia are involved.

Funding available for applicants

The measure supports each Centre with up to €320,000 per year (out of a total of €500,000 per year, with the remainder being provided by the businesses and the universities participating in the Centre) over the 7-8-year-period, providing a total of approximately €2.5 million per centre from public sources. In the fourth year, an independent interim evaluation decides whether funding is continued for the remainder of the seven years or not. Out of the eight centres supported initially,

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seven continued to be supported after the interim evaluation.

Time period over which the effects are expected to be felt

The Centres operate over a period of four years and can then be continued for another three to four years. The effects are expected to be felt throughout implementation, and the long-term impacts will be measured after the programme has come to an end after a total of seven to eight years.

How the measure is implemented

The instrument design

The instrument design focuses on the creation of research centres and two main components: the promotion of female research excellence by supporting female centre leaders and the generation of innovation through linking these centres to businesses interested in applied research. The intervention logic rests on the assumption that combining research innovation with organisational innovation in terms of the management of research centres and research teams can create impulses for the wider research and innovation (R&I) ecosystem in Austria. This is reflected in the impulse nature of this one-off programme which is coming to an end in 2018. In a way, the intervention logic assumes that innovation in employment matters can create innovation in other fields (such as research results). Thus, it is expected that research centres led by women will be organised in a different way. The Laura Bassi Centres adopt an intradisciplinary approach, which has attracted more female researchers and meant that research teams also included non-scientists. The Centre managers were provided with more freedom in designing their research projects than is typical for publicly funded research programmes. All of these factors are expected, in view of the managing authorities, to contribute to the Centres yielding different research results than more conventional research projects.

Eligibility criteria and restrictions

The selection criteria for the Centres included:

- Quality of the research programme;
- Quality of the consortium and research team;
- Management-related criteria: plausible concept of organisational structure, experience in research management, leadership competence, methods for know-how development with all participating partners, resource planning, plausible financial structure; and
- Career-related criteria: creating opportunities for career development of employees, adequate share of female researchers in team.

Centres were selected through a call for proposals at the beginning of the programme. There is a degree of competition among applicants, who are female scientists with a research project idea, in that once the eligibility criteria are met, selection criteria are also applied in relation to the quality of the applications (see section below for more information). This means that there is no guarantee that eligible applicants are finally selected.

How the measure is accessed and delivered

The measure selected the Centres it would fund through a two-step application process based on a single application. This included an evaluation of the scientific quality of applications and their future potential focusing on management and careers aspects and then oral assessments in which applicants set out their proposals to a panel of assessors. This was then used to assess the potential of individual scientists leading the centres with an emphasis on their future potential rather than their past achievements. Elements involve personal development and realising opportunities under

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adverse conditions such as part time contracts. This new focus was expected to make it easier for talented researchers with non-traditional career pathways to thrive. An international jury issued recommendations on which projects to fund. The final decision was taken by the BMWFW. In practice, they accepted all recommendations made by the jury. The FFG assessed the economic viability of applications.

The mechanisms used for the implementation

The measure is implemented by the creation and operation of research centres which are supported financially for up to seven years. The innovative and forward-looking selection criteria help to bring out the strengths of female candidates for the post of Centre manager and other posts. Other criteria relate to the scientific excellence of the focus and projects of each centre. Workshops are held once every year to train the centre managers and help maintain the special ethos of Laura Bassi centres.

How the measure is expected to generate its intended effects

The effects are generated through the networking and collaboration within Centres, the lessons that can be learned for the development of the programme, and the career development of participants. They concern the development of competences and skills rather than the creation or retention of jobs. The key is to support gender equality by promoting female participation in research leadership roles.

The intended general and employment effects of the measure

The creation or retention of jobs is not an explicit goal of the measure. Rather, the measure aims to contribute to improved working conditions and skills development. It helps explore and develop new career models and modern work environments. Employability plays a role in that the Centres implement a more cooperative model of innovation and research where conventionally the science community is quite competitive. Rather than being just excellent research specialists, the people working in the Centres also develop communication and management skills, which should increase their employability outside science. However, actual data on the career paths of Centre managers and employees are not yet available since this is an ongoing programme, and will not be evaluated until after it has come to an end in 2018. In the past, female researchers in Austria tended to prefer staying within a university environment. The BMWFW aims to change this through the measure and to reduce the distance to the business community through networking and collaboration. Industry management in Austria is still largely a male domain. Generally, though, it is difficult to trace career paths in the long term, especially when researchers go abroad.

A specific goal of the measure is the integration of female researchers. Here, one finding that fed into the measure's design is that in the case of female researchers it is important to not only to look at their track record but also at possibilities for future career development. The programme provides a new impulse in this regard. For the programme, the application process was designed in a way that makes it easier for female applicants to succeed.

Wider effects relating to competitiveness and business growth are not explicit objectives of the measure, but they are addressed indirectly, as the measure is intended to support the integration of the business and science communities and reduce cultural barriers between them, which in turn should benefit the R&I system in Austria overall.

Summary of the main evidence available

The main evidence available at this stage is:

- A hearing and internal midterm evaluation;
- An external interim evaluation; and

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- Monitoring data.

A final evaluation will be conducted after the programme comes to an end in 2018.

Each centre employs five to 10 team members, which is the only identifiable direct job creation effect of the measure, since the evidence currently does not focus on job creation. The number of partners participating in Centres can fluctuate over time; data on the actual number of participants in the past five years could not be obtained. At any rate, the number of beneficiary enterprises is not key in determining the performance and impact of this measure which rather focuses on the creation and management of innovation and research centres.

Instead, the key evidence of the measure's results relates to improved working conditions and skills development, achieved through training in the Centres. Recent workshops, that were organised as part of the wider w-fForte programme and not only for Laura Bassi Centre members, included aspects such as using 'gamification', where cooperation and team work are practiced in a gaming environment. Other workshops cover design thinking, management tools to increase resilience of organisations, teams and employees, and leadership coaching, among others. Overall, 600-700 female researchers have participated in such trainings, which also creates a networking effect. It has not been possible to establish how many of these are part of the Laura Bassi programme specifically.

Four years after the launch of the measure, half-time into the funding period, **a hearing and a midterm evaluation** of all Centres were carried out by w-fForte. This evaluation focused on the scientific aspects of the projects and is not publicly available. It identified some short-term effects relating to developments in working conditions and skills development that have enhanced the effectiveness of the centres, though the managing authorities expect long-term effects relating to participants' career paths to manifest themselves after the programme has come to an end.

An ex-post impact assessment is planned for the end of the programme.

An **independent external interim** evaluation was carried out in real-time during programme implementation by the Austrian Institute for SME Research from 2009 to 2014 and made publicly available. The study was commissioned by the Federal Ministry of Science, Research and Economy.

The evaluation focused on learning opportunities for the remaining implementation period and feedback loops including specific recommendations on programme management and procedures.

It made use of a diverse set of data collection methods, including:

- Desk research: secondary data reviewed includes programming documents, the evaluation handbook and documents generated as part of the midterm evaluation (see above),
- Analysis of monitoring data,
- Structured open interviews (including repeated interviews with the same counterparts over time),
- Focus groups,
- Workshops, and
- A standardised online opinion survey of managers and employees at the Centres. The survey was disseminated to 80 centre employees plus the 8 centre managers, with a response rate of 83%.

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Two dissemination workshops were also held, with the staff of the centres and public officials.

One of the study's key findings is that the centres play a useful role in enhancing cooperation and bridging cultural and communication gaps between the business and science communities. Centres also play a role in developing a new research culture where team results are valued more than individual contributions. The long-term funding of centres was credited with producing excellent research results through continuous competence development, which also had a positive impact on team members' career paths. In terms of wider lessons of this impulse programme, the study recommends pursuing a dual approach of a) mainstreaming successful and transferable programme elements such as the focus on management and personal development or the explicit support of intradisciplinary approaches, and b) continuing the programme itself but perhaps revising its target group to focus on young researchers. The study does not, however, provide any evidence as to the cost-effectiveness of the measure or the impact of the programme on the visibility of female researchers in the science and business communities.

The evaluation proved instructive in adapting the programme design in the second half of its implementation.

Apart from the evaluation's findings, feedback collected from project participants in the context of **ongoing monitoring performed internally** (see also next section) suggests that the Centres are useful in supporting researchers in developing their dissertations, by providing an environment in which research questions can be discussed, and allowing them to cooperate with industry to identify new research topics. It also benefits university researchers, allowing them to become familiar with industry topics, which facilitates the transition to a career in industry at a later stage. Industry partners are also satisfied with the measure. The Centres enable them to conduct research projects they may not be able to carry out otherwise and provides them with access to new know-how.

Quality of the evidence base

The independent external interim evaluation appears very robust and can draw on a rich evidence and data base. It is designed as a strategic tool accompanying the process of implementation. The study represents a process evaluation with an emphasis on learning and feedback loops and issuing clear recommendations on programming and implementation. Since the evaluation was carried out in parallel to the implementation of the programme, it can only provide initial evidence on the impacts of the measure.

The study clearly identifies two target groups on two different levels:

1. The direct target group of universities, research institutions, scientists and participating enterprises who are interested in the achievement of the goals of the Centres themselves; and
2. The research policy community, which is interested in the achievement of goals of the measure itself and its role as an instrument to learn about ways to support female research careers.

The study was guided by three goals:

1. Considering programme evolution, its phases and processes of implementation;
2. Analysing the functioning and perception of the programme; and
3. Supporting the generation of findings on gender-friendly RDI programmes and research 'cultures'.

The evaluation includes clear conclusions and recommendations, emphasising the right framework

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conditions that need to be in place for the programme to succeed along with accompanying measures. A plus is that the evaluation also assesses the replicability of the programme. It identifies elements that can be transferred to new or other programmes and suggests that the positive elements of the programme should be 'mainstreamed' into support measures in Austria overall.

The study is also transparent about challenges faced: the fact that the evaluation team was closely involved in the implementation phase of the programme did not diminish its independence.

Overall, the study has a fairly robust methodology and is transparent about how it arrived at its results. However, the evidence could have been stronger if stakeholder feedback had been triangulated by other data sources (other than a limited review of programming data) since this would have helped identify any contradictions in the data and increased the reliability of conclusions drawn from it. Moreover, a counter-factual analysis is lacking. At the same time, this is understandable in case of a process evaluation accompanying the implementation of a programme, which cannot have the same ambition in terms of assessing impacts as an ex-post evaluation. The results of the study are transferable only to a limited extent given that they focus on specific aspects of the programme such as its nature of being an impulse programme. However, the study does attempt to develop some recommendations on which elements of the programme can be mainstreamed into wider Austrian R&I policy.

Monitoring is very comprehensive and elaborate and takes place on two levels: on the level of the measure as a whole, and on the level of the individual Centres. It is conducted through a biennial assessment and annual management competence workshops guided by external experts on topics such as team leadership, organisational management, management of the work environment and personal marketing. Each Centre needs to detail research progress, achievement of goals, management and contribution to programme objectives in an annual report. While the monitoring data could not be obtained by the authors of this report, an empty template showed that the monitoring system includes indicators such as the number of full-time and part-time staff, their level of education, age and income groups and the individuals' roles within the team.

Moreover, the FFG regularly performs **surveys with research partners of Centres** (professors and project coordinators) to determine their satisfaction with the projects. Output indicators monitored include number of publications, patents and licences, but also more qualitative ones such as 'added value of an intradisciplinary approach', quality of team-building measures and design of career processes. Employment effects are not explicitly included in the monitoring.

Overall, the evidence that can be obtained from the interim process evaluation and other sources allows assessing the measure's effectiveness in achieving its objectives and its relevance to the wider research community. Information on the sustainability is lacking, given the evaluation was carried out half-way through implementation of the programme. Moreover, efficiency, coherence and added value are not explicitly addressed.

Actual employment outcomes

Employment outcomes relate to the improvement of working conditions, equal opportunities for men and women, and skills development and a major strength of the measure is its consistent effort to develop a new research culture in which these elements not only have an impact on the gender balance within applied scientific and technical research, but also contribute to a more diversified and effective innovation environment in Austria.

The employment outcomes are partly short-term effects that could already be observed in the interim evaluation, but there are also long-term effects in that it can be expected that participants' career paths are affected even after they leave the research centres after the funding period. However, the managing authority (the FFG) cautioned that it is difficult to trace career paths when researchers move abroad since then their social insurance number cannot be used to track where

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they take up employment.

In the long term, effects can also be expected in other organisations as participants move around the research and business communities and take up new jobs, bringing the skills they acquired during their time in the Laura Bassi Centres to bear in new contexts. The independent external evaluation also highlighted innovative aspects of the Centres' management and operational practices, including selection techniques and the use of interdisciplinary approaches.

The creation or retention of jobs are not monitored, since this is not an objective of the measure. In any case, the measure's budget and scope are too small to have a discernible impact on the Austrian job market.

There is also an issue of sustainability, which is a potential weakness of the whole approach. It was intended that the initiative would be an impulse measure that brought a change to the research and business environment, inspiring other research organisations in Austria to adopt similarly innovative approaches. Whether the lessons of the centres have in fact been carried over into other research environments is not certain and, if funding is not continued, it may be that the effects of the measure are dissipated.

Overall assessment

This measure explicitly focuses on employment enhancement, creating better employment conditions that are more conducive to women undertaking research and with innovation being supported both at the project and organisational level.

This measure does not focus on job creation and retention but rather on improving working conditions and creating equal opportunities for men and women in leadership roles in research and industry. It is innovative in that it emphasises future career potential rather than past performance in its appraisal process. The measure is small in scale, and does not have a great impact on employment locally, but it does have high replicability and may be taken up in neighbouring countries with similar framework conditions to those in Austria, though a certain degree of political commitment is required.

The measure is accompanied by a comprehensive and well-developed monitoring and on-going evaluation system with a wide range of indicators. In addition, a midterm evaluation was carried out which provides lessons learned for the remainder of the programming period. Its methodology is fairly robust and presents evidence from different data sources. It will be complemented by an ex-post evaluation at the end of the programme.

The key strength of the programme is that it tries out new approaches to research management and combines social and research innovation. The programme design explicitly facilitates the transferability of results and their mainstreaming into national R&I public support programmes. Weaknesses relate to the relatively small scope and limited funding available, which may undermine the representativeness of results given that only seven centres were supported for the full funding period.

Information sources

References

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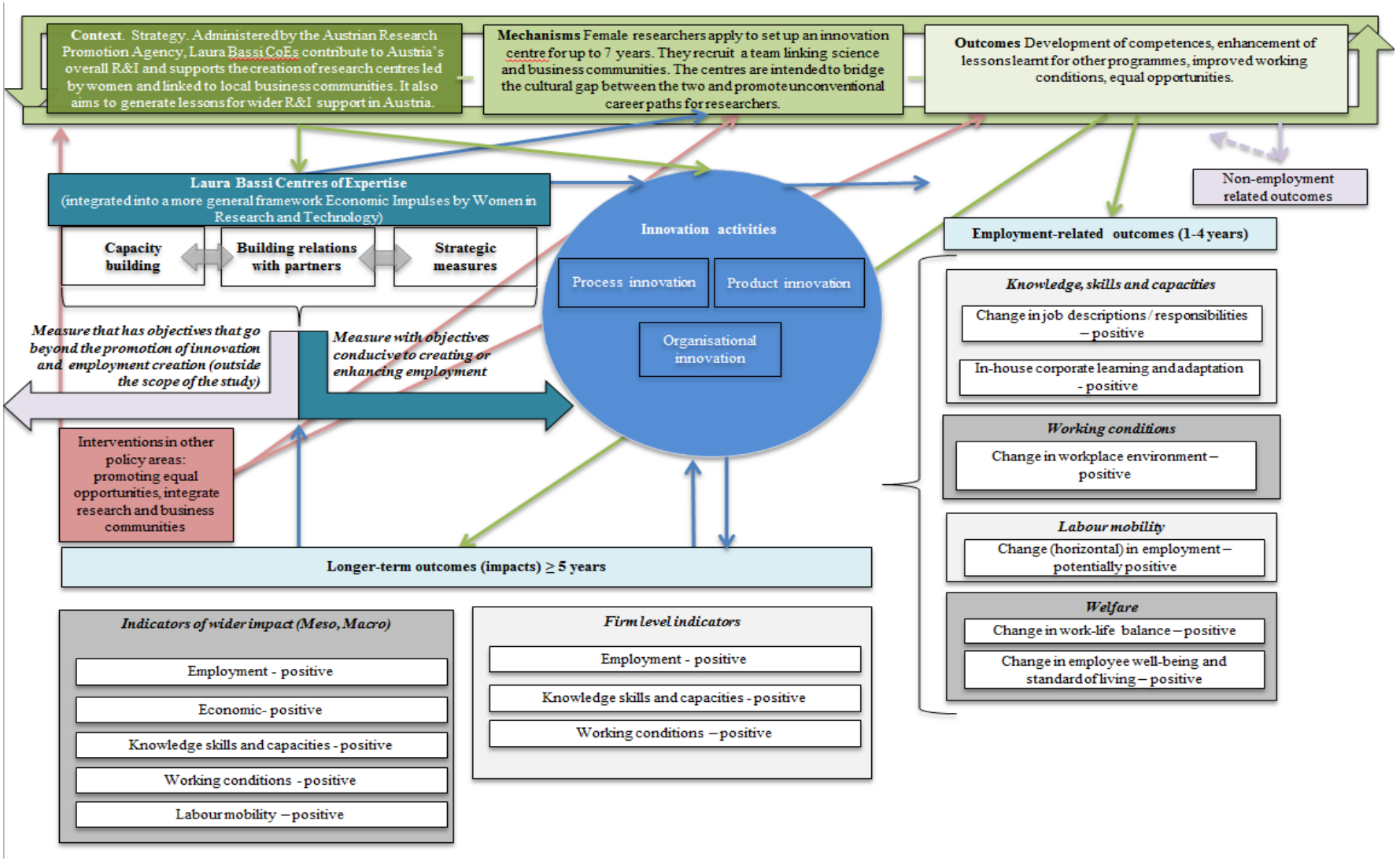
Links

https://www.ffg.at/en/laura-bassi-centres-expertise

Graphic representation of the intervention logic of the measure



Competitiveness poles – France

Competitiveness poles – France	
Measure identification	**FR Competitiveness poles**
Name of the instrument	**Competitiveness poles, Pôles de compétitivité**
Web link	http://competitivite.gouv.fr/
Location	A map of all current poles in France is available at: http://competitivite.gouv.fr/documents/commun/Documentation_poles/cartes-poles/carte.pdf
Starting year and duration	The measure has been in place since 2005. The first programming period ran from 2005 to 2008 and the second programming period from 2009 to 2012. The current programming period began in 2013 and will run to 2019
Name of the organisation providing measure	The General Enterprise Board (DGE) and the General Commission for Equality between the Regions (CGET). The poles are administered by the Inter-Ministerial Committee for Regional Planning and Development (CIADT)
Type of organisation providing measure	National government ministry
Other contributions	Financial support is provided through collaboration projects funded by the Single Interministerial Fund (FUI).
Total budget for the measure	€1.5 billion was allocated to the poles for the period 2009-2012, amounting to approximately €0.5 billion per annum.

Reason for highlighting this measure

Competitiveness poles are a common measure across Europe and have formed a key part of France's innovation strategy for over a decade. They are well integrated with other measures (such as the research tax credit) and have had their performance monitored and evaluated by the French government.

The competitiveness poles were created along thematic lines with an expectation that they would increase contacts and collaboration between the private sector and research actors in a particular industry (for example transport or energy), helping to overcome some of the difficulties in bringing research to the market. If this aim is achieved, poles can be expected to increase employment through economic growth, leading to firm growth and the creation of start-ups.

The policy context for this measure

The French government is very supportive of research and innovation, particularly within the private sector. By supporting the development of cutting edge research in new areas, French research and innovation policy aims to promote innovation and entrepreneurship in emerging sectors with the ultimate aim of developing a resilient economy that is well adapted to the twenty first century. France has historically invested a significant amount of money into research and development (R&D), with an R&D intensity of 2.26% and a GERD (Gross Expenditure on R&D) of €48.1 billion in 2014 (EU average €10.1 billion).

Poles form a major strand of French innovation policy, as laid out in the national research strategy, the most recent of which - 'France Europe 2020' – was published in 2015. They are one of a number of measures supported by the French government, which are intended to interact with and

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further boost each other. According to the evaluation carried out by Hassine and Mathieu (2017, see below for more information), for example, a significant number of the organisations benefiting from the poles were also recipients of the research tax credit – and benefited from higher levels of tax credits as a result of their activities in the poles.

Aims and objectives of the measure

Rationale, objectives and main elements of the support

Competitiveness poles bring together enterprises, research centres and educational institutions in a particular geographic area to develop synergies and cooperative efforts targeted at one (or more) given market(s). The poles are thematic and aim to use synergies and innovative joint projects to give their members a chance to be national and international leaders in their fields.

The poles aim to boost the competitiveness of the French economy and to help develop growth and jobs in key markets.

This objectives of the competitiveness poles, as defined by the French government, are:

- Helping to accelerate innovation efforts;
- Providing support for high-tech and creative activities; and
- Improving the attractiveness of France for multinational high-tech businesses via greater international visibility.

Target groups and intended beneficiaries

The measure is targeted primarily at the private sector and the research sector, although public sector actors are also allowed to participate in collaborative projects. If it achieves its aims, the ultimate beneficiary should be the French society in general, as solutions are developed for the societal challenges identified in France Europe 2020.

Characteristics of the measure

Instrument type

Competitiveness poles are aimed at building relationships with partners. There is, however, also an element of capacity building in the form of training provision.

Whether the measure is stand-alone or part of a package of measures

The poles are a stand-alone measure, however there is significant overlap between members of the poles and beneficiaries of other national innovation-boosting measures such as the research tax credits. This is part of the design of national innovation support measures in France, which are intended to be complementary to each other.

Type(s) of innovation supported

This measure is mainly focused on product and process innovation, but the networking and collaboration elements also point to organisational innovation.

Sectoral focus

Each pole has its own sectoral focus. These cover a broad range of areas, for example aeronautics, renewable energy, perfumes and cosmetics, and developing foods for the future.

Competitiveness poles – France

Regional specificities

The poles are organised thematically, so different regions tend to focus on different areas of expertise. The idea of proximity is important for the poles to function appropriately, in order to promote collaboration and networking. Most poles are based within one region although some are inter-regional.

Funding available for applicants

The French government provides funding for R&D projects and innovation platforms, through calls for projects from the Single Interministerial Fund (through France's National Loan Programme) and the Investments for the Future Programme. It also provides partial financing of pole governance structures (in collaboration with local authorities and firms) and financial aid for thematic activities through decentralised government departments. Further support for R&D projects carried out by pole members is provided through the French National Research Agency and, sometimes, by local authorities.

Time period over which the effects are expected to be felt

This is a long-term measure, with larger effects expected over a 10-20 year timeframe. Initial outputs, such as networking, relationship development and collaboration may be seen very early on but the development of new products and the broader economic impacts can only be seen in the medium to long term.

