Central Innovation Manual on Excellent Econometric Impact Analyses of Innovation Policy (CIM)

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An excellent econometric impact analysis of innovation policy is defined as a performance measurement of an innovation policy instrument that has been implemented in accordance with the most recent and best econometric research methods, and accordingly has a research quality allowing publication of methods and results in the most respected international journals in the relevant fields.[1]

The target group for the Central Innovation Manual on Excellent Econometric Impact Analyses of Innovation Policy (CIM) are programme owners in the Danish Ministry of Science, Innovation and Higher education and other ministries and government agencies seeking better information on the best methods for analysing the impacts of innovation and industrial policy, as well as external expert stakeholders and evaluation professionals (from organisations, regions, knowledge institutions, etc.) interested in following and entering a dialogue with the Danish Ministry of Science, Innovation and Higher education on how to document innovation policy effects. It is the intent of the Ministry of Science that the manual also contributes to knowledge dissemination about the best methods for impact analyses of research, innovation and industrial policy.

CIM is not identical to the work done in other countries[2] since the key objective is to establish a clear set of minimum requirements for setting up and conducting excellent econometric impact analyses of innovation policy. CIM focuses on how to set up a framework for a “standard” impact assessment procedure that makes it possible to conduct excellent impact assessments of research, innovation and industrial policy and compare the impacts of different policies. Hence, CIM is not an attempt to establish practical guidance on a broader number of methods on how to evaluate the wider impact of research, innovation and industrial policy. In this way, CIM complements existing documents and reports.[3]

1 Purpose, vision and delimitation

1.1 Purpose

The purpose of this manual is to establish a number of minimum requirements and standards for the implementation of excellent econometric impact analyses of the innovation policy instruments of the Danish Ministry of Science, Innovation and Higher Education. However, the target audience can be anyone interested in econometric impact analysis in ministries and agencies. Accordingly, the manual has been prepared in collaboration with Danish and non-Danish researchers, and has been discussed at

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[1] See e.g. Kaiser and Kuhn (2012), *Long-run Effects of Public-private Research Joint Ventures: the Case of the Danish Innovation Consortia Support Scheme*, Journal of Research Policy (forthcoming 2012).

[2] See *Guidance on evaluating the impact of interventions on business,* Department for Business, Innovation and Skills (BIS), august 2011

[3] E.g. *The role of evaluation in evidence-based decision-making,* Department for Business, Innovation and Skills (BIS), august 2010, and *The Green Book – Appraisal and Evaluation in Central Government,* Treasury Guidance, London, United Kingdom, and *The Magenta Book: guidance notes for policy evaluation and analysis,* Government Social Research Unit, HM Treasury, London, United Kingdom (October 2007)

seminars with researchers[4] and policy makers. It has been presented for comments in the Danish Ministry of Finance, the Danish Ministry of Business and Growth, the Danish Ministry of Climate and Energy, the Danish Ministry of Food, Agriculture and Fisheries, the Danish Ministry of Foreign Affairs and the Danish Ministry of the Environment. The manual is the result of the evaluation strategy of the Danish Agency of Science, Technology and Innovation and has been implemented as a 5-year research and innovation project about performance measurements in the innovation field.[5] The CIM summarises some key methodical results, but the main elements of the 5-year project are more than 50 analyses that have been conducted from 2007 to 2011.

In this way, the manual summarises and lists ambitious recommendations and minimum requirements on analysis methods and data bases which are necessary if the best possible impact assessments and solid analysis results are to be achieved.

1.2 Focus and delimitation of the manual

As the manual focuses on minimum requirements for excellent econometric impact analysis, it does not contain guidelines on other types of assessments and performance measurements of research and innovation programmes, e.g. about research, learning, organisational, internationalisation, equality or environmentally related effects.

Although CIM lists standards for impact analyses, the intention has been to do this while providing room for flexibility. This is partly because the recommended ‘propensity score matching method by nearest neighbour’ will not always be the most relevant method, for instance if the study has a wider focus than directly business-related performance objectives.