How the measure is implemented

The instrument design

Competitiveness poles in France have the objective of reinforcing innovation and boosting the competitiveness of the French industry by encouraging collaborations between established businesses, start-ups, universities and public research laboratories present on the same territory (this is usually done at the regional level, although some poles are inter-regional). The poles are organised thematically, with each territory specialising in a different area (examples of specialisations include cosmetics, aeronautics, telecommunications, energy and transport). Some of the poles were originally envisaged as business parks, with all organisations based in the same physical space. The definition currently used is much looser, with members required to be based in the same region but not necessarily in exactly the same geographic location. 67 competitiveness poles were initially set up but after some mergers, relabelling, creation of new poles and other changes, 71 exist in 2018. The poles focus mainly on collaborative R&D projects, providing training, equipment and physical premises as well as some financing opportunities.

Each pole is responsible for drawing up a five year plan, which explains the shared vision of the participants and lays out their aims and objectives. Poles are expected to establish partnerships between participants with recognised, complementary skills; set up collaborative R&D projects, as well as structuring projects such as innovation platforms that can benefit from public subsidies; and promote an overall environment that fosters both innovation and growth among the pole's members. This is done by providing leadership, exchange and support for members in areas such as private funding for firms, industrial property, forward-looking management of jobs and needs for new skills and qualifications, developing international technological partnerships regional synergies, etc.

Eligibility criteria and restrictions

Large and small firms, research laboratories and educational establishments based in a specific region and working on themes relevant to the particular pole are eligible to join pole. Other partners

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may be brought in, such as public authorities, either local or national, as well as firms providing business services.

Each pole operates according to its own internal rules, so the details of eligibility may vary. However, the basic criteria to join a pole are:

1. Members must be a private or public legal person;
2. Members must operate in one of the strategic business areas of the pole;
3. Members must contribute to the development of the pole, through their activity or by participating in collaborative initiatives and innovation projects associated with the pole; and
4. Members must pay an annual subscription and accept the internal rules of the pole.

Applications are made to a specific pole and membership of that pole is subject to approval by their internal managing authorities.

How the measure is accessed and delivered

For any individual pole, a public or private legal entity which is active in the poles area of expertise and present in the region (or moves there) can apply to join. The specificities regarding membership rules may vary for different poles, but the basic method is to apply via the pole's website. Members are expected to contribute to the development of the pole, through participation in collaborative initiatives and innovation projects as well as their own activities. Furthermore, an annual contribution is expected to help cover administration costs.

Once an organisation has been accepted as a registered pole member, they have access to various different types of finance allocated by the French government. As well as money to help with administration of the poles, members have access to pole activities (for example training and networking), funding for partnership research projects and financing for collaborative R&D projects which bring together at least two enterprises, a public or private laboratory, a higher education institution or a technology transfer agency. All partners in collaborative R&D projects must be registered as pole members.

The mechanisms used for the implementation

The measure works by bringing the different actors involved in all stages of R&D (from basic research to the commercialisation of research products) together in one region. This geographical proximity allows for formal and informal contacts to be developed, fostering information exchange, increasing flexibility and responsiveness between the different actors and allowing for better management of workflows along the supply chain. In addition, it is expected that competition within the pole would incentivise continuous innovation. The competitive advantage provided by collaboration between pole members is expected to speed up the development and commercialisation of innovative products and services.

How the measure is expected to generate its intended effects

The main method by which competitiveness poles generate their effects is by grouping together the various different actors involved in research, development and innovation in a particular sector. This geographical proximity is expected to generate effects in three principal ways. Firstly, they create efficient labour markets by facilitating the matching of employers' needs with appropriately skilled employees. In the French context, the thematic specialisations of different poles can be expected to further facilitate this process. Secondly, they are expected to reduce transaction costs

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by increasing the geographical proximity between firms along the supply chain (both upstream and downstream of the production process). Finally, broader spillover effects can be expected in terms of both formal and informal knowledge transfer facilitated by the physical proximity of different actors in the R&D landscape.

The intended general and employment effects of the measure

Competitiveness poles are expected to increase levels of R&D investment, which should lead to a direct increase in skilled research jobs. Furthermore, the opportunities for formal and informal networking, information exchange and training may be expected to increase job satisfaction levels. In the longer term, the competitive advantage which is expected to be generated by pole membership should translate into firm growth, opportunities for entrepreneurship and the creation of start-ups to commercialise research findings – thus creating direct and indirect job creation.

Summary of the main evidence available

A number of evaluations of the competitiveness poles have been carried out since 2004. The most recent of these was undertaken by Haithem Ben Hassine and Claude Mathieu of the public think tank France Stratégie on behalf of the newly created National Commission for the Evaluation of Innovation Policy (CNEPI) in February 2017. The evaluation is entitled 'Evaluation of the policy of competitiveness poles: The end of a malediction?' (Évaluation de la politique des pôles de compétitivité: La fin d'une malédiction?) and is based on data covering the period from 2006 to 2012.

The main objective of the evaluation is to understand if the creation of competitiveness poles has had an effect on private sector R&D expenditure or if it has instead had windfall effects, with the use of the 'pole' label enabling enterprises to replace their own funding of R&D with public sector funding. The evaluation also seeks to determine broader impacts of the measure, by analysing effects on variables which are deemed as being closer to the market, such as value added, exports, labour productivity, etc.

The study is based on an econometric analysis of the effect of pole membership on R&D spending and on research tax credit claims (CIR). A conditional difference in difference approach is used, with propensity score matching to control for biases. The analysis is carried out in two steps: in the first instance, data from 2005 (the year before the poles were introduced) is used to match firms belonging to poles with firms with similar characteristics which do not belong to poles according to their propensity score. This helps to control for two biases. The first is related to the difference in support according to the different observable characteristics of treated and untreated organisations. The second bias results from differences in observable characteristics between the two groups, even in the presence of a common support. The counterfactual for each firm present in a pole is built from a set of neighbouring enterprises, never present in a pole before the year considered, and whose respective weights (obtained from a kernel estimator, whereby enterprises in the control group are weighted according to their similarity to the treatment group on a range of indicators) indicate that they are similar in other respects to the firms in the treatment group. This means that firms which do not match the treatment group closely enough are excluded from the control group and those which match the treatment group most closely are given more importance within the control group than those which may only partially match the treatment group. In order to limit problems of reverse causality, the observable characteristics of the firms used to build the propensity score are also taken from 2005. The difference in results before and after the application of the measure for the treatment and control group is then calculated, in order to see the difference in their behaviours over the evaluation period (2006 – 2012). Any bias due to permanent differences between the two groups is thus controlled, as is the bias due to trend effects (treatment

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independent) for the group treated.

Multiple data sources were used to construct the control and treatment groups, with a total of 76,944 observations. The DGE has kept data on member institutions of the competitiveness poles since 2005, which allowed for a detailed analysis of membership (for example, to exclude members which left before the end of the period under evaluation or joined during the period). This provided a unique identifier for each organisation (the SIRET number) which allows tracking through the tax system and annual enterprise survey (since 2008, these were published jointly as Annual Enterprise Statistics). These databases cover all entities subject to corporation tax. They contain information on turnover, value added, export, intermediate consumption, wages, investment, etc. Job variables are also available but potentially subject to measurement errors. Although what these errors might be was not elaborated on by the evaluators, they could relate to the measurements relying on self-reporting, which is inherently less accurate than reporting associated with financial declarations. Employment effects were therefore measured by including data from annual social declarations (DADS) which track salaries, redundancies, retirements etc.

In order to identify foreign firms, an annual survey on financial links was used. Information gathered for the research tax credit and published by the Ministry of Higher Education and Research (MESRI) was integrated to understand what crossovers there are between the two measures. The choice of data sources appears to have been given significant thought and the sources themselves are largely from well-respected national surveys. Since they are based on tax data, however, they relate to profit-making organisations. This means that the primary focus of the analysis is by necessity the private sector, leaving out any impacts on research institutes and public sector partners.

The evaluation found that membership of the poles has grown significantly over the period under consideration. In 2012 almost 9,000 enterprises were members of one of the 71 poles installed on French territory, as opposed to 4,000 in 2006. The study also showed clear interactions between the poles and other innovation measures. Firms belonging to the poles received more public money in terms of public financing and tax research credits between 2009 and 2012 than those which did not belong to poles. This additional public money amounted to an annual average of €74,210 in subsidies and €118,000 in research tax credit. Membership of a pole led to an increase in investment in self-financed R&D from 2009 onwards. This amounted to €278,000 in 2009 and €413,163 in 2012 for net self-financing. This increase is substantial since it represents on average 26.4% of annual net self-financing over the 2009-2012 period. Moreover, it is significantly higher than the increase in public aid received. The poles would thus appear to be relatively good value for money, with approximately €0.5 billion per annum of public money allocated to supporting them between 2009 and 2012.

The evaluation finds a marked difference in the impact of pole membership on R&D activities depending on the size of the enterprise. Small and medium-sized enterprises - SMEs (defined in France as an enterprise with less than 250 employees) show a much higher impact, in terms of number of R&D staff hired (from 2007 onwards) and the level of additional spending on R&D (from 2010 onwards). Medium-sized enterprises and large corporations, however, tend to show little additional increase in R&D expenditure. Rather, their R&D expenditure increases in line with the increase in tax credit they have been able to claim since 2009.

In terms of employment effects specifically, the study found that firms belonging to a competitiveness pole hired 2.4 additional people in 2007 (15.5% of the average workforce of pole members) and nearly 6 additional people in 2012 compared to a non-pole member with similar observable characteristics (27.5% of the average workforce of pole members). This suggests quite a significant employment effect. Evidence of other downstream effects, such as increases in turnover, patent applications, exports or value added, was lacking. The lack of any significant findings

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related to downstream effects may well have influenced the policy design of the current pole policy, as the focus of the third phase (2013-2018) is on product development and commercialisation of research findings.

The finding related to job creation appears to be supported by an earlier 'Evaluation of the competitiveness poles' which was commissioned by the French government in June 2012 following completion of the second implementation phase (2009-2011) and carried out by a consortium of external evaluators (BearingPoint France, SAS, Erdyn and Technopolis Group-ITD). This evaluation did specifically address employment effects through a survey of 2,388 pole members.

The survey asked business owners whether they believed that membership of the pole had helped with the retention of existing jobs in the period from 2009 to 2011. Of the 1,174 that responded to this question, 84% considered that joining the pole had enabled them to maintain jobs and 43% said that it had helped them to retain more than 50% of jobs. Regarding job creation, 2,041 firms provided responses to the survey. Of these, 66% reported having created jobs through their membership of the poles. 14% of member enterprises indicated that this job creation rate was higher than 25%. In contrast, 34% of enterprises did not report any job creation. No information was provided on the types of jobs or their characteristics.

Quality of the evidence base

The principal evidence base used for this case study is an evaluation carried out by researchers from the public think-tank France Stratégie in 2017 on behalf of the CNEPI. The evaluation period covers the first two phases of pole policy (2005-2008 and 2009-2012), which allows for an evaluation of longer-term effects. The decision to commission external evaluators helps to ensure the neutrality and robustness of the evaluation findings.

The evaluation focuses primarily on relevance, effectiveness and added value. Effectiveness and added value are dealt with by measuring the impact of the measure on additional R&D investment in firms which are members of poles. Here, R&D expenditure is found to exceed government investment (including the tax credit). This was particularly true for SMEs, suggesting that the measure provides significant added value in this area. Relevance and coherence are considered by trying to identify synergies and overlaps with other innovation measures, namely the research tax credit.

The use of an econometric analysis with a counterfactual can be very highly rated in terms of weight of evidence. Researchers have used a conditional difference in difference approach to control for bias and potential reverse causality. The methodology appears to be robust and is explained in great detail, showing high levels of transparency on behalf of the evaluation team. The data used in the study is from well-respected sources and can be expected to be relatively accurate, as it is linked to tax declarations.

A significant weakness of the evaluation is that its reliance on an econometric evaluation leaves little space for contextual analysis. Reasons why an organisation may wish to join a pole or to remain outside of one are not considered within this study. Furthermore, the data gathered appears to focus solely on profit-making entities, potentially ignoring impacts on research institutions and the public sector.

The evaluation is highly relevant for the purposes of the current research, as it provides clear information in terms of employment effects. The approach taken to the econometric analysis – particularly the use of a conditional difference in difference approach - is also relatively efficient, as it enables the researchers to draw on existing data held by the French government without the need for any expensive data collection activities. The evaluation is also effective in showing employment outcomes – these are touched on only briefly, as they are not the main focus of the

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evaluation, but a clear correlation can be drawn between job creation and pole membership. However, while the data source is clearly identified, very little time is given to explaining how the findings on employment growth were arrived at, which makes it hard to validate the findings. Nonetheless, the findings of the 2017 evaluation are coherent with other studies, most notably a survey carried out as part of an evaluation in 2012 in which business owners credited membership of a pole with job creation at firm level.

Actual employment outcomes

The most recent evaluation of the competitiveness poles shows clear employment effects in terms of job creation. The study shows not just differences in terms of research jobs created between pole members and non-pole members with similar observable characteristics, but also an increase in the numbers of research jobs created over time. Specifically, the study found firms belonging to a competitiveness pole hired 2.4 additional people in 2007 (15.5% of the average workforce of pole members) and nearly 6 people in 2012 compared to a non-pole member with similar observable characteristics (27.5% of the average workforce of pole members).

A survey of pole members carried out as part of a previous evaluation also found a strong perception amongst pole members that membership of the pole had led not just to the retention of existing jobs but also to the creation of new jobs. 84% of survey respondents considered that joining the pole had enabled them to maintain jobs, while 66% reported having created jobs through their membership of the poles.

The poles are currently (2018) entering their fourth phase and this has been marked by a transition towards more regional autonomy. Although some centralised support will always be needed in order to ensure that new start-ups continue to appear, the regional autonomy provided in the new phase is hoped to provide greater long-term sustainability.

Overall assessment

The French government has shown a strong commitment to research and innovation, providing support to private sector R&D through a number of intersecting policy measures. Competitiveness poles are a long-standing form of innovation support in many countries, and were introduced in France in 2005. French competitiveness poles are based on bringing together different actors in a region with expertise in a specific field together through formal and informal collaborations. This is achieved through the provision of financial support for the set-up and administration of poles, accompanied by funding for a range of collaborative projects between pole members.

The poles have the long term objective of boosting economic growth through innovation in both traditional and emerging sectors. This is achieved through a step by step approach – meaning that the initial objective of pole policy was to increase private sector R&D investment and promote collaboration between different research and innovation actors (particularly research institutions and private sector enterprises). Longer term expectations include commercialisation of research activities through patenting activity and the commercialisation of research outcomes. Employment effects are an expected impact of pole policy, both directly – through firm growth within poles – and indirectly, through the opportunities provided by economic growth.

Evaluation findings with regard to these outcomes are positive, at least in terms of private sector R&D investment. A clear link can be made between membership of a pole and levels of spending on R&D. Furthermore, the job impacts of this R&D spending have not been insignificant. The analysis of firms' annual social declarations shows a higher level of job creation amongst pole members than non-pole members, an effect which appears to be increasing over time.

Key strengths of poles include their potential for job creation, their clear impact on R&D

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investment and their flexibility – allowing members to shape their direction somewhat through the five year plans. Furthermore, they appear to represent relatively good value for money. The effects of poles are particularly marked in SMEs, suggesting that they might represent a useful support for relatively new enterprises and may enable smaller organisations to compete with better established organisations through collaboration and economies of scale.

The weaknesses of poles can be seen in the limited downstream effects to date, in terms of patent applications and exports, for example. Their impacts on private sector R&D investment also appear to be much more significant for SMEs than for larger entities, suggesting that their impact may be limited to enterprises with a particular profile. This somewhat restricts their utility as a tool to promote innovation. Going forward, it may be necessary to consider how to better target large enterprises in order to ensure they are also investing additional resources in R&D.

In terms of transferability, poles are clearly replicable in other countries. Their flexibility means that they can be easily adapted to a particular national context and, indeed, poles are a common innovation support measure across Europe. In order for pole policy to be truly effective, however, the design and incentives provided need to be carefully considered. The package of measures provided by the French government in the form of funding for various collaborative projects and subsidisation of R&D through the research tax credit, for example, provide a national context in which poles form just one prong of a broader approach to promoting a national environment which is conducive to innovation. Furthermore, poles are not a short-term instrument. French pole policy has been in place for over a decade and there is little evidence yet of longer term impacts.

Information sources

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Links

http://competitivite.gouv.fr/

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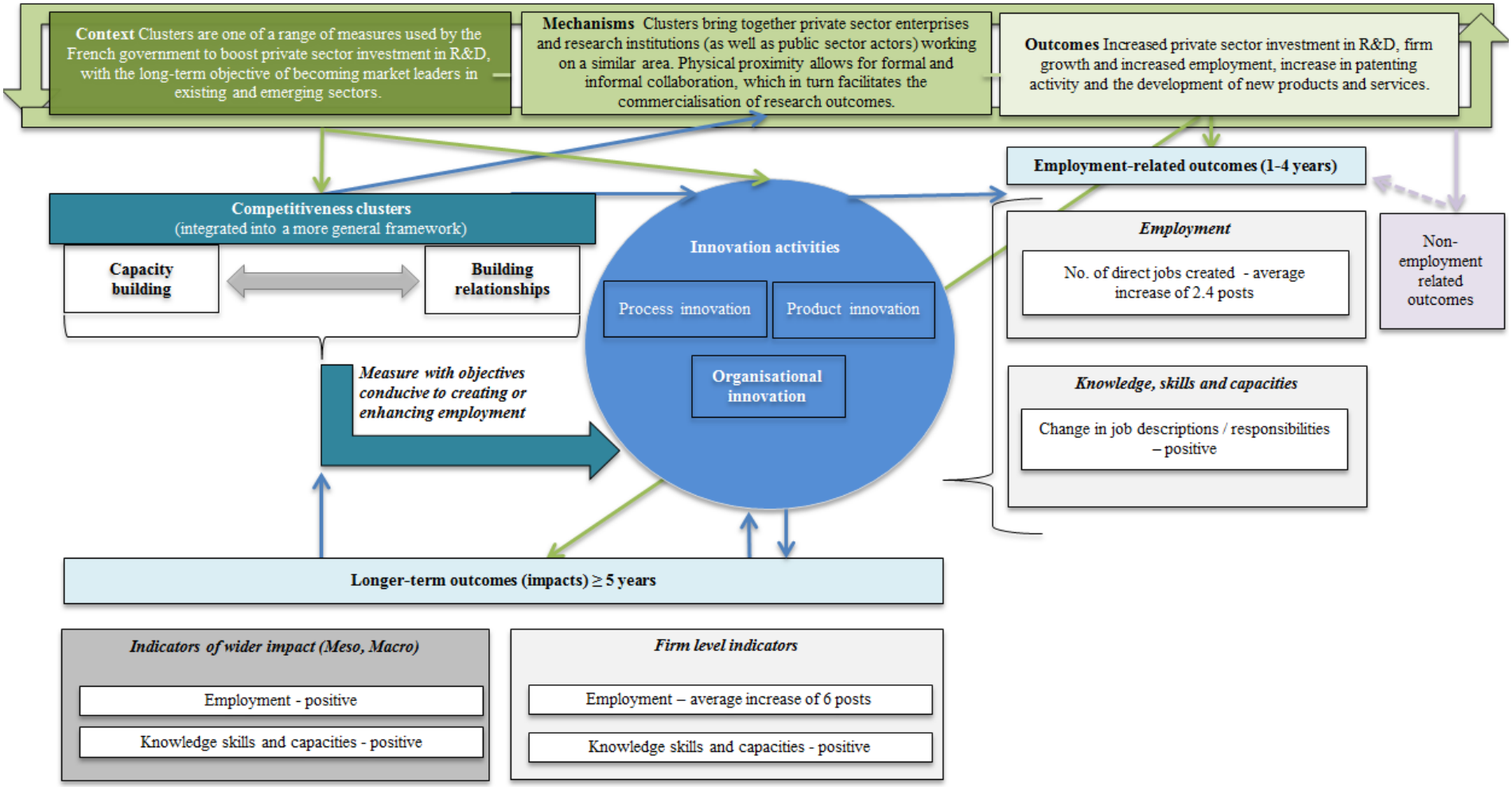
Graphic representation of the intervention logic of the measure



Cluster Promotion - Denmark

Cluster Promotion - Denmark	
Measure identification	**DK Cluster Promotion**
Name of the instrument	Danish Cluster Promotion
Web link	www.clusterexcellencedenmark.dk
Location	Cluster support operates in all regions of Denmark
Starting year and duration	Denmark launched its first-ever Cluster Strategy in 2013, though clusters have a much longer history in Denmark. The strategy, involving eight ministries, the six regional growth forums and Local Government Denmark (LGDK), brought together in the Danish Cluster Forum, aimed to provide coherence and coordination in the development of Danish clusters. Cluster Excellence Denmark is a key instrument in achieving this aim. The Cluster Strategy was up-dated in 2016 and the current period of operation covers the years 2016 to 2018.
Name of the organisation providing measure	The cluster strategy is managed by Cluster Excellence Denmark, under the direction of the Danish Cluster Forum, with funding from the former national Agency for Research and Innovation (since January 2017 the Agency for Research and Education) and six regional Growth Fora.
Type of organisation providing measure	Cluster Excellence Denmark is a not-for-profit organisation created to implement Denmark's strategic cluster policy. Its Steering Group is made up of representatives of national government agencies and the regions and it has a secretariat and an Advisory Board with representatives from specific clusters.
Other contributions	The income of the 42 Danish clusters was derived from the following sources in 2016: national government (32%), regions and communes (33%), enterprises – mainly members (17%), knowledge institutions (3%), EU funding (9%) and other sources (6%).
Total budget for the measure	In 2016, the 42 Danish cluster organisations had turnover ranging from under DKK 300,000 (€40,200) to over DKK 35 million (€4.7 million). Their combined turnover was DKK 338 million (€45.3 million). The budget for Cluster Excellence Denmark is €0.7 million per year.
Reason for highlighting this measure	
While many countries have a policy of promoting clusters, this example from Denmark illustrates a coherent strategic approach to cluster promotion, including an initiative to strengthen the skills and competences of both cluster managers and cluster members.	
The policy context for this measure	
Denmark's overall strategy for the development of clusters and networks is set out in a document entitled 'Cluster Strategy 2.0. Strategy for Denmark's Cluster and Network Policy 2016-2018', published by the Ministry of Higher Education and Science and the Danish Agency for Science, Technology and Innovation. This strategy specifies particular performance targets relating to the number of enterprises that have developed new innovations, the number participating in partnership projects with knowledge institutions or in international activities through the clusters and an appropriate regional distribution of the enterprises that have developed new innovations. The	

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targets are described in more detail below in the section relating to evidence on performance.

Denmark has a long history of encouraging cooperation between enterprises and clusters. In 2018, there are around 42 significant clusters and networks and a number of smaller, emerging or local clusters.

A joint ambition of the Danish government and regions is to strengthen growth and knowledge-based development through clusters and networks, which have an important role in building and strengthening the knowledge bridges between enterprises and knowledge institutions.

In 2013 the Cluster Forum was established with the aim of supporting cluster development in Denmark and creating cohesion between local, regional, national and international cluster and network efforts. The Cluster Forum is an informal forum for knowledge sharing and coordination between ministries, regions and municipalities in the cluster and network field. It is chaired by the Danish Agency for Science, Technology and Innovation and has representation from regional councils and large cities, the regional Growth Fora and Local Government Denmark. Its tasks include:

- Creating an overview of the Danish cluster and network landscape and providing a single access point to the Danish clusters via Cluster Excellence Denmark.
- Supporting the development of excellent cluster organisations, through competence development, knowledge sharing between clusters and international benchmarking.
- Promoting the internationalisation of Danish cluster organisations and Danish participation in EU cluster policy activities.
- Creating cohesion and synergy between the cluster policy and other relevant areas, including strengthening collaboration between clusters, business and innovation promotion activities as well as other actors in the ecosystem.
- Discussing and coordinating regional strategies for smart specialisation and ensuring cohesion with the general strategy for the cluster and network policy.
- Coordinating national and regional tenders and activities within cluster development and identifying opportunities for developing uniform application procedures and requirements.
- Monitoring, evaluating and measuring the impact of the cluster policy, partly by means of an annual set of performance accounts that takes stock of the overall efforts.

Cluster Excellence Denmark provides support for the Cluster Forum, assisting it with developing its strategic direction and providing services to develop existing and new clusters. These services include helping Danish clusters to benchmark their performance internationally and to obtain certification under the European Cluster Excellence Initiative – ECEI.

Aims and objectives of the measure

Rationale, objectives and main elements of the support

The aim of the policy is to help Danish enterprises to speed up their innovation processes and to achieve commercial success, by helping them to work together in clusters and networks and also to improve the performance of Danish clusters and cluster managements and to assist them to become excellent.

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Denmark has a strong track record of innovative SMEs collaborating with others, as acknowledged over the years by the European Innovation Scoreboard; cluster development is consequently a relatively longstanding feature of the Danish economy, but there is still scope for improvement and the current Danish cluster policy aims to develop a systematic approach to cluster development, not least by strengthening the management of Danish clusters.

There are therefore two target groups for the policy: the enterprises that can increase their competitiveness and grow through involvement in clusters and networks and the managers of clusters, who can help their members to benefit from cluster membership.

Although performance targets are set for clusters in general in 'Cluster Strategy 2.0', as mentioned above, they have not been set for Cluster Excellence Denmark, mainly, because of the difficulty of distinguishing between the effects of its activities and those of clusters overall.

Assistance is provided to individual enterprises, often through the regional Growth Houses (Vaeksthuse) and specific services are provided for cluster managers by Cluster Excellence Denmark.

Target beneficiaries

The policy is to promote and strengthen clusters, so that the beneficiaries of the support provided are initially cluster managers, but ultimately cluster members, enterprises and organisations with which they work.

Characteristics of the measure

Instrument type

Cluster promotion.

Clusters are defined in Denmark as a group of enterprises that have come together with research and education institutions and other actors in order to create better working relations and knowledge-sharing within a sector, profession or technology area. This policy area consists of a set of measures to promote clusters as defined.

Relation of the measure to other measures

In general, the measure is a strategic initiative to support cluster development and therefore makes use of, and aims to strengthen, existing measures, such as those that promote industry- knowledge institution collaboration or measures to support research and innovation, along with the development of a package of support instruments particularly for the use of cluster managers.

More particularly, the cluster policy relies to an important extent on the support of Growth Houses at a regional level in Denmark, to direct potential enterprise members to the cluster secretariat and also to support individual members with their own support services.

Around half of Danish clusters have also made use of the Innovation Networks programme (Innovationsnetværk), funded by the Danish national authorities. This programme brings together enterprises, knowledge institutions and other organisations with a particular sectoral or technology focus, in order to develop a joint programme of work. Participating enterprises have to fund their own activities in an Innovation Network, but they can obtain assistance in turning ideas into new competitive products or services, finding new partners for collaboration in research and innovation projects or getting in contact with researchers from universities and technological service providers. There can also be intensive interaction with purchasers in order to develop innovation and markets. Cluster support, therefore, overlaps considerably with the operations of the Innovation Networks

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programme, though the latter tends to have a greater emphasis on research and development work.

Type(s) of innovation supported

Clusters support product and process innovation, but also promote different forms of business organisation and marketing innovation, especially in the context of developing international markets. The overall promotion policy seeks to strengthen all the dimensions of innovative growth.

Sectoral focus

Each cluster has a sectoral focus, which can range from clean energy technology and biotechnology to construction, foodstuffs and design. This strategy, however, aims to promote all Danish clusters and to create new ones. It is therefore a horizontal measure with no specific sectoral focus.

Regional specificities

Clusters often have a particular regional focus, but the general aim of the measure is to support all clusters and help them develop across all Danish regions.

Funding available for applicants

The support consists of services rather than funding.

Time period over which the effects are expected to be felt

The impacts of the strategy on clusters in terms of their growth, competitiveness and sustainability are likely to happen over the mid to long term. The immediate impacts are on the skills and competences of cluster members and cluster managers and in building relationships between cluster members and external organisations.

How the measure is implemented

The instrument design

The policy of cluster promotion involves bringing together enterprises and other partners to form new clusters and, on the part of existing clusters, encouraging a consistent approach to cluster development through special measures to strengthen cluster management and encouraging a systematic use of existing instruments that promote innovation and competitiveness. The measure therefore consists of a series of activities that reinforce each other and contribute to the overall strengthening process.

Eligibility criteria and restrictions

The support provided to cluster management is open to any Danish cluster.

Clusters focus on particular sectors or technologies and often operate in specific regions or localities, but any enterprise that is capable of playing a productive part in a cluster is generally welcome to join (there is usually a membership fee) or to co-operate with cluster members.

How the measure is accessed and delivered

The existence of clusters is fairly widely promoted and events are organised to explain the advantages of participation. Enterprises then simply need to express an interest in being a member.

Cluster Excellence Denmark is in regular contact with clusters managers and discusses with them activities that can help their clusters to improve their performance.

Innovation Networks are a specific mechanism supported by a national programme that around half

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of the clusters make use of and they have a particular role to play when it comes to helping small and medium-sized enterprises (SMEs) access the innovation system. They do this by providing a platform within a specific technical or professional area where enterprises, universities, research institutions and other relevant players can meet to exchange ideas, knowledge and launch new projects. Innovation Networks thus provide a framework and funding to help cluster members to work together.

The mechanisms used for the implementation

Strengthening a cluster's capabilities is seen to involve building:

- The enterprises' competencies;
- The enterprises' innovation and product development;
- The enterprises' network of existing and new partners; and
- The enterprises' visibility and branding.

Building up competences in clusters applies at three levels:

- Strengthening the competences of cluster managers;
- Strengthening the interaction between cluster members; and
- Strengthening the skills and competences of individual enterprises and organisations within the cluster.

Cluster Excellence Denmark assists cluster managers to develop the co-ordination and effectiveness of their cluster organisations through services, which include:

- Day-to-day contact and interaction with cluster managements;
- Stimulating cross-cluster knowledge and experience exchange;
- Providing online support tools for learning and case study examples;
- Organising thematic workshops on themes like internationalisation, branding and matchmaking tools;
- Launching cluster Labs for development of new tools of general interest for the clusters;
- Providing classes to develop management capacities in a range of areas;
- Organising an annual Innovation Camp for cluster management, who engage in discussions and team-building activities;
- Developing tools for and supporting clusters in their internationalisation processes.
- Assisting access to finance.

Cluster Excellence Denmark also provides certified benchmark experts and trained assessors to help clusters achieve bronze, silver and gold status in cluster excellence under the European Cluster Excellence Initiative. This enables clusters to benchmark their performance against that of other

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clusters across Europe and, of course, build on their strengths and capabilities.

At the level of the individual enterprise, a range of activities are offered to cluster members and associates to help them and the cluster as a whole to improve performance. These activities are often organised by cluster managers, but may also be offered by other support agencies, the public authorities, etc. Typically, they consist of:

- Matchmaking and building bridges with other enterprises, knowledge institutions, public authorities and others.
- The organisation of cooperation projects, where enterprises and other institutions can work together on technical or commercial developments. Frequently, these take the form of developing, winning and implementing research and innovation projects, funded at EU, national and regional levels.
- The development of skills and competences, in a range of ways from mentoring and seminars and workshops through to working on management skills and mutual learning trough collaborative working.
- A range of activities relating to the internationalisation of enterprises, from strengthening marketing capabilities to arranging meetings with foreign buyers, study tours, help with managing and enforcing IPR, etc.

Innovation networks can add to these processes, by helping participating enterprises to take part in and benefit from the knowledge system by improving the innovation level, enabling research and development (R&D) collaboration and encouraging participation in other R&D and innovation programmes.

At all levels, support involves improving knowledge and awareness, especially of scientific and technological developments, but also and particularly at the enterprise level, it means strengthening skills covering a range of enterprise functions, from production, finance and human resource management, to logistics marketing and project management. This includes improving the skills of enterprise managers, but also of their staff and it may often involve changes in working conditions.

It should also be said that, although the primary emphasis is on improving the skills and competences of enterprises, developing clusters requires inputs from other parties, notably knowledge institutions and public bodies. These also need to learn how to engage with clusters as effectively as possible, so that there are also employment and skills development effects among these organisations as well as among enterprise cluster members.

How the measure is expected to generate its intended effects

Denmark's economy relies on the SME sector, but by promoting the development of clusters, the Danish authorities aim to help smaller enterprises to overcome some of the disadvantages that they suffer and help them to develop their competitiveness in international markets, notably through innovation in products and services and in their delivery. As a result, they expect to see the enterprises that participate in clusters grow successfully, in terms of turnover, export sales and employment, but also to further develop their capacities, not least through improvements in the capabilities of their workforce.

The mechanisms that the measure uses to achieve this integrated development of SMEs in clusters allow cluster managers to continuously improve the support they provide to cluster members, by promoting comparisons with practice in other clusters in Denmark and elsewhere, encouraging the

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growing professionalisation of support provided through the European Cluster Excellence Initiative and the specific development tools described above.

The intended general and employment effects of the measure

As a significant instrument in Denmark's growth strategy, cluster policy aims to promote the growth of Danish enterprises and the development of high-quality, knowledge-based jobs. Furthermore, a significant element in the cluster strategy is to ensure that participation in clusters is promoted across all the regions of Denmark, leading to a broadly-based improvement of productivity and capacities.

Within the strategy and consequently the service package offered in support, there are a series of elements intended to develop competences and skills within participating enterprises. These include the organisation of training, but also several arrangements for the interchange of experience. The employment dimension of cluster development is explicitly recognised and services have been developed to cater for it.

Developing clusters is a relatively long term process, so although impacts on growth, including growth in employment, are certainly an important overall aim, the focus in cluster promotion is on strengthening the capability of the members of clusters and the cluster as a whole, in order that clusters should be able to compete successfully, ultimately in global markets.

Consequently, the employment outcomes associated with this measure are ultimately the growth and greater stability of employment, generally at increased skill levels, but also the processes of building skills and competences and corresponding changes in working conditions.

Summary of the main evidence available

The Strategy for Denmark's Cluster and Network Policy 2016-2018 set out five Focus Areas:

A. Clusters and networks as bridge-builder to research and education;

B. Clusters as a driver of internationalisation;

C. Clusters as a driver in the regional ecosystem;

D. Development of strong and professional clusters; and

E. Cohesion in the cluster policy and cluster structure.

Five targets were specified for achievement by 2018 in Cluster Strategy 2.0, referred to in the policy section above:

1. At least 2,000 enterprises have annually developed new innovations as a result of the cluster activities (status 2014: 1,600).
2. There is an appropriate regional distribution of the enterprises that have developed new innovations, so that the policy benefits the whole of Denmark.
3. At least 2,500 enterprises participate annually in partnership projects with knowledge institutions through clusters (status 2014: 1,800).
4. At least 1,500 enterprises participate annually in international activities through

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clusters (status 2014: 900).

5. Denmark has at least 10 Gold and 10 Silver clusters (certified according to the EU's cluster Label system).

The success of the promotion of Danish clusters is judged mainly in relation to the evidence on the performance of Danish clusters themselves. There is a wide range of such evidence, especially in recent years, though some of it goes back to the 1990s. The evidence provided in four publications is set out below.

Cluster Excellence Denmark (2017) Knowledge and Growth – 2017 performance accounts for the clusters and networks in the Cluster Catalogue (Viden & Vækst - det samlede Performanceregnskab 2017 for klynger og netværk i Klyngekataloget – 2017**)**

This document reports on various aspects of Danish clusters and Innovation Networks, based on internal reporting systems and mainly providing information on output indicators. The 2017 report provides data relating to 2016.

In 2016, there were 42 recognised clusters operating in Denmark across a range of sectors. 22 of them were also national Innovation Networks. Eight of the clusters had been awarded gold status under the European Cluster Excellence Initiative, five silver and 20 bronze.

In the same year, 16,520 enterprises participated in the activities of the recognised Danish clusters. Around 6,000 of these were cluster members.

7,979 enterprises took part in matchmaking activities, 2,131 in co-operation activities (innovation and related projects) and 4,441 took part in international activities. On average, each of the clusters worked with 42 knowledge institutions and 38 different public bodies. Cluster members were assisted in making 129 applications for support under EU programmes (Horizon 2020, ERDF, ESF, COSME, etc.), 150 applications for national funds, 80 to the regions and 41 to other sources, including private funds.

1,524 enterprises developed new products, services or processes as a result of their participation in a cluster and 3789 enterprises developed new ideas that could later be turned into new products, services or processes.

22 of the 42 clusters worked with training institutes to provide skills development in specific training activities or courses. 849 enterprises took part in these activities and courses.

4,832 enterprises reported new competences or instruments that markedly improved their innovation skills.

No information is provided in the report on enterprise growth or numbers of persons employed, but interview evidence indicates that most activities aim to help cluster members to grow and this includes employment growth.

The report also contains a number of brief case studies setting out achievements in a range of areas experienced by particular enterprises.

The Danish Agency for Science, Technology and Innovation – DASTI (2017) 'Effects of enterprise participation in clusters and innovation networks (Effekter af virksomheders deltagelse i klynger og innovationsnetværk - 2017**)**

This assessment provides evidence on the performance of enterprise members of clusters.

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Methodology

The methodology is based on a survey, conducted by the Danish Agency for Science, Technology and Innovation of approximately 3,700 Danish enterprises that had participated in the clusters' activities in 2015. The number of different innovation networks and clusters represented was 42. The number of enterprises responding to the survey was 888, which represents a 24% response rate.

This was the second time that the survey had been conducted and consequently a comparison could be made with the results for 2013, when 883 enterprises responded to a survey conducted the following year. However, for the more recent survey, a series of additional questions were added, especially relating to the mechanisms by which the clusters had strengthened the enterprises questioned.

A publication describing the previous survey is available in English: The impact of enterprises' participation in clusters and innovation networks (2015).

The objective of the surveys was to examine the impact of the services and activities of Danish clusters on the performance of enterprises in terms of the development of their competencies and their innovation and product development. Since some of the impacts were yet to be realised, the survey asked about both actual and expected results.

The clusters that the research focused on are all established in the sense that they have a leadership and secretariat that has the task of initiating and promoting activities for the benefit of the cluster's members. Only 'dedicated' members were targeted. These are enterprise members that have confirmed their participation in the cluster through an agreement in writing or an expression of interest, have participated in projects or made an explicit membership contribution. Enterprises that merely receive newsletters or have only participated in an isolated event in the cluster are not included.

The results of the survey

Clusters provide a range of services and support to members:

1. Matchmaking and sharing knowledge (for example, workshops and professional networks);
2. Concrete common projects (for example, innovation projects involving enterprises and knowledge institutions);
3. Competence development (for example, courses and 'sparring' – individual advice sessions);
4. Communication (for example, conferences and seminars); and
5. Internationalisation (for example, working with foreign clusters or knowledge institutions).

In terms of engagement with these cluster activities, 63% had participated in conferences and seminars. 55% had taken part in professional networks with other enterprises and knowledge institutions and 42% in workshops and courses. 19% had had individual 'sparring' sessions. 24% had been involved in common projects and 13% in international activities. This was broadly in line with the results of the previous survey.

In response to a new question for this survey, the overwhelming majority of those surveyed (92%), expressed the view that it was important to be a member of a cluster - at least to some extent. 18% said that it was very important.

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Results on innovation

In terms of the nature of the innovation impacts on enterprises, the following table sets out the percentage of the respondents identifying particular developments according to their size (2013 figures in brackets).

Table 1: Proportion of respondents identifying various types of innovation in 2015 (2013)

	Small (%)	Medium (%)	Large (%)	Overall (%)
New ideas	27 (20)	25 (25)	31 (26)	28 (26)
New products or services	19 (22)	19 (24)	14 (22)	19 (15)
New processes	5 (4)	21 (22)	18 (14)	16 (16)
Streamlined workflow	8 (8)	9 (14)	12 (13)	9 (10)
Innovation or research projects	18 (12)	20 (15)	19 (12)	19 (23)
Financing of development activities	20 (8)	9 (11)	12 (9)	16 (14)

The effects of the clusters appear to be on most of the main forms of innovation - new ideas, new products and services and new processes and workflow and the clusters are also getting enterprises involved in new projects and helping to draw in finance. Evidence is not provided on marketing innovation, although since developing markets nationally and internationally is a key part of cluster activities, it is likely to be part of the overall effects. The exception highlighted by the evidence, however, is that small firms appear to be less likely to be involved in new processes or in streamlining workflows than larger firms as a result of being involved in a cluster.

The study concluded that the general lack of differentiation in the effects between the different size groups indicated that the clusters were achieving a good match with the needs of enterprises.

The figures above relate to actual innovation activities. The survey also asked about expectations of future innovation activities in the same categories. Broadly similar proportions stated that although they had not undertaken these activities yet, they would expect to do so in the future, so that, for example, 50% of the enterprises have either developed or expect to develop new ideas or concepts leading to innovation as a result of the clusters' work.

Strengthening of enterprise capacity and potential

As well as identifying actual outcomes, the survey also addressed the strengthening of enterprises' potential and capacities.

Many of the enterprises questioned already worked with other enterprises (49%), knowledge

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institutions (36%), public agencies (23%) and foreign partners (14%). However, they were also asked if they had acquired new partners as a result of being cluster members, with the following results:

The following proportions are working with new partners:

- 40% with other enterprises in the cluster;
- 22% with enterprises in other sectors;
- 21% with research and education institutions;
- 12% with other public agencies; and
- 9% with foreign enterprises.

Through cluster activities, enterprises gain access to various forms of knowledge that develop and strengthen their innovation competencies:

- 56% of the enterprises have acquired new relevant knowledge to a high degree or some degree (for example of market or technological trends);
- 40% of the enterprises have, to a high degree or some degree, strengthened their competencies relating to market, process or product development. For SMEs, this was almost 50%; and
- 28% of the enterprises believe that their employees' skills were developed to a high degree or some degree and a further 5% expected these skills to be developed in the future.

Some of the strongest effects of clusters were felt to be in relation to their sector or professional area as a whole:

- 65% of the enterprises think that clusters have enhanced the knowledge and technology level of their sector;
- Around half of enterprises consider that the clusters have the effect of making their sector attractive for a qualified workforce;
- 36-45% believe that the provision of research or test facilities or of education and training has been strengthened; and
- 38% believe that the clusters have a significance in terms of the capital attracted to the sector.

The clusters also provide a platform that allows the enterprises to have a higher profile. As a result, 39% say they have received more enquiries and contacts and 11% expect to do so in the future, while 49% say that they have benefitted from an increased visibility in the market, with a further 8% expecting to do so in the future.

Contribution to growth

Finally, there is an assessment of clusters' contribution to growth among the enterprises responding to the survey:

- 3% state that being a member of the cluster has contributed to growth in turnover to a great extent and 24% to a lesser extent, but 56% say there has been no contribution; and
- 2% state that being a member of the cluster has contributed to growth in exports to a great

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extent and 10% to a lesser extent, but 68% say there has been no contribution.

It should be recalled that the survey that formed the basis of the assessment asked cluster members about the effects of activities in the previous year. Arguably the impacts on growth generally take a longer time to emerge, but there is no assessment over a longer period.

No indication is given of the impact on employment.

The Danish Agency for Science, Technology and Innovation – DASTI (2011) *The Impacts of Cluster Policy in Denmark* and **Danish Agency for Science, Technology and Innovation – DASTI (2010)** ***The Short-run Impact on Total Factor Productivity Growth of the Danish Innovation and Research Support System***

These two publications are the products of studies conducted by The Danish Agency for Science, Technology and Innovation (since 2017 part of the Danish Agency for Science and Higher Education). The second publication mentioned relates to an econometric study of the effects of a range of innovation and support measures, provided by the Danish authorities, whereas the first provides the results of the study that relate to one particular measure which supports clusters - the measure known as the 'Innovation Network'. The following draws on both publications.

Both studies make use of the same longitudinal data from 2002 to 2008 and apply econometric methodologies making use of controls groups. In order to establish a counterfactual, the analysis identified a control group of enterprises that did not participate in the programmes under consideration. The control group was selected by 'propensity score matching' and had similar characteristics to participants in terms of firm size, industry, previous performance, exports, educational level among employees, R&D activities and research collaborations.

The analysis used merged data from the participation list, General Enterprise Statistics and Innovation Statistics for 2002, 2004, 2007 and 2008. There were 1,225 enterprises participating in Innovation Networks that were included in the analysis. Innovation is defined on the same basis as in the Innovation Statistics. For 2002 and 2004 it includes product and process innovation but in 2007 and 2008 organisational and marketing innovation were also included.

The DASTI (2011) study considered the impact of participation in the Innovation Networks on the behaviour of the participants. It found that the probability of being innovative is 4.5 times higher for enterprises participating in Innovation Networks than in the control group. Furthermore, in the first year of participation in Innovation Networks, the probability of entering an R&D collaboration increased by 95%. In the following year, the probability of entering R&D collaboration is almost 300% higher for those participating in an innovation network than other similar enterprises not participating in networks.

The behavioural impact of participating in an Innovation Network therefore is an increased probability of being innovative and increased probability of entering into an R&D collaboration. It is thought likely that this would lead to increased growth in turnover exports and employment, but the study says that the effects of this kind are likely to happen from three to five years after the initial involvement. There were not enough data over a sufficient time period for analysis of these effects to the calculated.

The second study - DASTI (2010) - does, however, add some further information, using largely the same data set. This study looked at the changes in total factor productivity and examined whether this increased faster for those participating in a range of Danish support programmes, including the Innovation Network programme, than for a control group. A control group was established for each programme using a similar methodology to that outlined above.

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Effects examined cover programme participation observed from 2002 to 2009, where only firms that did not receive support two years previously are considered, in order to exclude the possibility that the effects might result from other initiatives.

Estimates are made that allow historical productivity growth to be taken into account by including a variable using productivity growth lagged by two years. These estimates show that, at the 5% significance level, participation in the Innovation Networks leads to an increase in subsequent years of 3.6 - 4% in total factor productivity over that experienced by non-participating enterprises.

No information is provided, however, on the components of productivity growth, so it is not known how much of the increase in productivity relates to turnover growth and what the corresponding factor inputs are (labour, capital).

Quality of the evidence base

The three types of study summarised above are quite different in character:

- The first report is based on internal reporting data and relates to outputs;
- The second is based on a survey and is mainly concerned with the experience of enterprises participating in clusters, primarily to establish if clusters are providing the right type of support; and
- The third one is econometric analysis with a control group selected by propensity score matching. The data for these studies is somewhat older than is the case for the other studies, but is based on substantial data sets maintained by the Danish state, including the cluster participation list, General Enterprise Statistics and Innovation Statistics. These studies also only considered enterprises participating in Innovation Networks, which can be regarded as only a sub-set of enterprises participating in clusters.

Although the reports in the last category acknowledge that the ultimate assessment of Innovation Network support needs to consider impacts on enterprise growth and competitiveness, none of the sources provide direct information on cluster growth nor on direct employment impacts. The nearest the studies come to this is the results on total factor productivity growth, where one of the econometric studies shows that cluster members outperform similar enterprises not supported by a cluster.

Interviews have confirmed that data on these variables are not available, except at the level of some of the projects undertaken by cluster members, where the different monitoring regimes required by a variety of programmes (EU, national, regional and private) make aggregation too difficult. The basic problem, however, is that it can take some time for the ultimate impacts of the complex range of support provided by clusters and their secretariats to emerge and studies have not so far attempted to address the methodological problems of conducting such an exercise nor of identifying the appropriate data.

The assessment of the effectiveness of Danish cluster support policy, therefore, has a major element missing, though there are other indicators relating to intermediate outcomes, including the probability of being innovative (as recorded in innovation surveys), where it was shown that innovation network members outperformed similar enterprises.

The results of the econometric studies generally are based on rigorous analysis, with an exemplary selection of a control group based on propensity score matching, using the nearest neighbour matching method. The restricted range of impacts considered, however, also makes commenting on

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the efficiency of the measure difficult, since this relates to the cost and effort required to achieve the results and in this case information on important impacts is missing.

It should be noted in this context that even the targets set for 2018 are framed in terms of more immediate outcomes – referring to the number of enterprises that develop new innovations or participate in partnership projects with knowledge institutions or engage in international activities.

The survey provides information on participant perceptions of the support offered and generally confirms its relevance and also the coherence of the mutually reinforcing activities. 92% of those surveyed thought that it was important to be a member of a cluster, at least to some extent. There is also some information on the impact on innovation activities and even on growth of the enterprise, although relatively low proportions are able to report achievements in this area only a year after the activities have taken place. Somewhat higher proportions of those surveyed report improvements in a range of developments relating to competences and capacities. Cluster members have increased their interaction with other enterprises, knowledge institutions and other organisations. Over half have acquired new relevant knowledge. 40% (and almost 50% of SMEs) have strengthened their competencies relating to market, process or product development and 28% of the enterprises believed that their employees' skills had been developed and a further 5% expected these skills to be developed in the future.

This aspect of the effects of cluster development is confirmed by the report providing information on output indicators, where it is stated that around half of the clusters worked with training institutes to provide skills development in specific training activities or courses and that 849 enterprises had taken part in these activities and courses in 2016. Similarly, it is said that 4,832 enterprises reported new competences or instruments that markedly improved their innovation skills in that year.

Taken altogether then, the evidence presented provides some indications on the effectiveness of cluster support, especially in terms of intermediate outcomes and innovation, but very little on impacts on growth and nothing on employment impacts. This also makes it difficult to comment on the efficiency of the support and its sustainability, though the levels of appreciation seen in surveys of users, would appear to indicate that it is perceived to be relevant. Overall, despite its variety and the use of different methods, the strength of the evidence is not such that clear conclusions can be drawn on the policy's achievements.

Actual employment outcomes

There is little direct evidence on employment outcomes of cluster development, although information from interviews suggests that they may be substantial. The aim of all clusters is to assist their members to grow, especially through innovation of various kinds, and this generally implies growth in employment. Moreover, since many of the clusters are involved in new technologies and markets, there is a reduced risk of displacing other firms and their employees. However, most of these effects are likely to become apparent only over the medium to long term when innovations are exploited.

More immediately, cluster development involves a considerable enhancement of skills and competencies at all levels within the cluster and its member enterprises. There are therefore important employment-related effects that generally equip those affected to better address the emerging needs of the labour market. Again, however, the extent and specific nature of the skills developments taking place is difficult to assess and the evidence relating to it mainly relies on imprecise indications from participants. There is, though, a recognition of the need to have a significant human resources dimension in the types of innovation process promoted by clusters and indeed to train the workforce for the emerging work environment of the future. Interviewees have

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commented that this raising of the skills level is usually associated with other improvements in working conditions and, when appropriate, salary levels. It is also worth mentioning that the processes leading to skills enhancement are often occurring in SME cluster members, which would generally be much slower to promote skills development within their own firms, if they had remained outside of a cluster.

Overall assessment

Strengths of the instrument from an innovation and employment perspective

Cluster development is a major instrument in modern innovation policy and the coordinated approach in Denmark, including supporting cluster managers through Cluster Excellence Denmark, illustrates the consistent approach to innovation that has earned Denmark a high position among innovation leaders in the Innovation Union Scoreboard. Strengths of the policy include the coverage of all the main aspects of modern innovation processes, from encouraging research and interaction with knowledge institutions to marketing and interaction with other enterprises and the (international) market in order to offer an attractive package to customers. Furthermore, the approach adopted in Denmark incorporates the provision for training and the development of skills and competences, both among cluster and enterprise management and for employees, and the evidence suggests that this is being delivered successfully. In other words, the approach adopted by this measure recognises the significance of human resource development as part of the innovation policy and takes steps to ensure that this aspect is included in the support offered.

Weaknesses of the instrument from an innovation and employment perspective

Although the Danish cluster policy is assumed to be creating jobs, its main focus is on the development and competitiveness of the Danish economy and particularly its small firm sector. This involves encouraging innovation and growth, but also a number of intermediary outcomes, largely to do with the competences and capacities of cluster members and their interaction with each other. Consequently, policy monitoring and assessment tend to concentrate on the elements which are needed to deliver final outcomes rather than the final outcomes themselves. There is therefore little information on growth and employment outcomes and even the information on achievements in relation to innovation is not as developed in statistical form as might be expected. In response to this criticism, it might be argued that a wealth of case study material has been developed and some of it has been presented in the first study referred to above. These provide information in a more intuitive form about the processes whereby clusters encourage innovation and are probably more suited to potential cluster members than dry statistics.

Implementation requirements

Danish clusters are fortunate to have a consistent policy stance backing them, with an advisory Cluster Forum helping to direct policy and, in Cluster Excellence Denmark, a team dedicated to enhancing cluster management. In addition there are a range of other support measures that the clusters can call upon to help strengthen particular aspects of the cluster that need attention. The Innovation Networks and Growth Houses, in particular, are well integrated into the cluster development system, but it is also clear that the clusters' own development programmes play an important part, not least in promoting the development of new skills and competences.

Clusters and their development are well established across Europe and the European Cluster Excellence Initiative is helping to ensure that support is provided to a high standard across the continent. However, the Cluster Forum in Denmark provides a structure for the informed development of policy in this area and Cluster Excellence Denmark, along with the secretariats of many of the individual clusters, provide mechanisms for the continuing enhancement of cluster activity. These elements can serve as an example for more consistent approaches to cluster

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development elsewhere.

Information sources

References:

Cluster Excellence Denmark (2017), *Knowledge and Growth – 2017 performance accounts for the clusters and networks in the Cluster Catalogue (Viden & Vækst - det samlede Performanceregnskab 2017 for klynger og netværk i Klyngekataloget – 2017)*

Danish Agency for Science, Technology and Innovation – DASTI (2017), *Effects of enterprise participation in clusters and innovation networks - 2017 (Effekter af virksomheders deltagelse i klynger og innovationsnetværk - 2017)*

Danish Agency for Science, Technology and Innovation – DASTI (2011), *The impacts of cluster policy in Denmark*

Danish Agency for Science, Technology and Innovation – DASTI (2010), *The short-run impact on total factor productivity growth of the Danish innovation and research support system*

European Innovation Scoreboard (2017)

Danish Agency for Science, Technology and Innovation - DASTI (2015), *The impact of enterprises' participation in clusters and innovation networks*

Ministry of Higher Education and Science and the Danish Agency for Science, Technology and Innovation (2016), *Cluster Strategy 2.0. Strategy for Denmark's cluster and network policy 2016-2018*

Links:

The Ministry of Higher Education and Science: https://ufm.dk/en/the-ministry/organisation/the-ministry

Cluster Excellence Denmark: http://www.clusterexcellencedenmark.dk/

The Clean cluster: https://www.cleancluster.dk/

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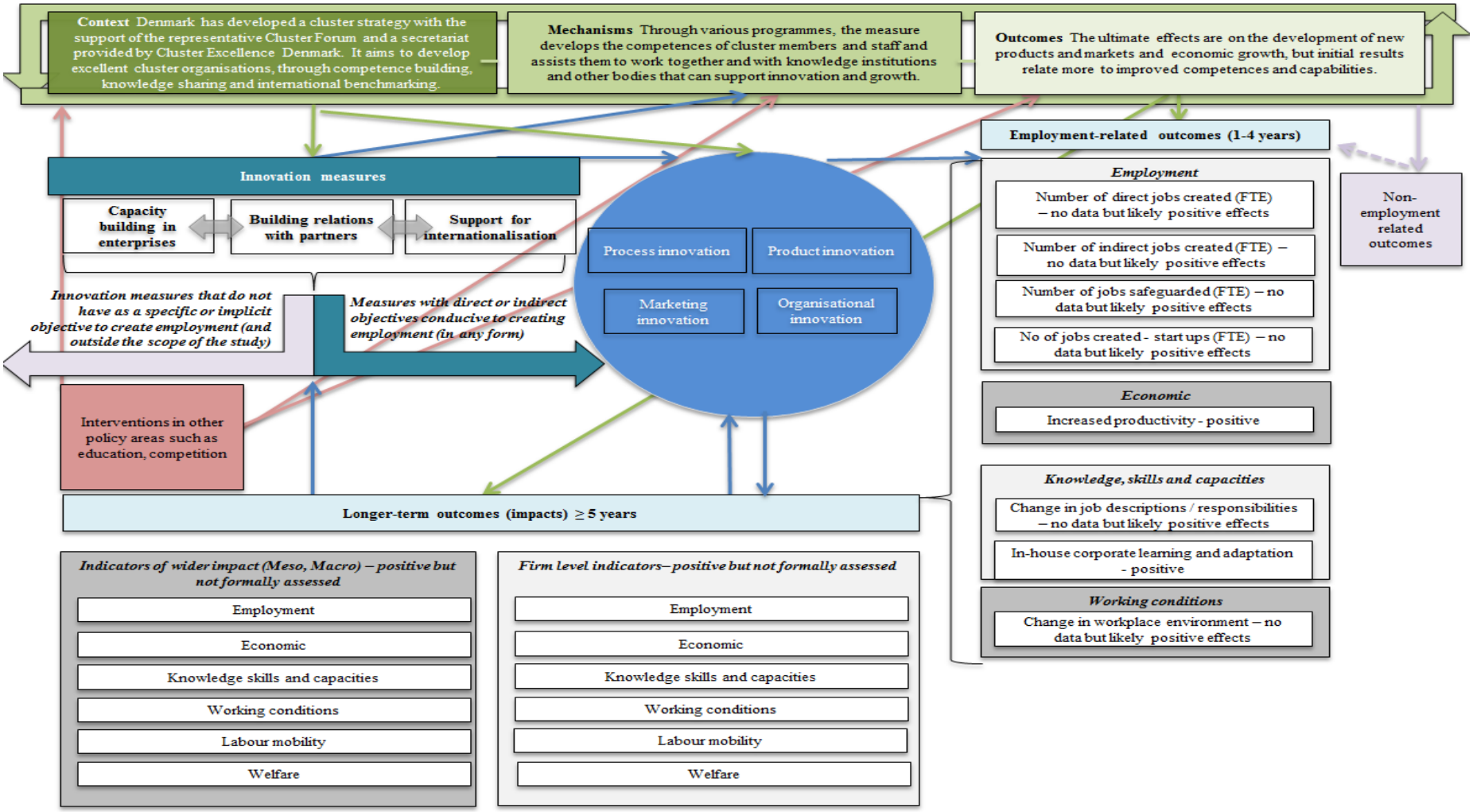
Graphic representation of the intervention logic of the measure



Startup in Residence Amsterdam (SiRA) – The Netherlands

Startup in Residence Amsterdam (SiRA) – The Netherlands	
Measure identification	**NL Start-up in Residence Amsterdam**
Name of the instrument	Startup in Residence Amsterdam (SiRA) (also exists in other cities, regions, and government departments in the Netherlands)
Web link	https://startupinresidence.com/amsterdam
Location	This scheme started in 2015 and applies only in Amsterdam, but there are similar 'startup' measures in other cities, regions, and government departments in the Netherlands that have followed the lead of Amsterdam. SiRA links in with a wider ranging Startup Amsterdam programme. SiRA is based on a model that was developed in San Francisco.
Starting year and duration	2015 – Applicants apply on an annual basis. Currently the programme is in its third edition.
Name of the organisation providing measure	SiRA is administered by the city of Amsterdam at city level. A similar startup programme also runs in other cities, regions and ministries in the Netherlands (Den Haag, Gelderland, Noord Holland, Ministry of Security, Ministry of Internal Affairs), each of which has its own administrative set-up and orientation but is based on the original model from Amsterdam. SiRA was the initiator of this scheme in the Netherlands and is now beginning to set up a network with other similar initiatives in the country.
Type of organisation providing measure	City government
Other contributions	There is extensive networking and collaboration with other support and delivery partners (public and private sector), for example, through the broader Startup Amsterdam programme. Contributions are, in principle, in kind, involving for instance the use of office space, personal contacts, etc.
Total budget for the measure	The city funds programme implementing staff and project managers who also act as trainers and coaches for the startups. As such it is a very 'lean' operation of which the main component is the salary of the project manager. Expenditure figures are confidential. The programme does not, in principle, provide funding to support startups, but funding may become available through a government department (client) if it appears that it would make a critical difference and provide value to the outcome.
Reason for highlighting this measure This is an example of innovation initiated by the public sector, making use of the existing social resources of the area in its jurisdiction. The aim is to drive innovation in public sector procurement which is traditionally a very slow moving and bureaucratic activity. As such, the city government cannot always buy what it is looking for to deal with new problems or develop new solutions for	

Startup in Residence Amsterdam (SiRA) – The Netherlands

problems.

At the same time the idea is provide the opportunity for startups to develop customised products and services to meet needs which the market is not presently providing.

The initiative therefore aims to open-up and innovate in public procurement and thereby, working with startups, helps meet societal challenges for which market solutions have not been developed. If the innovation is successful, the public sector will act as a launch customer and may provide funding to get it in a state where it can be successfully commercialised. Going by the popularity of the scheme it seems to be successful – or at least of significant interest. There is little financial outlay involved. However, no independent external evaluations of the programme have been carried out yet.

Policy context for this measure

The higher-level policy goals of this measure have not been identified in policy statements, but it certainly contributes to policy initiatives related to innovation in public procurement, social innovation and urban management and development. Similarly, potentially it is also linked to other horizontal measures such as the circular economy, dealing with congestion and traffic flows, social support (in areas such as health and mobility), and encouraging communities to address their own issues, including creating employment opportunities, and even tourism, transport, etc. The innovations in question cover a very wide field.

In addition, it can act as an attraction to inward investors both from within the Netherlands and abroad and particularly younger entrepreneurs who can contribute to the fostering of an innovative, self-reliant culture.

As such, the measure links with the macro-level initiatives, such as the new enterprise policy introduced in 2011, which adopted a more systematic and co-ordinated approach to driving innovation and enterprise in the Netherlands. However, the main driver is the goal of the city administration to make Amsterdam one of the top three innovative cities in the EU. To this end Amsterdam has appointed a City Innovation Officer (CIO) and increased the team in the city administration from 6 employees to approximately 50 in recent years.

Aims and objectives of the measure

Rationale, objectives and main elements of the support

This measure has multiple aims, including (as mentioned in the previous paragraph) to make Amsterdam one of the top three cities for innovation in the EU. More specifically, SiRA

aims to transform the conservative bureaucratic nature of city purchasing activities which are often closed to SMEs and innovation, a result of which is that new products and services are not always being acquired by the city government. The SiRA aims to change this by integrating innovation and openness to change into the purchasing process, also providing more opportunities for SMEs by making the whole buying process simpler and more transparent.

This change is achieved by driving and supporting the creation and development of innovative startups, including social enterprises, encouraging entrepreneurship (including prizes and awards) and building and leveraging on linkages with other delivery partners. So far, each year between 15-20 startups have been selected to this end. The plan is to increase this number substantially in coming years.

Overall, the measure is aimed at (re)vitalising the city buying processes, at supporting the entrepreneurial culture, at attracting investors and, importantly, providing benefits for public

Startup in Residence Amsterdam (SiRA) – The Netherlands
procurement. Amsterdam wants to get its inhabitants to collaborate to make the city function better by starting new businesses to provide new goods and services to city government departments. *Target beneficiaries* There are two main target groups: the city government's purchasing departments and startups in Amsterdam. City government purchasing departments that have buying requirements that cannot be met by their existing suppliers are encouraged to participate in the programme. Startups can include both conventional and social entrepreneurs/enterprises. Other than that, there is no specific targeting other than that applicants must demonstrate they meet the requirements sought by the city purchasing departments as published through the calls. The SiRA project manager accesses these startups through networks of older startups who act as ambassadors, at co-working spaces, business incubators, etc. throughout the innovation ecosystem.
Characteristics of the measure *Instrument type* Capacity building, building relationships with partners and strategic measures combined. *Relation of the measure to other measures* This measure can be used in combination with any other measures present in the Netherlands, such as for example the WBSO (mentioned elsewhere in this report). As such it potentially piggy-backs on them and gives them additional leverage. The project manager saw the expansion of the measure to other regions and government purchasing departments as something positive which would increase the level of innovativeness throughout the country. The SiRA also obtains resources from organisations acting as good corporate citizens of Amsterdam, which have good will towards the city and which often provide support in kind (such as business space or mentoring). *Type(s) of innovation supported* This measure covers all the types of innovation to a greater or a lesser extent: marketing, process, organisational, product and social, depending on the nature of the specific requests and the way in which applicants respond to the calls. *Sectoral focus* The activity must respond to needs identified and published by the city government. In principle there are no sector constraints. Examples from the 2017-2018 call are for proposals to be submitted relating to 20 topics which include: • Smart roads: to develop an innovative solution to improve (with the aid of data technology) the management of the city's road network; • Energise Amsterdam: to find an innovative way to inform and motivate people to become physically active, using Amsterdam sports activities and facilities;

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- Healthy heartbeat: to develop an innovative solution to measure the health of the city and its population;
- New Amsterdam citizens: to develop a solution that offers everyone (citizens in general, as well as professionals) an easy and accessible overview of the available public programmes in Amsterdam, describing their objectives and their implementation programmes; and
- Waste away: to find a good solution to get bulky waste off the street.

Within each of these areas, guidance is provided. For example, within 'Energise Amsterdam' the following types of information are offered:

- Background: an explanation of how sports and exercise are important contributors to the health and personal development of Amsterdam's citizens and how the city offers countless opportunities for people to engage in sports, organised by various clubs and organisations throughout the city.
- The role of the City: the City has a role in disseminating information about the range of sports opportunities and sports facilities available, to encourage people to know the current offer and take part.
- The issue to be addressed: at present, both residents and professionals lack a clear overview of the sports offer and infrastructure in Amsterdam. The relevant information is spread across various locations, at the local government level but also at sports providers. This makes getting involved in sport and becoming physically active even harder.
- The challenge: 'Find an innovative way to inform and motivate people to get physically active, using Amsterdam sports activities and facilities'.

Every year the calls are published through a range of media such as the SiRA website, and spread through the innovation ecosystem. Application is through a link on the web page.

Regional specificities

This measure is only relevant for the city of Amsterdam. However, given the interest in the scheme, the city administration is beginning to expand it to the 34 municipalities of Greater Amsterdam, where each municipality can implement its own version of the measure. However, this is still at an early stage, and details are still to be worked out.

Funding available for applicants

In principle no funding is available – the main support provided by the measure being training. However, if a good case for it exists, it may be forthcoming from the department that is buying the products or services to be produced. If the innovation is successful, the city will either become a launch customer or invest in (co-funding) the venture.

Time-period over which the effects are expected to be felt

The gestation and implementation period involved vary depending on the project in question. Projects might also scale up over time if they are successful, which can mean on-going impacts for many years. However, as most projects are by definition still at an early stage of development and have not even reached a pilot stage, results are unlikely to happen within a short time frame of a

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few months.

How the measure is implemented

Instrument design

The instrument was designed to be a low-cost solution to some key city needs and aspirations: to encourage startups and generate innovation in public purchasing in a way that would also address societal problems. The problems in question are set out in the calls. Further examples from the 2017-2018 call than are set out in the preceding paragraph on sectoral focus include:

- Full access: to find an innovative solution to improve the accessibility of shops in Amsterdam's shopping areas and public spaces (City Centre/de Pijp);
- Help wanted!: to develop an innovative tool to encourage victims of discrimination to seek help sooner in an easily accessible manner and to gain access to the appropriate professional organisations; and
- Wild peeing, no more!: to find an innovative way to diminish public urination of the visitors in and around the Rembrandt Square area.

The startups that develop solutions to these problems may at the same time address social problems during implementation. For example, RecyQ aims to increase the waste separation rate in Amsterdam from 25% to 65% by 2020, reduce C02 emissions from burning waste and support the circular economy. RecyQ provides small monetary rewards for collection recyclable materials, and uses groups that might be socially excluded in the process.

Eligibility criteria and restrictions

Applicants must complete a Single European Procurement Document. Startups are defined as follows:

- The business must not have been registered with the Dutch Chamber of Commerce or a similar chamber in its country for more than four years;
- The business must consist of natural persons or a legal entity;
- If the business consists of a legal entity, the business must have no more than 10 salaried employees;
- The business must not have contracted any subcontractors;
- The business must own a minimum viable product(MVP)/prototype/beta version;
- The business must not yet have paid customers for the product provided as the solution. The City has the intention to become launching customer with the Programme;
- Startups must be able to align their features set with the market situation. It is expected that the business will be flexible and open to adjustments;
- The business must not be a startup that has originated from another business that has 250 salaried employees or more.

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How the measure is accessed and delivered

The city identifies the key social challenges it wishes to address through the programme and then launches a call for proposals from applicants to solve those challenges.

The mechanisms used for the implementation

A selection committee chooses the applicants to go forward into the programme which has five phases as set out below:

1. Deep dives and kick-off: the official opening of the programme, a first introduction to the public/municipality and the deep dives with the responsible civil servant/mentor/startup. During the deep dives goals are set and expectations are managed.
2. Lean Basics: this is about getting to know each other better and getting to know the lean startup basics. During this period the startup will follow a training programme (as set out below), have a weekly lunch meeting and a two-weekly meeting with their mentor.
3. Options and decisions: this is critical for the rest of the process – options are identified and evaluated, and decisions made on how to proceed.
4. Validate and prototyping: The prototypes are validated and tested. This phase is based on three key principles: Build – Measure – Learn. This is an on-going process.
5. The last phase is 'launching customer'. If solutions prove successful, the City of Amsterdam will invest in the startup as a launch customer and thereby provide a significant kick-start to the startup's development.

The six-month programme, which covers the five phases mentioned above, includes support for startups in the following ways:

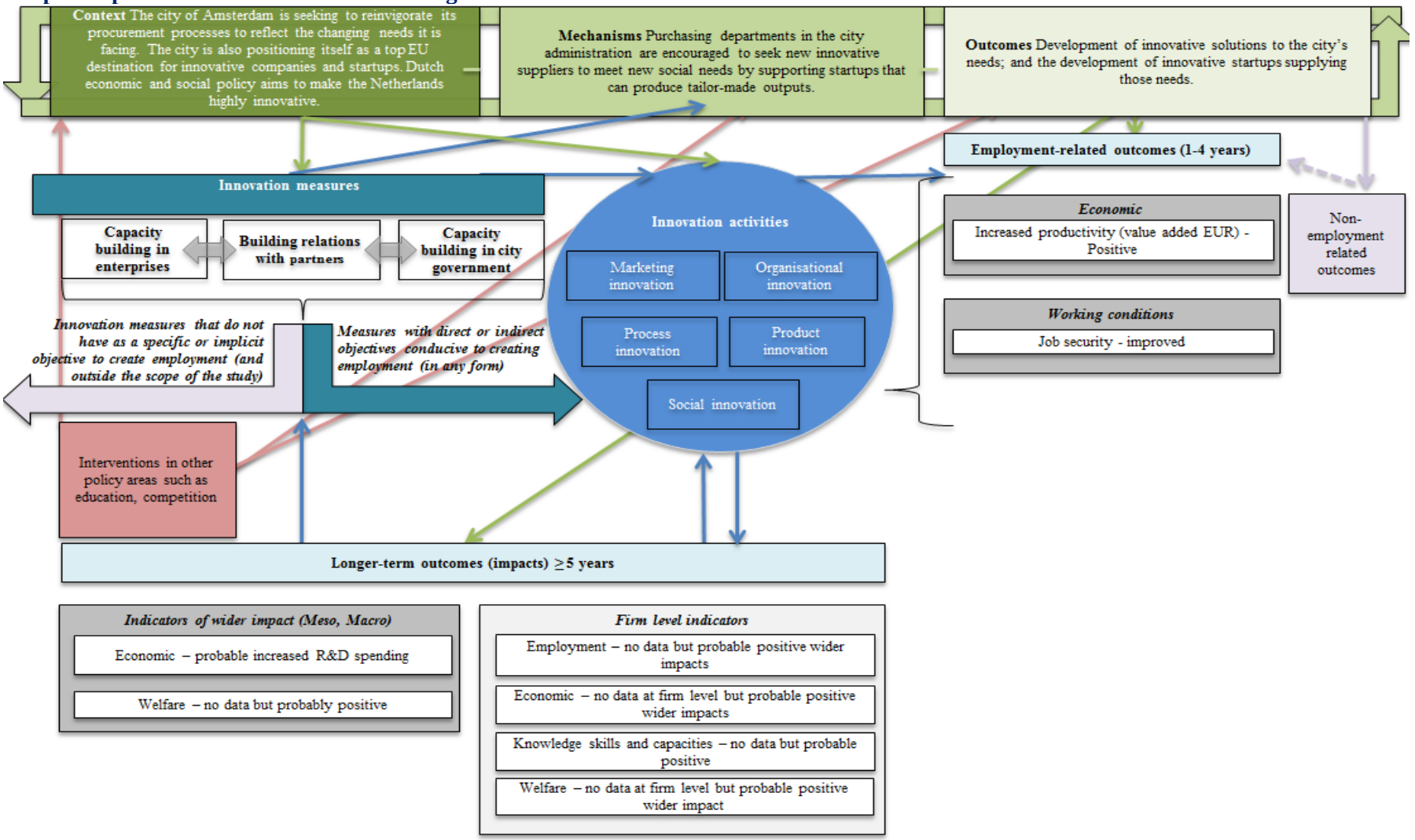
- Training/workshops (an incubator programme of the City and its partners) for an average of four hours a week;
- Professional mentoring/coaching;
- Internal content guidance from the City on how to do business with City purchasing departments;
- Peer-to-peer learning;
- Workspace (at partners and the City);
- The network of the City;
- Process support;
- Product or service development;
- Access to startup events;

Startup in Residence Amsterdam (SiRA) – The Netherlands
• How the City can act as a Startup Visa Facilitator. *How the measure is expected to generate its intended effects* The measure is intended to give rise to more efficient and effective purchasing processes by the city government to ensure that the social challenges the city faces are better met. This is achieved through the support provided to: government departments to revise their purchasing procedures; and to innovative startups who develop tailor-made solutions to meet public purchasing requirements. By supporting the innovative startups, the city government encourages employment in socially useful enterprises which provide high value-added employment in both an entrepreneurial and a societal sense. For example, some startups may provide low value-added in terms of financial criteria, but still fulfil a very useful social function.
The intended general and employment effects of the measure While not the main aim, the measure should provide employment in successful startups and employees recruited if the business grows. The SiRA management team has only recently started to think about expanding internal data collection processes to include data on performance regarding employment. Existing data collection for internal monitoring is primarily focused on the development of the startups and whether that is going to plan. Indirect employment effects are realised in many ways. For example, better management of traffic on the canals leads to improved rates of utilisation and more activity. This, in turn, leads to more throughputs and more employment for those involved in or using canal transport. Increased collection and separation of waste supports the recycling industry. While startups or government purchasing departments do not all generate the same employment effects – direct or indirect – they are nonetheless not insignificant. Potentially a very wide range of impacts exist given the wide scope of the measure. For example, success stories to date include: providing interconnected technology to deal with traffic on the Amsterdam canals; using waste plastic as building material for 3D printers; influencing the behaviour of residents by doing this in a playful way, instead of doing this by fines or by imposing restrictions; improving the quality of tourism by connecting tourists with local residents through a digital platform; helping to deal with the bicycle parking problem, etc. As such, the measure is a source of local solutions, encouraging local innovation and employment to implement them. This does not mean that foreign enterprises are excluded: one of the SiRA companies is from Tel Aviv. A further key employment impact is on those individuals in the startup who have gone through the training programme. They avail over a much-enhanced skill set which will stand them in good stead and means they can continue as employment creating entrepreneurs throughout their working lives.
Summary of the main evidence available and quality of the evidence base At the moment no data are publicly available other than some details about the enterprises that were successful in their application. However, the SiRA project manager advised that the data being collected every year is improving, and they are beginning to think about doing some kind of impact

Startup in Residence Amsterdam (SiRA) – The Netherlands
assessment which will capture qualitative factors.
Actual employment outcomes *Numbers of beneficiary enterprises* For the first two calls, out of some 90 applications each year, 7 companies were selected (each year). During the latest call (2017), out of the approximately 90 applications 13 were selected for the programme. There is no focus on actual employment outcomes, as such. However, employment is one of the ways of characterising the growth and development of the startups.
Overall assessment Based on the data available and the interview feedback, the scheme appears to be developing well and promises much in terms of linking innovation to employment. It also appears that this employment would be quite durable as it is for newly developed products and services to meet new needs, or old needs in a new way. While it is still too early to fully assess SiRA, for one project manager to have catalysed some 27 startups in less than 3 years reflects a certain measure of success. *Strengths/success factors of the instrument from an innovation and employment perspective* The SiRA scheme can provide very direct support to innovation because it is based on an identified need and the requirement for a solution for that need, linked with a potential customer. This reduces the risk for those enterprises that are selected for the programme. As such, there could be employment spin-offs for those working in those ventures, and those who will be employed in the future if they take off. The SiRA scheme also provides the opportunity for social innovation initiatives that employ local people that might not otherwise be in the formal labour market. A further strength of the scheme lies in its relatively low-cost of implementation. *Weaknesses/bottlenecks of the instrument from an innovation and employment perspective* There does seem to be a limit on what can be done with this scheme within the City of Amsterdam, although gradual roll-out to the 24 surrounding municipalities suggests there is scope for further development. *Implementation requirements and its degree of transferability* The measure has been quite widely adopted in the Netherlands which suggests that it is well transferable. Implementation requirements, in addition to setting up an appropriate organisational structure in the city government, related to recruiting a suitable employee and organising and structuring delivery partners and calls for proposals, and then managing successful applicants. *Cost of implementation* The City of Amsterdam's Chief Technology Office (CTO) innovation team employs the startup officer who manages the overall programme and provides much of the training. City government departments that are looking for specific solutions are responsible for funding the specific initiatives relevant for their departments. As such this is a very lean delivery model.

Startup in Residence Amsterdam (SiRA) – The Netherlands
Information sources *Links* StartupAmsterdam website: https://www.iamsterdam.com/en/business/startupamsterdam Startup in Residence Amsterdam website: https://startupinresidence.com/
Report author Jan Smit, CSES

Graphic representation of the intervention logic of the measure



Small Business Research Initiative - UK

Small Business Research Initiative - UK	
Measure identification	**UK SBRI**
Name of the instrument	**Small Business Research Initiative (SBRI)**
Web link	https://sbri.innovateuk.org
Location	United Kingdom (support to enterprises and public bodies based anywhere in the UK)
Starting year and duration	The measure began in 2001 and was implemented by the then Technology Strategy Board (TSB). After a difficult start it was launched in its current form in 2009. The duration of each SBRI contract is between 6 months (for phase one – Research and Development - R&D) and two years (for phase two - prototype development and testing).
Name of the organisation providing measure	Innovate UK – The UK agency for innovation, reporting to the Department for Business, Energy and Industrial Strategy (BEIS). The responsibility for running and funding SBRI competitions lies with the funding department; they have autonomy over the number of competitions they run, contracts they offer and money they put into a scheme. For example, SBRI Healthcare has been independently run and funded by the National Health Service (NHS) England since 2013.
Type of organisation providing measure	Innovate UK is a non-departmental public body.
Other contributions	None.
Total budget for the measure	In 2014/15 the government budget speech stated that the value of SBRI contracts should have risen to GBP 200 million (€227 million). However, despite increased funding allocation, by 2015 annual SBRI spending had grown to only around GBP 75 million (€85 million) due to underspending on the scheme in most government departments (Innovate UK Review of SBRI, 2016).

Reason for highlighting this measure

The SBRI supports public sector bodies and departments to enable them to identify and develop innovative products and services which create improvements in the efficiency and efficacy of public sector services, for instance making cost savings, saving staff time.

At the same time it stimulates innovation and economic growth, by providing development funding for emerging small and medium-sized enterprises (SMEs) through awarding contracts (with the government being the lead customer) to the most promising solution providers. The measure uses public procurement to drive innovation and is an example of a demand-side approach to innovation policy.

The measure does not include any specific intention or programme to support human resource development, training or skills enhancement, but does encourage learning in enterprises. While job creation may be a secondary or indirect benefit, no data are collected on this in the programme, overall. However, recent studies have provided data on job creation in the SBRI

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healthcare programme. This report will use SBRI healthcare as a case study of SBRI in practice.

Policy context for this measure

SBRI provides a lead-customer model of support, which is detailed in UK innovation policy as a critical method of using procurement of R&D services to drive innovation. It aims to boost the productivity and competitiveness of UK businesses. While demand-driven innovation policy is developing, there are some significant gaps in the application of the approach in practice (Bound and Puttick, 2010). The UK ranks 30th in the world for government procurement of advanced technologies, having been slow initially to develop demand side measures. The SBRI has not been implemented to its full potential or to the full extent that policy and budget dictate (Civitas, 2017). This has been as a result of a lack of capacity (skills and time) within departments to create competitions. Furthermore, implementation has been hindered by bureaucratic processes in the procurement pathway in certain departments, for example the NHS.

The potential role that government procurement can play has been regularly highlighted over the last two decades, including in the Department of Trade and Industry's 2003 Innovation Report, which states the DTI intention to 'reinvigorate the SBRI programme to encourage the procurement of R&D from SMEs by Government Departments and Research Councils'.

The SBRI in its current form was established in 2009. In the Department for Business, Innovation and Skills – Innovation and research strategy for growth (2011), the government made a firm commitment to become a lead customer and to use its procurement power more effectively to address cost inefficiencies in service delivery through innovative products and services. It aims to drive innovation in the UK economy through investment in the SBRI along with the Procurement Centres of Expertise, which act as a source of expertise on a market in a particular technology area/sector and are a strategic focal point for engagement with industry; and Public-Private Procurement Compacts: partnerships between the public and private sector which stimulate the market to develop new technologies and provide innovative solutions to both public and private sector challenges

In December 2014, the Department for Business, Innovation and Skills - Our plan for growth - science and innovation committed the government to providing further support to innovative business through a continued implementation of the SBRI, linked to other programmes such as the Knowledge Transfer Partnerships and Networks. The policy makes the benefits and potential of the SBRI clear. It states that over 1,850 contracts worth GBP 210 million (€238 million) have been awarded from 2009 to 2014 and commits the government to expanding this further over the following 12 months. This required improving awareness and understanding across departments and agencies of how SBRI could help solve their policy challenges, and improving communication of successful outcomes, tracking of SBRI projects, sharing best practice and networking between departments.

The Department for Business, Energy and Industrial Strategy - Building our industrial strategy green paper (January 2017) details ten pillars which will drive growth. The relevant pillars include:

- Pillar 1 - Investing in science, research and innovation, becoming an innovative economy and doing more to commercialise the world leading science base to drive growth across the UK.
- Pillar 4 - Supporting businesses to start and grow – ensuring that businesses across the

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UK can access the finance and management skills they need in order to grow; and creating the right conditions for companies to invest for the long term.

- Pillar 5 - Improving procurement – committing to strategic government procurement to drive innovation and enable the development of supply chains. The government commits to investing in the SBRI as the main driver of innovation through procurement, along with a range of measures to simplify SMEs' access to public sector customers.

The defence and healthcare sectors have demonstrated the greatest commitment to investment in innovation procurement through the SBRI. The Ministry of Defence (2012) white paper entitled National security through technology: technology, equipment, and support for UK defence and security details the SBRI has an integral part of sourcing and developing new technology in counter-terrorism. It aims to make full use of technologies developed for civilian applications and to invest in the development of defence and security uses for them.

The Accelerated Access Review of Innovative Medicines and Medical Technologies was announced in November 2014 by the Minister for Life Sciences. Its aim was to speed up access to innovative drugs, devices, diagnostics and digital products for NHS patients. The Accelerated Access Review Final Report (2016) finds that the Accelerated Access Partnership should 'build on the gaps in the technology pipeline exposed by horizon scanning and use SBRI to enable the NHS to articulate to innovators the technology requirements that would best support its needs'.

Overall, innovation policy makes a firm commitment to driving public procurement and supporting innovation in the economy through the SBRI programme.

Aims and objectives of the measure

Rationale, objectives and main elements of the support

The SBRI was established as a replication of a successful 35 year Small Business Innovation Research (SBIR) programme in the USA. This is a similar demand-driven model, which aims to advance innovation in the economy through government procurement of R&D.

The original SBRI in the UK was established in 2001 and led by the TSB. After some failed attempts and following recommendations in the Sainsbury Review in 2007, it was re-launched in 2009 in its current form (Tredgett, 2015).

The SBRI was established because government departments lack access to new and innovative processes and technology that can help them address pressing public sector service delivery challenges. In addition, emerging science and innovation SMEs often lack the investment they need to develop new innovations and markets speculatively, and are unable to access government departments as customers.

The objectives of the SBRI Programme are to:

- Provide innovative solutions to challenges faced by the public sector, leading to better public services and improved efficiency and effectiveness;
- Bridge the seed funding gap experienced by many early stage companies, generating new business opportunities for companies enabling the development of innovative products and services and providing SMEs with a route to market for their ideas; a
- Support competition and growth of the UK economy.

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After the re-launch of the programme in 2009, Innovate UK, along with the Department of Trade and Industry, was given the task of working with departments to deliver SBRI, and it continues to play an important role in coordinating and supporting the programme. Pilot programme were launched in the NHS and the Ministry of Defence between 2009 and 2012. The roll-out the programme to other departments occurred through Innovate UK approaching the R&D teams in those departments to define the objectives of the departmental programme and the specific competitions (Connell, 2017).

Target beneficiaries

The SBRI is targeted at governments and UK based SMEs largely in science and innovation. Enterprises are typically at the early stages of working on the development of an innovative process, material, device, product or service.

Characteristics of the measure

Instrument type

The measure is an example of demand-side stimulation of innovation through public procurement. It promotes innovation in the private sector by providing public sector contracts which support research, development and innovation of products or services.

Relation of the measure to other measures

The SBRI is a stand-alone programme but forms part of the package of innovation offerings delivered by Innovate UK. The SBRI is the only demand-led innovation programme used in the UK, but it interacts with measures such as the Catapult Centres, which work in several areas of innovation across the UK and offer technical and business development support to innovative UK- based businesses. There is, however, no cross over between SBRI and loan and grant schemes offered by Innovate UK because SBRI provides the full cost of R&D, so there is no need for cross funding.

Type(s) of innovation supported

The SBRI primarily promotes product and service innovation, but may also stimulate process and organisational innovation.

Sectoral focus

The SBRI does not have a specific sector focus, but has been narrowly applied to date, focussing predominantly on the healthcare and defence sectors, with some implementation in home affairs, transport and in energy and climate change.

To give an indication of sectoral spread, in the 2013 Budget, the chancellor aimed to increase the value of SBRI contracts granted by key departments from GBP 40 million in 2012-13 to GBP 100 million (€113.5m) in 2013-14 and GBP 200 million (€227million) in 2014-15. Six departments had specific targets for 2013/14: Defence (GBP 50 million/€56.75million), the NHS (GBP 30 million/€34million), Transport (GBP 7 million/€8 million), the Home Office (GBP 7 million/€8million), Energy and Climate Change (GBP 3 million/€3.4million), and Food and Rural Affairs (GBP 3 million/€3.4million). These doubled in 2014/15. However, all departments have fallen far short of achieving these targets, with SBRI healthcare being the most successful in spending one third of its GBP 60 million (€68million) budget (Civitas, 2017)

Connell and Probert (2010) found that 'the fragmentation of budgets and innovation management responsibilities within individual spending departments has meant that participation

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across government and the value of SBRI competitions announced so far have fallen well behind the commitment made in the March 2008 budget'. The Civitas (2017) analysis shows that this has continued to be the case.

Regional specificities

There are no regional specificities in the scheme, although some government departments may present SBRI challenges related to a particular region or geographic area.

Funding available for applicants

Funding is in the form of a public sector contract, not a grant, which removes restrictions on co-funding and allows for the full costs of development to be covered by the SBRI. Contract funding is awarded in two phases:

- Phase 1 - feasibility is demonstrated – typically worth between GBP 50,000 (€56,800) and GBP 100,000 (€113,500);
- Phase 2 – prototypes are developed – typically worth from GBP 250,000 (€284,000) to GBP 1 million (€1,135 million).

Time period over which the effects are expected to be felt

If the expected impact is new and innovative products available on the market, then the expected timeframe would be between three and four years. Phase one (feasibility, R&D) lasts six months and Phase 2 (prototype development) lasts up to two years. Thereafter the product is ready to be used in a public sector setting. Research into SBRI healthcare suggests that within four years a significant impact has been seen in terms of new products available on the market, and enterprises exporting these products to new markets outside of the UK. However, the interview with the SBRI Healthcare programme manager suggests that the timeline is longer (five – six years) because of the emerging nature of SBRI enterprises who are often not yet investment-ready.

How the measure is implemented

The instrument design, and intervention logic

The measure is designed to assist in the development of products and services with the potential to become solutions to public sector problems. The SBRI programme is centrally managed by Innovate UK, along with the Department of Business, Energy and industrial Strategy (BEIS). Innovate UK with each government department having autonomy over how they implement and fund the measure.

In the March 2013 Budget an ambitious target was announced for SBRI contracts totalling GBP 100 million (€113 million) to be awarded in financial year 2013 -14 with GBP 200 million (€226 million) in 2014-2015. Individual targets were set for six departments. Commercial Directors of these departments, who are responsible for procurement, were encouraged to identify areas where SBRI could help address department needs for innovative solutions. This encouragement was reinforced by high level Cabinet Office and Treasury interventions with departments over the next two years and a wide range of SBRI competitions were initiated as a result (Connell, 2017).

Innovate UK has a dedicated team of six SBRI account managers, each with a portfolio of departments and agencies. Innovate UK continues to play a key role in the oversight and management of SBRI. Its responsibilities include promoting it to public sector bodies and

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helping them set up competitions, marketing them to businesses and, where appropriate, helping to manage them (Connell, 2017).

The government department seeking an innovative solution will design a competition in which SMEs tender for support. The measure provides funding to develop the innovation in phases. The first phase is to test the feasibility of the product or service and the second is to develop a prototype. The enterprise retains intellectual property and is free to sell elsewhere to government or in commercial settings. If the solution created shows promise, in terms of an improvement in the efficiency and effectiveness of government services, with significant cost savings, the government will procure the innovation through a public sector contract.

The funding tends to support enterprises with the potential to be commercially viable but which are at an emerging stage and would be unlikely to secure funding from elsewhere. The government funding also helps to leverage further funding for growth and development.

Eligibility criteria and restrictions

All applicants must be UK registered businesses. The programme tends to focus on SMEs but does not have a threshold limit for turnover. 64% of SBRI contracts (up to October 2016) were awarded to SMEs as defined by the UK and EU employment definition (that is less than 249 persons employed). 52% of the contracts were awarded to companies with less than 50 persons employed (Connell, 2017).

Larger companies that have already developed and commercialised their products or services, although eligible are unlikely to apply, because they would not consider the programme to be a viable use of time and resources. Pre-start-up enterprises, universities and charities are eligible, providing they are a registered company. Applicants must demonstrate a route to market for their product or service (namely, its commercialisation potential).

How the measure is accessed and delivered

Each government department works with the support of Innovate UK to develop an open competition to find an innovative solution to a public sector service delivery problem. Enterprises then apply for the programme.

NHS England, for example runs competitions twice a year and operates a systematic process from problem definition through to procurement support, with clinicians, commissioners and people with a business of venture capital background involved in selection interviews.

The SBRI is then implemented through a two-phase approach:

Phase one (testing): Government departments define an operational or policy problem, identifying the clearest way to communicate their need to businesses. Subsequently, there is an open competition, and the most promising entrants are awarded 100% funded R&D contracts to test the feasibility of their solutions.

Phase two (contracts): Companies who gain these contracts can subsequently apply for further funding to develop a prototype ('phase two contracts'), typically lasting up to two years. These contracts are usually capped at GBP 1 million (€1.135m) but this depends on the competition, and more has been awarded in some cases.

Subsequent to this the enterprise independently takes the product or service to the open market and/ or the public sector procures the technology itself.

Competition among applicants is usually limited due to the specialist nature of the innovative

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product or service being sought.

The mechanisms used for the implementation

The main mechanism for implementation is the funding of contracts through open procurement processes, involving the two-stage process described above. The contracted company often subcontracts to other enterprises or individuals who have the required skills. For instance, a company with technical skills may contract someone with clinical skills to assist in tailoring the innovation to healthcare settings. The programme provides no training or mentoring. However, at the outset of the programme enterprises are required to submit a business plan in which they define outcomes and targets. Government departments implementing the SBRI regularly monitor these metrics.

Government departments have failed to spend the Treasury's 2013-14 GBP £100 million (€1,13 million) target on SBRI competitions, let alone the 2014-2015 GBP 200 million (€2,26 million) target. In 2015-2016 spending was 24% below its peak the previous year. The NHS England SBRI budget has been cut by nearly 40% from its peak and, in 2017, successful SBRI programmes in several departments seemed unlikely to be continued (Connell, 2017).

Only 172 of the 258 reported SBRI competitions have followed the two-phase model. Average Phase one and two application success rates were 20% and 30% respectively. Approximately one third of recorded SBRI competitions have had a single phase rather than following the two-phase model. Some 27% of applicants were only offered Phase one contracts, and 7% only Phase two contracts (Connell, 2017).

How the measure is expected to generate its intended effects

The measure intends to enhance innovation in individual businesses and the economy by stimulating innovative solutions to public sector challenges, improving effectiveness and providing efficiency savings. The measure allows a solution to be developed through R&D, rather than seeking an existing 'off-the-shelf' product. If the proposed solution shows promise, the enterprise responsible will be given the opportunity to apply for a significant contract to develop a prototype. The second intended effect is to support emerging businesses in the science and innovation fields, and particularly to enable them to develop products or services, develop markets (through providing a public sector customer base) and to find routes to market and other funding. The SBRI process does not in any way restrict the intellectual property of the business allowing it the complete freedom to take the innovative process or product it develops through the contract to the open market. It encourages a competitive edge and helps to boost productivity.

The intended general and employment effects of the measure

The intended general effects of the programme include improved efficiency and effectiveness of public sector services, as well as provision of opportunities to take innovative products and services to market, which leads to economic growth.

Employment effects are an indirect impact of the measure and the metrics and indicators of the SBRI programme do not, for the most part, extend to employment and related effects in either the government body administering the scheme or the companies which have been awarded contracts.

However, SBRI Healthcare has generated some good data on these areas, having been one of the most successful and researched SBRI programmes in the country This report will use SBRI Healthcare as case study to highlight these employment effects.

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Summary of the main evidence available

The broader range of evidence related to the SBRI programme can be divided into four areas:

1. Reports which have been commissioned by the government but conducted by external research institutions;
2. Independent academic studies and evaluations which have not been commissioned by the UK government body responsible for the scheme;
3. Evidence developed within the SBRI itself, whether this is the national SBRI programme (led by innovate UK and the Department of Business, Energy and Industrial Strategy) or SBRI Healthcare; and
4. Policy papers which give some evidence of SBRI progress or provide case studies and details of government commitment and intention. These particular documents are discussed in the policy context section above, and not given additional attention here.

Overview of SBRI outcomes

Between 2009 and 2016, SBRI had provided GBP 352 million in funding to 2,164 different projects from 70 public bodies (Connell, 2017). The most significant departments to implement SBRI (by proportion of total SBRI expenditure) were Innovate UK (22%), Ministry of Defence (20%) and NHS England (17%) (Connell, 2017).

NHS England has the longest running SBRI programme. Started in 2009 in the East of England, by February 2017 it had funded 67 projects through to Phase 2, over a quarter of which had led to commercial product sales to the NHS (Connell, 2017).

There is a growing deployment of SBRI funded technologies with the cumulative present value of benefits to the NHS forecast to rise to between GBP 349 million and GBP 482 million by 2022 and to between GBP 1.2 billion and GBP 1.9 billion by 2027 (Connell, 2017).

Area 1: Reports commissioned by the government but conducted by external research institutions

The four pivotal reports which have been commissioned by government are as follows in descending date order:

Lichten *et al* (2017), The Small Business Research Initiative (SBRI) Healthcare programme: An evaluation of programme activities, outcomes and impacts, Rand Corp, Cambridge, UK.

Funder: Commissioned by the UK Department of Health Policy Research Programme.

Aim: The study aimed to explore the contribution of the SBRI Healthcare programme to innovation in the NHS. Specifically, the study aimed to:

1. Review the aims and activities of the SBRI Healthcare scheme;
2. Explore the outcomes and impacts of the programme; and
3. Review the challenges and opportunities it faces.

Note that employment related effects are not included in the overall research objectives, but job

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creation is included as part of survey and interview questions.

Methods: The evaluation is based primarily on evidence gathered through a series of surveys and interviews, as detailed in the table below, to allow for triangulation.

Method	Participant profile
Telephone interviews with 16 stakeholders	Representatives of NHS Academic Health Science Networks (AHSNs), the healthcare and technology industry, innovation networking organisations, and the SBRI Healthcare programme delivery team
Survey of unsuccessful applicants	Representatives of organisations that applied unsuccessfully for SBRI Healthcare funding during 2009–2015 (177 responses from 783 businesses, 22% response rate)
Survey of successful applicants	Representatives of organisations that were awarded SBRI Healthcare funding during 2009–2015 (45 responses from 99 organisations, 45% response rate)
Telephone interviews with five funding recipients	Representatives of companies that were awarded SBRI Healthcare funding and responded to the survey of successful applicants.

Interviews and surveys have identified consistent and important insights.

Results:

- SBRI Healthcare funding enabled the 68 companies who responded to the survey to hire 181 full-time equivalent (FTE) staff and to retain another 275 FTE posts.
- One company (initially a microenterprise) reported that they had hired 34 new employees and one other reported that they had hired 15 employees. No other company reported hiring more than six employees.
- In 2015, those 68 companies, subsequent to receiving the SBRI Healthcare award, obtained a total of GBP 36.7 million (€ 41.5 million of additional investment funding from private investors). The credibility obtained from the SBRI contracts was considered to be an important condition for additional investment.
- Given the early-stage of development of most innovations supported by SBRI Healthcare, it is uncertain how many will reach the market. Nonetheless, more than one quarter of surveyed successful applicants reported product sales between 2008 and 2017. These are still modest, totalling GBP 4 million (€4.5 million) of sales in this time period (of which GBP 3 million was in the NHS) by 13 of the 45 companies who responded to the survey. Although still too early to identify impacts on patients and the NHS, awardees reported impacts such as including potential NHS cost savings in the tens of millions, as well as improved use of NHS staffing and resources.
- 23% of respondents noted the potential of the programme to increase the productivity of

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healthcare professionals and data-driven improvements to management processes, as well as reductions in admission and readmission rates, Accident & Emergency attendance and unnecessary follow-up appointments.

- Unsuccessful applicants were also surveyed. Some went on to develop their ideas further and found that they also created new employment opportunities. 70 respondents (80% of 88 unsuccessful applicants that went on to develop their ideas) reported hiring or retaining at least 0.5 FTE employees as a result of further developing their ideas. This would suggest that the companies that were unsuccessful but still continued to pursue their ideas through other means were also successful in creating jobs within their companies.
- While 74% of successful applicant respondents to the surveys agreed that the application and selection process was fair, only 20% of unsuccessful applicants agreed with that view. Concerns were raised by unsuccessful applicants about the level of technical expertise of the assessment panel and the quality of the feedback provided; only 28% of unsuccessful respondents agreed that the feedback they had received was helpful.

The report gives several recommendations for improving the innovation pathway through capacity building, building networks and creating an enabling policy environment to speed up innovation development.

Accelerated Access (2016), ***Accelerated Access Review: Final Report,*** **UK Government (funded by the Wellcome Trust)**. This review explores progress made in accessing innovative medicines and medical technologies for the NHS. It provides a qualitative assessment of feedback from 600 stakeholders in different sector organisations, including clinicians, NHS commissioners, patient groups, charities, life sciences industries, academia, and national bodies that influence the innovation pathway, among others. The report documents the SBRI as a case study of good practice noting that SBRI-backed companies report jobs and trade growth, private investment of over GBP 45 million (€ 50,85 million) and a pipeline value to the NHS evaluated by health economists at over GBP 510 million (€576.3 million).

Health Enterprise East (2016) ***Quantitative Evaluation of the SBRI Healthcare Programme (2008–-2015)*****' [Report for the SBRI Management Board, July] (Unpublished). Cambridge: Health Enterprise East.** This report discusses the outcome of a study involving 68 businesses which had been the recipients of SBRI contracts from 2009 to 2014. The study requested information on job creation and investment leverage. The Lichten et al (2017) study aimed to use a similar sample and to complement the results of this study. The full study does not appear to be available online so it is difficult to see the specific results.

Bound, K. and Puttick, R. (2010) ***Buying Power? Is the Small Business Research Initiative for procuring R&D driving innovation in the UK?,*** **NESTA**. The report, covering the first year of the SBRI scheme (2009–2010), is a 'health-check' rather than an impact assessment, as there had been very little time to assess the effects of the programme. It looks at a sample of SBRI competitions from a range of departments including NHS England, Department of Health, the Ministry of Defence and the Home Office to analyse the effects of SBRI on both the companies and public sector bodies engaged in the scheme. Interviews were conducted with over 30 respondents including government departments and agencies, companies, universities and other organisations. Secondary sources where available were also analysed.

The report found that the SBRI programme has great potential to deliver on its aims of promoting demand-led innovation in the UK based on the first year of the programme. It lists the

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benefits to government and innovation SMEs and recommends greater investment and support for the programme.

The report has been criticised as being biased towards the SBRI scheme due to its government associated funding (Tredgett, 2015).

Area 2. Independent academic evaluations commissioned by the UK government body responsible for the scheme

Connell, D. (2017), ***Leveraging public Procurement to Grow the Innovation Economy*****, BEIS, London.** This is a full review of the SBRI programme from 2008 to 2016 including an explanation of the deployment of the programme, analysis of data on competitions and awards. The report includes a quantitative review of spending and a range of interviews with companies, SBRI programme managers and directors. It concludes with a set of recommendations for how the SBRI programme can be more fully implemented in the UK industrial innovation landscape. A selection of the data produced by their report has been detailed here, including the value and number of competitions between 2008 and 2017 and the value of the benefits this has yielded to government departments. The study does not cover employment related effects.

Civitas (2017), ***Developing SBRI: Using procurement to spur innovation*****.** This is a briefing note developed in response to the Industrial Strategy Green Paper published in early 2017. It focuses on demand-driven innovation and reviews the recent literature to present the benefits and pitfalls of the SBRI programme as a means to deliver procurement-driven innovation. The report summarises SBRI healthcare's achievements noting that over the last four years (2012–2016), NHS England's scheme 'SBRI Healthcare' awarded GBP 57 million (€65 million) in funding via 168 R&D contracts to businesses. The scheme helped to put 20 products on the market and resulted in nine companies exporting their products. In addition, according to independent audits, the innovations inspired by the scheme have generated an estimated cost saving of GBP 1 billion (€ 1.14 billion) for the NHS and created or safeguarded 420 jobs (their value to the economy is estimated at GBP 33.6 million - €38.2 million). This shows that procurement for innovation can nurture cutting-edge products, help companies to export and make public services more efficient.

Tredgett, E and Coad, A. (2015), ***The shaky start of the UK Small Business Research Initiative (SBRI) in Comparison to the US Small Business Innovation Research Programme (SBIR),*** **Birkbeck University**

This paper compares data on the US SBIR and the UK SBRI. Quantitative data on the first four years of the UK SBRI (2009–2013) were compared to data on the first four years of the US SBIR (1983–1987) from the US Small Business Administration.

The data include numbers of competitions, applicants and money spent on research contracts.

Some key differences in implementation of the two initiatives are identified and discussed in relation to the quantitative data. Quantitative data show that while the US SBIR had steady growth, the UK SBRI had a shaky start. This is largely a result of competitions being too bureaucratic and academic and having little relevance or appeal to a large number of enterprises, as well as their being limited funding to support access to the programme. Another problem identified is that, unlike the SBIR scheme in the USA, the SBRI does not include a Phase 3 funding competition to support enterprises to take products to market.

Connell, D. and Probert, J. (2010), ***Exploding the Myths of U.K Innovation Policy – How 'Soft' Companies and R&D Contracts for Customers Drive the Growth of the High-Tech Economy*****, Centre for Business Research, University of Cambridge** The report aims to document and explain the overall impact of the 'soft company' model (companies which carry

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out R&D on new products) in the east of England region. It seeks to analyse their role in regional economic development and the role of government R&D contracts in economic development in the region. In addition, it identifies policy actions to encourage economic development through government R&D contracts and other measures that support the 'soft' model. Data were collected through 52 interviews with founders or senior managers of major firms operating some form of soft business model, and with various business intermediaries. The SBRI model is given much attention and the authors suggest it has great merit and should be awarded greater funding, and that there should be a reduction of bureaucratic barriers hindering access by some companies, or implementation by some government departments. The report recommends that the SBRI scheme should be promoted at regional and national level and that there should be regular independent evaluations of the scheme to highlight its outcomes and impacts.

Sainsbury, D. (2007), ***The Race to the Top - A review of Government's Science and Innovation Policies*****, HM Treasury, U.K.** The aim of the study was to look in particular at the role that science and innovation can play in enabling the UK to compete against low-wage, emerging economies such as China and India. The review consulted many organisations, including companies, trade associations, universities, the Trade Union Congress and government departments and gave recommendations on innovation strategies in the UK. The SBRI formed a central focus of the report and a major recommendation was to increase funding and mandatory targets in terms of the level of departmental budgets spent on R&D. These recommendations were taken up by the TSB/Innovate UK.

Area 3. SBRI Publications

Annual Reviews of the SBRI Healthcare have been published on the SBRI website since 2013-2014. A total of four reports are available. These are internal reports which cover a range of metrics, job creation and retention being a key indicator. Total funds awarded, total contracts awarded (and in which phase) and total savings to the NHS and the companies' ability to leverage additional investments are also included as well as case studies of good practice.

The SBRI Healthcare Annual Review 2013-2014 reported that 93% of contracted companies have hired or retained staff and estimated that around 100 new jobs had been created or safeguarded. This increased to 200 jobs in the following year (SBRI Healthcare Annual Review 2014-2015), while the 2016 Review stated that the SBRI has created or safeguarded 420 jobs in healthcare with a value to the UK estimated at GBP 33.6 million (€38.1 million). The latest Review (SBRI Healthcare Annual Review 2017) puts the number of jobs created or safeguarded at 788 in the first five years with a value to the UK economy estimated at GBP 47.2 million (€53.6 million).

While the data appear to be robust, the reports do not highlight any setbacks in the implementation of the scheme such as delays in delivery of project innovations, which have been highlighted in interviews with SBRI recipients in other reports (such as Connell and Probert, 2010). Furthermore, the metrics are rather superficial giving no information on the type, quality or duration of jobs and contracts created by the SBRI scheme.

Across all of the studies presented, there are clearly some discrepancies in the quantification of impacts, notably in relation to the number of jobs created. Civitas (2017) and Lichten et al (2017) point to similar numbers, with the former referring to 420 jobs created or safeguarded, while the latter talks of a total of 456 jobs being created and safeguarded between 2009 and 2016.

The SBRI Healthcare Annual Review (2017), however, puts the number of jobs created or safeguarded in the first five years at 788. This is higher because SBRI Health care includes

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employment metrics in its annual monitoring and can therefore acquire more accurate data.

Quality of the evidence base

Internal departmental reports: The annual internal reports which have been commissioned by the SBRI tend to provide surface level data on basic indicators such as number and value of contracts awarded, number of jobs created and retained and number of new products created. The reports include case studies of best practice. They are not designed to be critical of the programme but rather to give positive information about the policy, so they may be biased. Additional or more detailed indicators, such as the level of employment created (full time, part time, freelance, contracts) designed into the programme from the outset would have improved the quality of these studies and the possibility to determine employment related outcomes.

Government commissioned reports: Cross-referencing between the reports commissioned by government and those that have been externally funded and independently researched shows that there is some research bias towards describing the SBRI programme in a positive light. This was highlighted by Tredgett (2015) when comparing the Nesta (2010) government funded study to the externally funded one compiled by Connell in 2010. Both reports however are also only able to skim the surface of the programme as it was re-launched only in 2009. The 2017 study by Connell, provides more accurate data and deeper insights into the impact of the programme over time. The purpose of these reports is largely to determine the level of success of the programme from the point of view of different stakeholders, while also examining the data objectively. These reports have provided a series of recommendations to government on next steps in the programme.

Independent academic reports: These have provided the most in-depth and least biased account of the programme and have used the largest sample size (as in the case of Lichten et al, 2017).

The Lichten et al (2017) report is the most recent study and has analysed the impact of the programme over the longest time period (six years), building upon previous reports and using the same sample, in order to demonstrate the impact of the programme over time. The study provides in-depth quantitative and qualitative analysis of SBRI outcomes and offers the highest quality results on job creation and the investment leverage impacts of the programme on SBRI funded businesses. It combines qualitative and quantitative methods. In its comprehensive approach, it has been the most effective in terms of analysing the relevance, efficiency and effectiveness of the programme both in relation to the measure's stated objectives and the indirect outcomes (including employment related effects).

There are, however, some caveats in relation to that report:

- The survey data gathered are self-reported, and are not independently validated, though there is no reason to believe that inaccurate information was provided.
- The study aims to assess the unique character of the SBRI Healthcare programme and its added value. However, it does not assess the counterfactual, namely, what would have happened in the absence of the SBRI Healthcare programme. To mitigate this, the study gathers responses from both successful and unsuccessful business applicants. While the groups are not directly comparable, this did provide useful insights.
- Caution should be exercised with generalisation of the findings. Response rates of 45% and 22% for successful and unsuccessful applicants respectively from a relatively small sample

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do not allow the results to be generalised beyond the sample.

It was seen that reports of the SBRI programme in the SBRI Healthcare Annual Review provide higher estimates of job creation, based on direct monitoring of participants in the programme.

The studies in general have used a variety of methods including interviews with companies who have been both successful and unsuccessful, case studies, surveys, quantitative analysis of secondary data and interviews with key informants. Although no counter-factual studies exist, this has given an excellent overview of the programme in the context of other innovation measures. Given the specific nature of the programme and the niche area of SMEs working in science and innovation it would also suggest that similar results will be seen among the same cohorts in the future. However, most studies have only used a small sample of respondents with fairly low response rates suggesting that generalising beyond the sample should be cautioned against.

Looking at standard approaches to evaluation, the Lichten et al (2017) study provides the most comprehensive application of standard evaluation criteria including analysis of relevance, coherence, efficiency, effectiveness, sustainability, impact and transferability. In terms of the *efficiency* of the measure, the study documents the measure's ability to leverage funds, create new posts and retain existing staff, but it is not able to give detailed findings on the return on the investment (the outlay on the measure) in terms of the improved performance of NHS services.

Actual employment effects

Impact on job creation and retention

Specifically within SBRI Healthcare, job creation and job retention are the main indicators of employment effects collected by both internal and external evaluations. As mentioned above, an impact evaluation carried out by the Office of Health Economics (OHE) for HEE in 2014 found between 2009 and 2014 SBRI Healthcare had led to the creation of at least 89 FTE jobs in 68 surveyed companies which had been successful in receiving SBRI contracts.

An update of this evaluation undertaken in April-May 2016 by HEE itself found that the funding enabled this figure to double from 2014 to 2016 to 181 FTE staff in 68 companies and to retain another 275 FTE posts (Lichten et al, 2017).

The SBRI Healthcare Annual Reviews similarly show a gradual increase in the number of jobs created or safeguarded, the latest review putting the figure for 2017 as 788. It is not clear whether these jobs are highly skilled or unskilled, or whether job creation takes into consideration those created in other companies along the supply chain.

Increase in additional funding generated

The SBRI has been recognised as a reputational endorsement which leads to further investment funding. The OHE report for HEE in 2014 found that funding from the SBRI had enabled companies to obtain a further GBP 6.3 million (€7.15 million) in additional investment from other sources, corresponding to an additional GBP 0.42 (€0.47) per GBP 1 (€1.14) invested in the SBRI Healthcare programme. The updated survey in 2016 found that the level of additional investments was also growing, reaching GBP 36.7 million (€41.7 million) among the 68 companies surveyed in 2015, corresponding to an additional GBP 0.86 (€0.98) per GBP 1 (€1.135) invested in the SBRI Healthcare programme (Lichten et al, 2017). This investment effect has generally given rise to further employment.

An interview comment was 'No doubt in the majority of cases the company [receiving the contract] would not have existed or would not have grown in the way they had without the

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funding'.

Capacity shortfalls

An interesting employment related effect of the programme is that innovations developed by the SBRI do not take into account the skills and capacity of the NHS staff who need to implement them. The Lichten et al 2017 review noted that NHS respondents identified clinical barriers to uptake in the NHS, including a difficulty in integrating their innovation with existing practices (mentioned by eight respondents, or 18%) and a shortage among NHS staff of the skills required for uptake of their innovation (seven respondents, or 16%). One respondent expanded on the latter point, stating that NHS staff are too busy to develop new skills and integrate new ways of working.

Furthermore, SBRI is currently underused by all government departments, with most not meeting their spending targets (Connell, 2017; Sainsbury, 2007). Most government departments believe the scheme would bring value to their service delivery, but they have been hindered by a lack experience and technical capacity to procure technological innovations (Civitas, 2017). The interview with the programme manager revealed that in the first phase of the SBRI contract many companies subcontracted to consultants or other companies in order to have sufficient capacity. When they receive the second phase funding (around 40% of SBRI contracts progress to this stage), the enterprises usually bring the capacity in house by recruiting technical or clinical staff as needed.

Overall assessment

Strengths/success factors of the instrument from an innovation and employment perspective

The SBRI is a high potential demand-led innovation model implemented as part of a suite of measures by Innovate UK. The programme enables government departments to create competitions to find innovative solutions to public sector challenges and provides successful UK- based science and innovation SMEs with full funding so that they can conduct R&D leading to a particular innovation that will help to meet this challenge. A positive related impact has been the amount of new investment leveraged as a result of the SBRI contract support. The scheme has taken 20 products to market and resulted in nine companies exporting their products. In SBRI Healthcare the scheme has had an estimated cost saving value of GBP 1 billion (€ 1.14 billion) for the NHS (Civitas, 2017). Although not a direct objectives of the programme, some evidence exists on employment creation and job retention, mainly within SBRI healthcare, with estimates of jobs created or safeguarded varying between 420 and 788. There is little evidence of other employment effects from the programme including the nature of skills development, changes in the working conditions or environment, flexibility and other factors. These effects are seen as indirect and related indicators are not used in the programme. However, an assumption can be made that senior technical and clinical jobs are created and coupled with an increase in investment in the enterprise, which is likely to lead to higher salaries, better working specialisms and opportunities to learn and develop in the company. Interview evidence suggests that manufacturing jobs created further down the supply chain are often evident beyond the UK.

Several evaluations have determined that the programme is a useful measure to drive innovation and drive efficiency savings in government departments. The pipeline value to the NHS is estimated to vastly increase overtime (Connell, 2017). This shows that procurement for innovation can nurture cutting-edge products, help companies to export and make public services more efficient (Civitas, 2017).

Several independent and government funded evaluations have recommended additional government investment in the programme to further develop a potential that has been

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demonstrated (Sainsbury, 2007; Bound and Puttick, 2010; Connell and Probert, 2010; Civitas, 2017, Connell, 2017).

The scheme has several features which make it attractive to businesses in the science and innovation field including its appeal to nascent businesses: its ability to fund the full cost of R&D; its ability to help develop a market; and its flexibility around intellectual property. Another clear advantage has been the enhanced credibility in respect to follow-on investment from the private sector, assuming rigorous public sector due diligence and the identification of clear market potential (Bound and Puttick, 2010)

Weaknesses/bottlenecks of the instrument from an innovation and employment perspective

The fact that the measure has not been taken up more systematically by government departments suggests that there are weaknesses in its design and delivery.

Most evaluations report that while the scheme is very effective and has great potential, it has not been exploited effectively by the government departments which have almost universally failed to meet their targets (Sainsbury, 2007; Connell and Probert, 2010; Civitas, 2017). This is largely because of a lack of human resources and capacity to fully understand and implement innovation processes. A number of government departments that would benefit greatly from the process (for example, the former Department of Energy and Climate Change and Transport) have barely implemented it. There are also problems with exploiting the innovations that are generated. This was confirmed by the SBRI Healthcare Programme Manager who stated that cumbersome procurement processes within the NHS cause major delays in taking up new innovative products, and supported firms can often make commercial sales more quickly than obtain government contracts.

The main weaknesses according to respondents in the study by Connell and Probert (2010) are the contracts being too academically orientated, the application process being too slow and unclear and a reluctance of departments like the NHS to take on innovations.

Another weakness compared to the US scheme is a lack of Phase three funding. This means that companies are required to fund the roll out of their product to the market themselves, or to find external investment to do so.

More generally, the problems of implementation point to an over-concentration on the technical aspects of innovation, to the detriment of the human resources dimension. Greater attention to the need to implement innovative changes in real working environments would generally help to ensure that the innovations are implemented more successfully.

Outside of SBRI Healthcare there has not been consistent tracking and reporting of the benefits of the programme in terms of cost savings and efficiencies. Making this information more widely available to government departments could have led to a wider implementation of the programme.

Implementation requirements and its degree of transferability

The innovation policy environment in the UK is generally conducive to the implementation of SBRI with central innovation policy and department level plans specifically mentioning a desire to drive procurement innovation. As indicated, the problems arise from a lack of involvement in the scheme by certain government departments. For some projects, barriers arise when it comes to the implementation of the innovations generated. The SBRI is a stand-alone scheme but is complemented by other capacity building, training and mentoring schemes such as the Catapult Centres which provide business support.

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Budgets for the scheme have been increased year on year to support roll out. The Lichten et al (2017) report notes that more could be done to support the innovation pathway in healthcare including promoting innovation skills, capabilities and leadership, networks and encouraging relationships that connect the innovation pathway.

The fact that the measure was initially based on the SBIR initiative in the USA and that other European countries, such as the Netherlands, have adopted similar schemes implies *transferability*, but with appropriate consideration for the difficulties that have been witnessed in the roll out of the scheme in the UK.

The evidence available on the SBRI includes a combination of SBRI internal reports which have been produced by SBRI HealthCare since 2013, government funded reports, independent evaluations sponsored by trusts and foundations and implemented by academic institutions. Although the research results provide good insights overall, there is a need for more regular externally funded and independently evaluated studies to ensure clear and robust information on the programme.

Information sources

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- SBRI Healthcare (2017), *2016/2017 SBRI Healthcare Annual Review: Bringing new tech to the NHS* Cambridge: SBRI Healthcare
- SBRI Healthcare (2016), *2015/16 SBRI Healthcare Annual Review: Accelerating the development of Innovations for NHS Need.* Cambridge: SBRI Healthcare
- SBRI HealthCare (2015), *2014/2015 SBRI Healthcare Annual Review: Accelerating innovation in Health*. Cambridge: SBRI Healthcare
- SBRI Brochure: Government Challenges, Ideas from Business, Innovative Solutions

Links

- UK Industrial Strategy: https://www.gov.uk/government/organisations/department-for-business-energy-and-industrial-strategy
- Innovate UK: https://www.gov.uk/government/organisations/innovate-uk
- The SBRI scheme: https://sbri.innovateuk.org/; https://sbri.innovateuk.org/about-sbri
- SBRI Healthcare: https://sbrihealthcare.co.uk
- https://sbrihealthcare.co.uk/annual-review/

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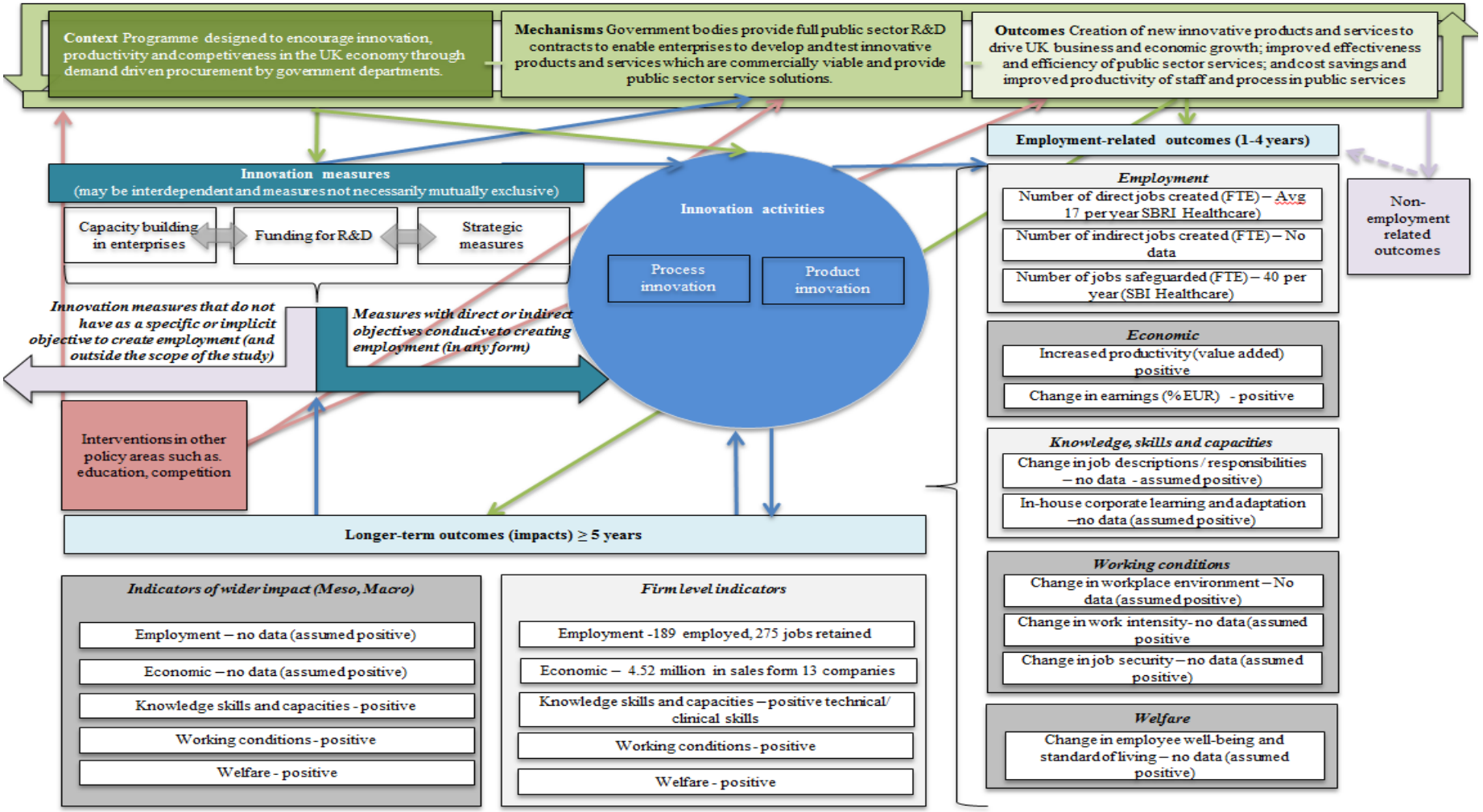
Graphic representation of the intervention logic of the measure



Swedish Winter Sports Research Centre – Sweden

Swedish Winter Sports Research Centre – Sweden	
Measure identification	**SE Winter Sport Strategy**
Name of the instrument	Swedish Winter Sports Research Centre – *Nationellt vintersportcentrum*
Web link	https://www.miun.se/NVC/
Location	Sweden, Jämtland
Starting year and duration	The Centre was established (in its current form) in 2006. There are no plans on discontinuing the activities of the centre.
Name of the organisation providing the measure	*Mellersta Norrland* (ERDF Managing authority – NUTS 2) *Jämtland Härjedalen* County Council (ERDF co-funding) *Mittuniversitetet* (Mid Sweden university – administrator)
Type of organisation providing measure	Regional authorities in collaboration with the Mid Sweden University
Other contributions	During the 2007-2013 programming period, the Structural funds financed half of the project costs, while the remaining budget was covered by the Mid Sweden university and the County council in *Jämtland*.
Total budget for the measure	ERDF funding was provided 2007-2013 in two rounds. Total budget = €3.77 million (€2.15 million for the 2007-2009 period and then an additional €1.62 million 2011-2013).

Reason for highlighting this measure

The Swedish Winter Sports Research Centre (SWSRC) is a competence centre based at the Mid Sweden university and an interesting example of regional smart specialisation. Smart specialisation is becoming an increasingly important strategy for regions in Europe to support innovation. It aims to make use of regional competitive advantages to build a competence cluster with high regional relevance. At the same time it is envisaged that the Centre has potential to work internationally in the field of winter sport and health.

As part of the university, the overarching strategy of the Centre is to:

- Establish and develop support functions for professional sport in Sweden in particular i) winter sports and ii) physical activities and health.
- Undertake R&D and publish outputs of the academic research internationally.
- Strengthen the sport sciences infrastructure at the Mid Sweden University.

Although the centre has an international outlook, it equally holds a key position in the regional economy, as it works with local and regional authorities, sport organisations and local businesses to strengthen the links between academy and industry. The *Östersund* region (which lies within the larger *Mellersta Norrland* area) attracts many athletes – the majority of the Swedish cross-country skiing and biathlon squads live and train in the town. This development has had a positive impact on job creation in a region characterised by older industries (forestry, heavy industry) and which is looking to capitalise on sectors more conducive to the knowledge economy.

The policy context for this measure

The SWSRC measure is a central part of the regional innovation strategy (developed for the two

Swedish Winter Sports Research Centre – Sweden

counties *Jämtland* and *Härjedalen*). The innovation strategy is a forerunner of a forthcoming smart specialisation strategy for *Jämtland Härjedalen*.

The *Jämtland Härjedalen* region covers a relatively large area of Sweden but is sparely populated (both relative to the Swedish as well as the EU population). A SWOT analysis developed as part of the innovation strategy lists geographical remoteness, a low business enterprise R&D expenditure (BERD) and a lack of regional private R&I capital investment as weaknesses, and a lack of collaboration among regional actors, a diminishing number of student places at the Mid Sweden university (the key higher education institution in the region) and depopulation as threats.

Sport, physical (outdoor) activity and tourism are all high priorities in the innovation strategy, along with a strong human capital potential. The interview with the regional policymaker (and author of the innovation strategy) highlighted the region's approach to emphasising the potential of human capital in promoting innovation. It was felt that innovation driven by human resources to counter the relative remoteness and lack of high-tech industries was a key opportunity for *Jämtland Härjedalen*.

This does not only include the activities of the SWSRC. In addition to the Winter Sports Research Centre, the region also hosts a larger 'Peak Innovation' centre which is an incubator operating in the same fields as SWSRC and which is co-funded by VINNOVA (the Swedish Innovation Agency), the Mid Sweden university and by public and private investors, including the *Jämtland Härjedalen* regional authorities.

Support in the sport and well-being industries are not only regional policy priorities in their own right, but also have the potential to bring further benefits, such as attracting students to the university, attracting investment, encouraging activities in related fields such as medicine and public health, and tourism. For example, *Jämtland* has considerable employment in the healthcare sector – 18.7% of the working population (SWECO, 2016). It is also expected that the public intervention will support regional public-private collaboration and growth in existing and new companies in the area.

Aims and objectives of the measure

Rationale

The SWSRC rationale for generating effects largely follow that of the competence model intervention logic, although the focus is not solely on the university's ability to collaborate with industry (as some competence centres aim to do) but, as a result of the high relevance of the competence centre activities, also involves a broader range of actors, including the International Olympic Committee and NGOs (for example local sport associations) working with sport in the area.

The rationale for promoting and growing the SWSRC has evolved over time. The Centre was not originally set within the structure of the Mid Sweden university but was established by the *Jämtland-Härjedalens* sport association in 2001 as a grass roots initiative. It was incorporated into the university structure as a competence centre in 2006-2007, but it has continued to cooperate with the original founding sport association (Almerud et al, 2010).

The decision to move the centre within the university was an important initial step of building a foundation for 'generating bigger effects' as it provided the impetus for a reorganisation of the management and operations of the centre. The division of labour was developed in line with the academic system in Sweden. Technically, the Centre belongs to the Department of Health Sciences of the university but spans a total of four institutions and two faculties.

There is thus a clear multidisciplinary element which makes cooperation even more important. The incorporation into the university structure also helped the centre activities grow and provided funding for physical space, equipment as well as additional staff to support the (pre-) existing R&D activities

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undertaken by the centre.

Moreover, existing evaluations point out that the SWSRC ability to collaborate with other partners in the region (such as the County Council and the Swedish Public Health Institute) was enhanced thanks to the university connection. This was a crucial first step as it allowed the Centre to forge closer ties with key public actors in the region, exchange ideas, and – ultimately – influence the region to promote the Centre's activities to support sport and wellbeing as part of the regional strategy. The Centre activities have over time become more prominent features in the region's innovation framework, notably the regional innovation strategy, which is the document on which the smart specialisation strategy is building on.

Objectives

The objectives of the Centre are linked to the following activities:

- The development of support functions for elite athletes in Sweden within the framework of a centre strategy with special focus on winter sports and physical activity and health.
- Enhanced infrastructure in sports science at the Mid Sweden university.
- The further development of R&D to study and enhance performance and thereby support Swedish and international winter sports.
- The development of an environment that enables the study of physical activity and health, as well as establishing national/international networks and research collaboration and highlighting important contributions to the international academic literature.
- The development of a good education environment for Mid Sweden university's students, including establishing a tailored degree focusing on sport science.
- The further development of a test laboratory for Olympic winter sports.

These objectives are monitored as part of the reporting requirements of ERDF funding in Sweden. However indicators do not exist for all objectives, as they are not required. Nonetheless, the project owner (the SWSRC director) provided qualitative updates in the form of annual reports during the project period.

Intended beneficiaries and target group

The key actors involved in these core activities are national and international researchers, teachers, students, elite activists and talents in Swedish sport. The target group also includes coaches who work with elite athletics development, and with an interest in studying physical activity and health (Almerud et al, 2010).

Characteristics of the measure

The main characteristics of the measure are summarised under the following headings:

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Instrument type

The SWSRC was funded as part of the *Mellersta* Norrland ERDF programme, however the instrument model – generally referred to as a 'competence centre' model, or 'triple helix' model[6] – is equally well-established in Sweden and competence centre programmes have existed for decades in the country. For the purposes of this study, the SWSRC is classified as a strategic measure – Smart specialisation.

Relation of the measure to other measures

The SWSRC's funding stems from several sources, thus its funding model should be described as a 'package'. The key co-funding agencies are the *Mellerta Norrland* region (ERDF Managing Authority), *Jämtland* County Council (ERDF co-funder) and the Mid Sweden university.

Type(s) of innovation supported

In theory, there is no limit regarding the types of innovation that can be supported; however the main innovation forms being promoted through the SWSRC are technological (development of elite sport technologies) and organisational (enhanced collaboration and ability to collaborate across the region).

Sectoral focus

Elite sport and wellbeing with wider links to medicine, public health and tourism.

Regional specificities

This is a development envisaged in the regional innovation strategy.

Funding available for applicants

ERDF funding can be sought by regional public and private organisations. The Mid Sweden university applied for funding through the regional ERDF OP. A total of €3.774 million was requested by the university and granted by the Managing Authority. Although there is no figure available which gives an indication of funding available per applicants, for context, the total *Mellersta Norrland* ERDF budget for 2007-2013 totalled €353 million (Community + Swedish budget). Thus, the Centre has received less than 1% of the available ERDF funding.

The ERDF funding granted to the Centre was also matched by the Mid Sweden university.

The Centre has also received funding under the 2014-2020 ERDF OP for an Interreg project with a Norwegian partner.

Time-period over which effects are expected to be felt

Activities were implemented by the Centre through two rounds of ERDF funding.

The **first round of activities** (2007-2009) was aimed at creating a strong foundation for continued activities. The effects of these activities were expected to cover improved capacity and capabilities of the SWSRC and partner organisation staff (including new employment) and a better (established) network of regional and national partners. The nature of most of these effects was short-term or

[6] The Triple Helix Model, established by Etzkowitz and Leydesdorff, copes with different forms of university – industry – government interaction. It reacts on the rising uncertainty and ignorance in society, which are results of the developments towards a knowledge society. See Hohmann, L., (2016). To what Extent Is the Triple-Helix-Model of Etzkowitz and Leydesdorff of Use for the Implementation of Smart Governance? – an Analysis Referring on Implemented Triple Helix-Constellations. Glocality, Vol, 2, No. 1, p.2. DOI: http://doi.org/10.5334/glo.7

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immediate, however it was also important to ensure that the Centre could build up activities with high sustainability.

Key activities and main effects included (note that although the activities described began around 2007, many of the effects are dated in 2009-2011):

1. Establishing a world-leading R&D centre for winter sport

This goal was largely measured quantitatively through common academic indicators, including the number of publications in scientific journals. During the project period, the Centre has obtained a status of world leader in the number of publications published for 2011-2013, partly thanks to the purchase of research infrastructure and partly thanks to competent and internationally competitive staff. The Centre has a good reputation internationally for R&D, R&D infrastructure, and can also offer the right climate, that is, cold weather and snow.

2. Establishing a field station in the skiing-town of *Åre*

The Centre has established a field station in the skiing-town of *Åre*, which is undertaking R&D in the areas of skiing, cycling and disability sport. The field station has also been working with the sport and skiing industry on a number of pilot projects (contract R&D) aimed at creating innovations in these areas. More generally, the field station has created a commercial front for the Centre and has become a meeting place with industry.

3. Developing business models

Thanks to the ERDF funding, the Centre has been able to focus more on developing suitable business models for interacting with the industry and with other partners. This has helped to structure activities aimed more closely at the market. Commercial activities undertaken at HEIs are regulated by law, but thanks to the Centre's reputation, the Swedish government has issued the Mid Sweden university with 'the permission' to charge for testing and certification services. The same level of freedom is not granted to other institutions, which helps the Centre's competitiveness nationally. This in turn has allowed the Centre to hire staff with the responsibility of networking with industry. The commercial side of the Centre activities has also seen collaborations with Peak Innovation (the regional incubator) and its industry partners. As a result, two companies, CRAFT (a manufacturer of sport clothes) and Qualisys AB (manufacturer of 3D cameras) have relocated a number of their R&D projects to the region.

4. Developing an international R&D environment for winter sport and public health

The Centre has sought to establish an international reputation through a global recruitment drive. As a result, four out of the six Postdoc positions put in place 2011-2013 have been international with staff recruited from the UK, Canada, New Zealand and the USA.

5. Strengthen the cooperation with the Swedish Olympic Committee

This has included signing a cooperation agreement for R&D projects, which has given the Centre a unique position vis-à-vis the Committee as an R&D collaboration partner.

6. Develop new kinds of business activities involving the university, public actors and industry

Since its foundation, but during 2011-2013 in particular, the Centre experimented by developing different collaborative models that could help increase cooperation with external parties. One of these projects resulted in a collaboration with the regional health authority, where the Centre has functioned as a contract partner for diagnosing patients with osteoporosis.

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7. Develop a centre for physical activity and health

The Centre has gradually also established R&D activities focused on physical activity and health, which have resulted in a number of scientific publications. An unknown number of staff recruitments have also been made to further develop this line of R&D.

The **second round of ERDF funding** (2011-2013) saw the continuation of the above-mentioned activities, but also new links with VINNOVA, the Swedish Innovation Agency, and new innovation-focused activities in the field of Internet of Sport. Internet of Sport is the umbrella term for the use of high-tech ICT in sport performance. The Centre is currently closely involved in developing an Internet of Sport cluster in Sweden and managing a number of field projects together with of ICT companies in *Kista*, outside Stockholm (Kista is Sweden's largest high-tech ICT hub).

The push for more use of smart technology in sport has also been beneficial to the Centre as a higher education institution, as students have benefitted from learning and using very high-tech and smart equipment as part of their degree.

How the measure is implemented

Instrument design

The instrument design and its intervention logic are well known within the Swedish research and innovation and higher education community, and often encouraged by public funders.

Sweden has long encouraged the use of competence centre programmes as a mechanism through which to build up regional competence and create regional knowledge economies. That is, Sweden sees Competence Centre programmes as a way of supporting high quality regional specialisation.

Swedish Competence centre programmes were first implemented in 1994 and were largely modelled on a similar instrument designed by the US National Science Foundation in the 1980s.

Broadly, the main assumption for achieving impact of this instrument is that support is envisaged to stimulate scientific excellence in a focused area relevant for industry, thus concentrating public efforts on this area. By increasing the influence of industry on the agenda setting in the region, industry would acquire innovation capabilities, which would lead to improved competitiveness. In addition, this 'pool of competence' would act as a magnet for international top talent and R&D investments (Stern et al, 2013).

However the intervention logic varies from case to case, with some instruments having a more explicit intervention logic than others. Previous research shows that in some cases there is a clear agenda by funders to influence the structure and behaviour of universities and to entice industry into more 'open' innovation without this necessarily being clearly stated. Moreover, although there are also educational aspects to the competence centre model, these tend to be less prominent compared to the focus on research and innovation.

In the case of the SWSRC, the intervention logic is anchored in the region's specialisation in winter sport, both in terms of being a location of professional sport competitions but also as a region with a high number of businesses catering to professional sport competitions and elite athletes. Thus, the envisaged cooperation partners for SWSRC include both public agencies as well as local firms. This is further explained in the Context section below.

Context

Although a competence centre is an instrument used throughout the country, each centre is designed according to its surrounding context, that is, successful centres are able to carve out a competitive

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advantage by working with regional partners who have the same interests and goals in a way envisaged through the smart specialisation approach.

In the case of the SWSRC, activities were first developed (2001) in a bottom-up approach under the management of the regional sport association (described under the 'Rationale' section), before becoming more formalised when it was brought in under the Mid Sweden university structure (2006-2007).

More broadly, sport – and in particular elite winter sport – has been an important area to the region economically for a long time. The *Åre* resort regularly hosts international cross-country and downhill skiing competitions while also being a tourist and elite sport training destination.

As described above, SWSRC activities are in line with the priorities of the regional innovation strategy and will also form part of the forthcoming smart specialisation strategy.

There are other regions which also have strong profiles in winter sport – both in northern Sweden as well as in Norway (which borders to the *Mellersta Norrland* region), however according to the SWSRC management, their activities are predominantly either different (in terms of research activity focus) from or incomparable (unrelated) to the activities of the SWSRC.

Mechanism

The SWSRC activities are driven by a number of inputs. In line with smart specialisation initiatives generally and the Competence centre model specifically, there is no one single mechanism which drives activities but different interventions play different roles in the development of the Centre.

In line with the competence centre model, there are a number of important activities taking place, and which could be described as follows:

- **Education and Teaching**: undergraduate, postgraduate and PhD level studies in the area of winter sport. The SWSRC offers a number of courses, including a Master degree[7] in English in order to attract international students – Masters Degree in Sports Science - Performance Optimisation with a Focus on Elite Sport.
- **Research:** Academic research in the area of sports and performance, and sports and health. SWSRC has international partnerships and collaborations with other universities and research centres.
- **Innovation and testing**: working with sport and public health institutions and with industry, the SWSRC also supports the innovation and commercialisation of sport technology and runs testing services relating to the human body (fitness tests) and sports technology.

In practice, these different activities also interact on a number of levels. For instance, students take on supporting roles in innovation and testing activities, which also exposes the students to more hands-on activities and the use of high-tech technology. SWSRC researchers support individual industry partners with ad-hoc research projects that feed into the innovation side of the SWSRC role.

The two rounds of ERDF funding have played a fundamental role by providing the Centre with financial resources to fund R&D activities, purchase R&D infrastructure and run the Centre more

[7] SWSRC teaches in this course in collaboration with the Health Science department.

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generally.

The Mid Sweden University also provides funding (for example, financial resources towards the educational side of the Centre) as well as a physical and managerial structure.

In addition to these two key inputs which funds different activities can be mentioned a third category of ad hoc project-based funding, and in-kind contributions from partners (such as sport associations and individual businesses), which is ultimately geared towards more innovation-focused activities.

An important point here is that as there are multiple mechanisms involved, the Centre management play an important part in ensuring activities are coordinated and effective. The Centre management also need to manage expectations from different stakeholders to ensure that there is a long-term buy in from all parties involved. For example, as a higher education institution the Mid Sweden university is keen for the Centre to prioritise research outputs (scientific publications) and commercial outputs that bring income (typically patents and other copyrights). In contrast, companies collaborating with the Centre may prefer to focus on immediate challenges to their products and services.

Consequently, the Centre management put significant focus on encouraging dialogue and cooperation in order to trade between different needs and priorities. The Centre management has in particular put significant efforts into developing the Centre as a viable platform for co-production and to build up trust when collaborating with external partners.

Outcomes

Typical outcomes and impacts expected from the use of a Competence centre model are listed on the left-hand side of the below table. The right-hand side column assesses these from the point of view of the SWSRC.

Note that there are no explicit employment-related objectives; rather the Centre is focused on fostering collaboration in the region and innovation.

Expected outcomes (general)	Outcomes expected by the SWSRC as reported in monitoring reports to the ERDF MA
Performing industrially relevant research of a more fundamental kind than is normal in academic-industrial cooperation.	Expected/Achieved – the Centre has been actively collaborating with regional and national businesses in the high-tech (elite) sport performance area and is working closely with the Swedish Olympic Committee.
Producing high-quality scientific outputs, in line with the quality norms of the scientific community.	Expected/Achieved – the Centre performs exceptionally well in terms of scientific outputs. It has made the top 100 in the 2016 Shanghai Global Ranking of Sport Science Schools and Departments.
Developing scientifically qualified human capital with skills in industrially relevant areas – Integrating PhD training into the centres.	Expected/Achieved – the Centre has established an integrated approach to R&D activities and involves PhD students in field research, which exposes them to the latest technology in the area.
Focusing the skills and experience of academic and industrial R&D workers in the scientific and technological domains of	See below.

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the centres.	
Encouraging the development of interdisciplinary critical mass within academia in areas of industrial relevance.	Expected/Achieved – with the second round of ERDF funding, the Centre has developed expertise in the emerging (interdisciplinary) field referred to as 'the Internet of Sport', which involves the use of high-tech technologies in monitoring and analysing elite performance. The field is becoming an area of expertise at the Centre and the SWSRC is collaborating with a dozen companies, which has led to the Centre recruiting an unknown number of new senior researchers and other (not defined) co-workers.
Changing research culture – Encouraging companies to engage in 'open' innovation (open both to academia and to interaction with other companies) and jointly exploring more fundamental questions than normal - Encouraging greater interest in and acceptance of the value of industrial collaboration within academia.	Expected/Achieved – the Centre management has put significant efforts into developing the Centre as a viable platform for co-production and to build up trust when collaborating with external partners.
Producing innovations in the participating companies and through spin-outs.	Expected/Achieved – the Centre has 'produced innovation' in collaboration with industry, but these appear to have been produced through contract research and have not (yet) produced any spin-outs.

Eligibility criteria and restrictions

ERDF eligibility criteria are applied to the Centre funding. The Centre itself does not have any explicit eligibility criteria when entering into collaborations with external partners, however the agreements are tailored to each individual needs, with regards to timing, scope, and specific issues such as intellectual property. The Centre also has to take into consideration competition regulation and regulation governing Swedish universities' commercial activities.

How the measure is accessed and delivered

The Centre submitted the application through the Mid Sweden University (that is, the university is the beneficiary according to ERDF rules), which also receives the funding, which is then spent by the Centre management.

The managing authority for the ERDF in Sweden is the national Swedish Agency for Economic and Regional Growth, however the Operational Programmes developed are regional. The ERDF OP designed for *Mellersta Norrland* granted funding based on the SWSRC application. ERDF co-funding was provided by the County Council.

The mechanisms used for the implementation

See above.

How the measure is expected to generate its effects

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The main expectation is that the measure stimulates collaboration between the Centre and external partners as described in the outcomes section above (see specifically the Expected outcomes table). The Centre effects are multifaceted and differ with the different cooperative agreements in place.

The ERDF funding was a crucial step in the strategy of establishing the Centre activities more broadly and thus to enable its effects to be larger in scale. In particular, the ERDF funding allowed the Centre to broaden cooperation between regional public actors, industry and the University staff.

The intended general and employment effects of the measure

Although there are no explicit objectives or goals set in terms of the level of employment effects the Centre is expected to produce, the SWSRC should still be expected to contribute to some extent to i) new employment opportunities and ii) better coordination among Mid Sweden university employees.

There are no formulated expected strategic and operational effects in the measure documentation. This may be because the Centre activities and their associated (expected effects) are quite broad. Secondly, there is no clear division between strategic and operational effects. There are no explicit employment-related objectives, but implicitly, the Centre expects to create employment through collaboration with internal and external partners.

The Centre documentation usually describes the intended effects to cover the following areas:

- **R&D, innovation and the knowledge economy** – the Centre has a strong academic reputation in Sweden, and this is also growing internationally. The Centre is not only reputable in academic publishing, but is also competitive as it houses very modern technology and equipment, especially in physiology and biomechanics. SWSRC works closely with the VINNOVA-funded Peak Innovation Centre, also located at the University, which specialises in innovation and commercialisation in the sport sector.

  As such, the Centre activities can be expected to contribute to wider employment opportunities in the region through commercialisation of R&D efforts (in collaboration with Peak Innovation and other actors).

- **Smart specialisation** – SWSRC has an important role in the regional economy, as it works closely with both public and private local actors. Winter sports – and related tourism – are very important to the regional economy, and are a priority sector for *Mellersta Norrland*. This has been formalised in the current programming period as a winter sport-based smart specialisation strategy.

- **Promoting health and well-being**, **active ageing and a healthy workforce** – although the Centre has focused more on elite sport than amateur sport or physical activities, the equipment and knowledge used to support professional athletes can – and is also used to – support the general population. SWSRC has worked with other universities in Austria, Germany, France, Italy, Finland, Norway and the USA in this area, for example in the field of human development and ageing.

The centre activities can be expected to contribute to structural employment changes as the region works to move away from traditional industries (including forestry) to industries associated with the knowledge economy (tourism, high-tech health services and high-tech sport services).

Summary of the main evidence available

SWSRC and specific projects undertaken by the Centre have undergone two on-going (real-time)

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evaluations, which have assessed their performance and results, as well as other organisational aspects. These two evaluations were undertaken by two different external contractors, both consultancy firms with experience in on-going evaluation techniques.

The evaluations appear to rely mostly on:

- Desk research – review of the Centre documentation;
- Qualitative (face-to-face) interviews; and
- Participatory research (attendance at Centre meetings).

Real-time evaluations do not tend to cover a broad range of evaluation criteria. This is true for both the above studies, which have focused on implementation, in particular efficiency and immediate effectiveness.

In addition to the evaluations, there is also evidence on results and impacts through the Centre's own reporting on the two rounds of ERDF investment (monitoring data). This evidence takes the form of self-completing data including reporting on pre-agreed indicators as required by ERDF funded projects.

A full list of references used to date is provided below under the heading 'Information sources'.

Quality of the evidence base

The authors' assessment of the quality of the evidence is that it is fairly high albeit focused – as real-time evaluations are – on operational implementation and on immediate or short-term results. The reports available are transparent and clear in their structure, aim and limitations.

For the purposes of exploring employment-related outcomes, the main weakness with regards to the quality of the evidence is that the 'evaluation perspective' is skewed by the fact that both evaluations were real-time assessments of the Centre. Although it should be stressed that real-time evaluations per se are not of lower quality than other studies, they do focus on processes and organisational aspects, thus giving less attention to outcomes – and in particular long-term ones. Nor has either of the studies focused on employment aspects.

This withstanding, an advantage with the real-time evaluation approach is that it clearly described the activities undertaken by the SWSRC required for producing (expected or unexpected) outcomes. Both evaluations provide overall convincing explanations to how (and to what extent) the Centre has reached its achievements to date.

In terms of the quality of the methods of the studies, there seems to have been an overreliance on interviews. Although interviews are good sources of information and also increase the relevance of the research, on the other hand, the evaluators need to provide an assessment based on subjective input. Another general drawback to the use of real-time evaluation is that their methods to not include tools, which are universally recognised as producing robust assessments – there is no use of control groups or of systematic or other evidence reviews. As described, instead evaluators are forced to rely on internal monitoring data and on interview and survey data.

As a direct result of the payment schedule of ERDF grants (which is backdated), the two real-time evaluations also appear to have been undertaking their research towards the latter period of the two ERDF rounds. This means that the researchers were not able to follow the Centre activities from start to finish.

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Actual employment outcomes

The two evaluations that have been commissioned to assess the Centre activities and outcomes highlight the following key outcomes which could be considered as pre-conditions for creating new employment:

1. The creation of conditions to develop as an internationally leading research environment in the fields of sport and health.
2. The strengthening of the Centre's role as a winter Olympic Test Centre nationally. Building on the R&D activities in winter sport science, the University has been granted 'testing status' by the Swedish government which in practice means that the Centre can charge fees for various types of services to industry (such as testing of equipment standard, performance of winter sport equipment, physical health and performance of athletes).
3. Co-production and business development in collaboration with the regional business community in the sports products/services and outdoors activities sector.
4. The R&D activities are also developing into the creation of new industries (in collaboration with existing businesses).

The evaluations also include some qualitative assessments addressing employment outcomes in a number of areas. These documented outcomes are also supported by the two interviews carried out for this study, although the interviewees tended to rely on the findings of the evaluation reports when discussing employment outcomes. The major employment outcomes relate to:

- **New direct employment**: the expansion of Centre activities have allowed for SWSRC to hire more academic and technical lab staff. The Centre has also hired academic expertise from abroad, indicating a good degree of international competitiveness in academia.
- **Increased learning capabilities and skills**: collaborative activities have increased, which have allowed the university academic and students more exposure to the working environment and challenges of businesses and regional health authorities. As the evaluations also point out, the Centre activities have also supported more intra-university collaboration, although perhaps not as much as was originally envisaged by the institution.

There is no complete typology available which lists employment outcomes for the time period concerned. Rather the real-time evaluations – and the interviews – have focused on how employment outcomes have been achieved rather than the quantitative outcomes. As a precondition for creating employment out of this type of innovation support, the buy-in into the Centre strategy and activities by the rest of the region (that is the ability of the Centre management to balance different needs of stakeholders) is crucial. The evaluations of the SWSRC are very positive about this aspect and provide evidence for widespread support from municipal and regional actors, regional and national businesses and sports associations. The close nature of the collaboration also fits the mostly rural region, which is small population-wise, and thus 'everyone knows everyone else' and is used to working together in different projects.

Having said this, a willingness to collaborate and old habits of doing so are not sufficient to establish sustainable partnerships. The Centre management (and more widely, the university management) plays a key role in this regard and is also supported by an expert panel (which is also a common feature in Competence Centre Programmes in Sweden) that advises the Centre management. Beyond the

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university, the Centre activities are also aligned with the region's priority of growing the tourism sector, in particular tourism linked to outdoors activities, sport and wellbeing (such as weekend wellness and spa breaks).

There are some specific data, including quantitative data (with regards to Centre staff) on employment-outcomes however, in this study's assessment, these – for two reasons – are very likely to underestimate the employment effects of the Centre: 1. The data are somewhat out-dated. 2. The Centre activities are very widespread and are not systematically documented as they involve different actors. For example, although the Centre management document core activities, there are no reporting requirements for firms collaborating with the Centre. Thus, employment effects in the participating firms are anecdotal only.

Centre staff composition

The first evaluation (2010) suggested that the core staff employed by the Centre (at the time, 10 FTE) could be expanded and strongly recommended the Centre to recruit as well as train existing staff to improve on the current division of responsibilities. According to the evaluation, the Centre struggled to keep up with demand for its services – partly as a result of understaffing and partly as a result of a lack of organisation. The key challenge was to access and hire qualified staff in the region.

However, according to the SWSRC's final reports (required by ERDF funding), as of 2013, the Centre had created **six new full-time equivalent jobs**. Two of the new employees were women and four male. In addition, the Centre had created eight employment opportunities for researchers (who may be existing employees). These have been a mix of academic and technical (lab) positions.

Increased intra-university collaboration as a result of the Centre development

When the SWSRC was brought in under the Mid Sweden University umbrella structure, an envisaged outcome was that of improved and increased collaboration between institutions and disciplines. This has partly materialised, albeit constricted to health and sport, while a wider collaboration has not happened to the same extent. This may be related to the fact that many of the senior researchers and staff needed to collaborate more widely are physically located in other regions. Other reasons explaining the lack of result include i) a lack of collaborative approach in academia (own interests are prioritised) and ii) the limited time period lapsing between the centre establishment and the evaluation results, as namely more time was required to establish collaborative university networks.

Improved (organisational) working environment

Although the evidence on broader collaboration is mixed, anecdotal evidence from the interviews and evaluation points to more productive interaction within the key public and private actors of the Centre. As described elsewhere in this report, this has resulted in several commercial activities; including the set-up of R&I networks and contract research with industry. However outputs and outcomes of these activities are yet to be assessed.

Overall assessment

The establishment of SWSRC as a competence centre and its subsequent expanse within the region is a good example of bottom-up led smart specialisation. It should be noted that in order for the Centre to succeed it has taken several 'reincarnations' as activities have expanded and – should it be maintained – it is likely to continue to be part dependent on continued public funding, even if the share of industry funding and industry participation may continue to increase.

An assessment of the measure can conclude the following:

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Strengths/success factors of the instrument from an innovation and employment perspective

Very high relevance of the theme and activities to the surrounding region and to a wide range of actors. The Centre's activities are core to the local/regional sport associations and to the tourism industry. Sport and health, along with tourism is also receiving public policy support through the smart specialisation strategy. Of course, the high relevance of the Centre activities to the socioeconomic regional context maximises the conditions for creating employment. There is limited competition with other Swedish regions. Although other (northern) regions have singled out tourism and sport as priority areas for growth and employment, the Centre activities are sufficiently differentiated to develop into a niche market.

A seemingly step-by-step plan on how the Centre can expand by first incorporating the activities under the remit of the university, and thereafter establishing collaborations to include industry and national and international partners.

A tested and proven approach to research and innovation collaboration in Sweden. The Competence centre model has been endorsed for decades by policymakers in Sweden and there is a wealth of experience of how to succeed with these types of collaborations. Over the course of the last 15 years, several dozens of Competence Centre's have been funded.

Weaknesses/bottlenecks of the instrument from an innovation and employment perspective

Potential bottleneck in hiring suitable qualified employees due to the remoteness and small size of the region. With an effective higher educational aspect of the Centre, this appears to be a short-medium term bottleneck, as the Centre reputation grows and as qualified future staff are being trained through the degree programme.

Implementation requirements and its degree of transferability

The overall environment in which the Centre operates is complex and involves a large number of stakeholders with different viewpoints and different level of involvement. This somewhat complicates the ability to pinpoint single success factors, which are relevant for considering the measure's degree of transferability, as the positive effects created by the Centre activities are often more than the sum of their individual parts. However, key points include:

- Building on innovative activities relevant to the region and in which multiple actors can engage.
- Building sustainable ties between industrial actors involved (focusing on activities in which companies are not in direct competition with each other).
- Key requirements include long-term buy-in at regional and local level from both the public and private sector (not least the university). It should be recalled that the Centre is part of a wider smart specialisation strategy and a central component of the regional innovation strategy.
- Limited competition from neighbouring regions is also important.
- There are no limitations to the type of regions which may benefit from a competence centre; it is each specific context which is important to consider.
- Ensuring and supporting the development of a stable and effective Centre management that can earn the trust of industry.

Broadly speaking, transferability should be considered to be high with the precondition that there is

Swedish Winter Sports Research Centre – Sweden
'foundational platform' from where to expand. But of course, the exact nature and themes of collaboration cannot be directly transferred.
Information sources *References* Almerud, M., Åstedt, E. and Kempinsky P. (2010), Slututvärdering av projektet 'Innovationsnav för kunskapsinriktad idrottsutveckling, folkhälsa & elit' Jämtland Härjedalen (2015), *Innovation Strategy* Nationellt Vintersportcentrum (2013), *Följeforskningsrapoort Slutrapport* Nationellt Vintersportcentrum (2009 and 2013), End of project reports for the Structural Funds Nationellt Vintersportcentrum (2013), *Slutrapport* Nationellt Vintersportcentrum (2014), *Slutrapport Internet of Sport* Stern, P., Arnold, E., Carlberg, M., Fridholm, T., Rosemberg C. and Terrell, M. (2013), *Long term industrial impacts of the Swedish competence centres*, VINNOVA Analysis VA SWECO (2016), *Regionala effekter av Mittuniversitetet* *Links* A partner organisation of the SWSRC, the Peak Innovation incubator, has been evaluated in a study commissioned by VINNOVA (in Swedish). However, it does not constitute a 'full' ex post study but does provide some interesting data and analysis relating to R&I collaboration in the region: Bumpy flying at high altitude? International evaluation of Smart Textiles, The Biorefinery of the Future and Peak Innovation
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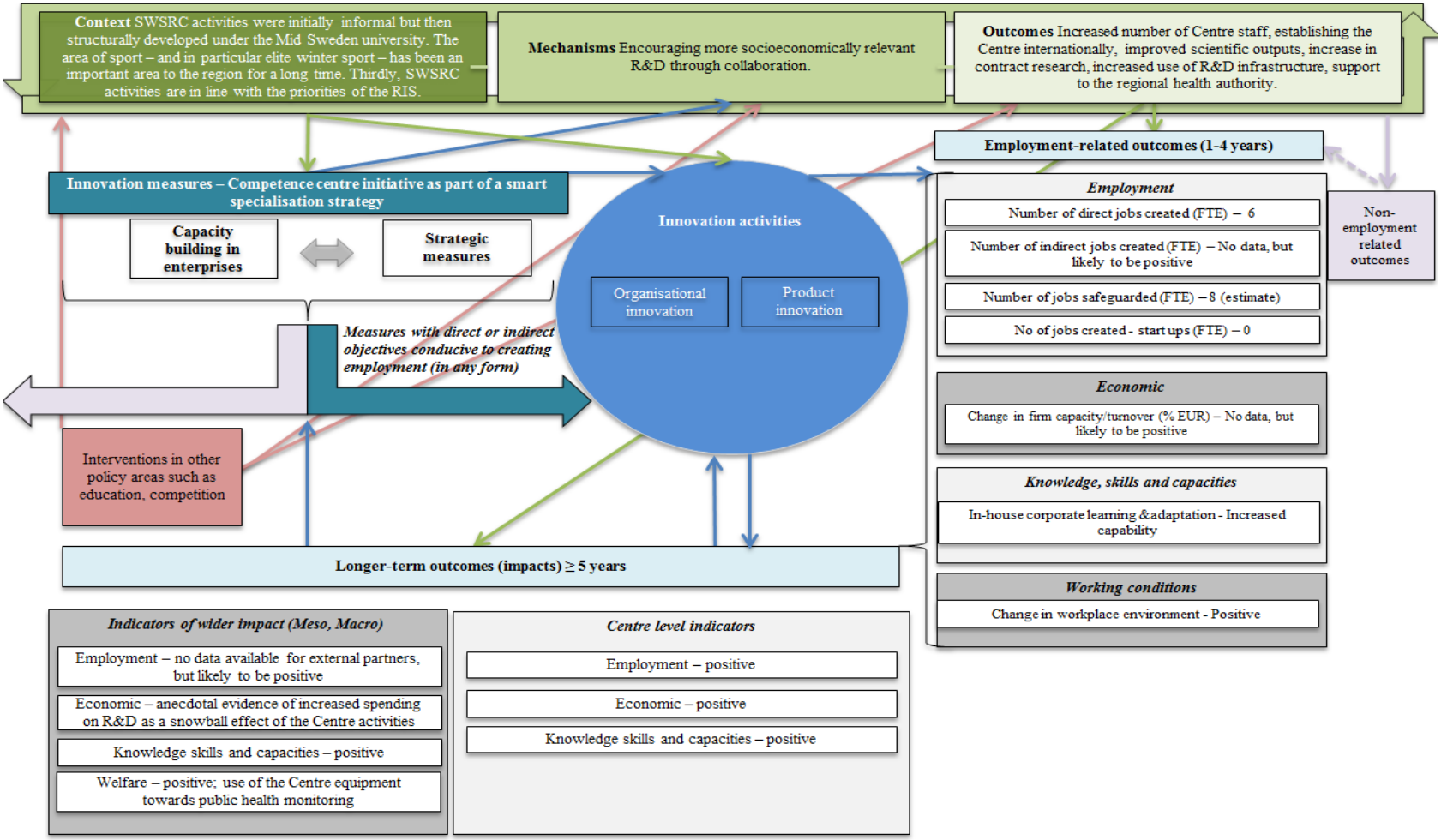
Graphic representation of the intervention logic of the measure



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