Impact assessments of the listed economic performance targets may also be less relevant if the main purposes of a programme are non-economic activities. This is for example the case with impact analyses of cluster policy and innovation networks, where the main objectives are not necessarily economic performance targets alone but may also include non-economic behaviour regulating performance objectives. Hence, it is important that concrete impact analyses consider the purposes of a given programme. Accordingly, the manual also includes an overview of non-economic performance objectives for the most important innovation programmes in the Danish Ministry of Science, Innovation and Higher Education.

Finally, in many innovation programmes it is challenging to establish a sufficiently consistent data basis in terms of timeframe and number of observations, as well as identifying a (high quality) qualified control group in accordance with the same conditions. Thus, for new programmes or programmes where only a relatively small number of businesses have participated, it may be required to show a certain amount of flexibility due to the nature of the data basis. Alternatively, when such limitations occur it will be necessary to insist that impact analyses are implemented using methods testing the robustness of the results.

[4] In particular, I would like to thank PhD Johan Moritz Kuhn and Professor PhD Anders Sørensen at Center for Economic and Business Research (CEBR) at CBS (Copenhagen), and Michael Mark (DAMVAD Consulting) for their comments on CIM.

[5] Since 2007, the development of methods for performance analyses has been an ongoing work. See e.g. the report *FI (2007), Data og metoder ved effektmåling af innovationskonsortier* (Data and methods for performance measurements of innovation consortia) and *FI (2009), Data og metoder ved effektmåling af videnpiloter* (Data and methods for performance measurements of knowledge pilots). Also see FI (01/2011), which describes methods and data selection in relation to analyses of Industrial PhDs and Innovation Consortia, respectively. Further developments are to be found in, Kaiser and Kuhn (2012), *Long-run Effects of Public-private Research Joint Ventures: the Case of the Danish Innovation Consortia Support Scheme*, Journal of Research Policy (2012). Also see FI (01/2010) and FI (02/2011).

1.3 Vision

The vision of the Danish Agency of Science, Technology and Innovation (under the Ministry of Science, Innovation and Higher Education) is that the excellent impact analyses and studies conducted about research, innovation and industrial policy will be best practice examples internationally over the coming decade.[6]

At an international level, there is an increasing interest in carrying out quantitative analyses of the effects of enterprises' activities in research, development and innovation. Among others, the increased focus has been encouraged by the OECD[7] which has placed significant emphasis on the area through a coordinated effort among most of the 27 EU countries, Korea, Norway, Switzerland, Russia, Turkey, South Africa and most of the countries in South America.

Most of the countries do not have the same possibilities as Denmark (or for instance Norway, Sweden and the Netherlands) due to limited access to quantitative micro data and very long time series. In a majority of the countries, it is difficult to establish the micro data basis needed to carry out solid and validated quantitative econometric analyses that can document and calculate the effects of businesses' research and innovation policies historically.

In Denmark, the standing policy concerning evaluations and performance measurements is that:

- The effect must be ***documented*** consistently for all innovation offers.
- ***Unambiguous key performance objectives*** must be listed for all instruments and foundations etc. by the responsible authorities.
- Impact assessments and performance measurements must be applied when making decisions on possible ***continuation, mergers or adjustments of research, innovation and industrial policy.***

1.4 Possible challenges in laying down minimum requirements and standards

When laying down minimum requirements and standards, a number of issues must be taken into consideration:

- The primary purpose of impact analyses is to document economic effects and other key performance effects of existing innovation programmes in the best way possible.
- Secondly, it is important in more general terms to be able to verify the effects of innovation policy in order to strengthen innovation policy as a political discipline.
- Thirdly, it is important to be able to establish a better understanding of the different instruments in the innovation policy toolbox. This can be achieved, for instance, by ensuring comparability of results *across* analyses and *across* innovation programmes in a far better way than has been the case until now.
- Fourthly, there is a need for evidence-based development and renewal of the prioritisation tools for innovation policy.

The challenge is that there are many degrees of freedom for impact analyses, e.g. the choice of key performance indicators, success variables, choice of data basis, treatment of outliers, choice of

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[6] In the reports ‘Clusters Are Individuals – Benchmarking Insights from Cluster Management Organizations and Cluster Programs’ by Kompetenznetze Deutschland (VDI/VDE Innovation + Teknik) and ‘Service innovation: Impact analysis and assessment indicators’ by the European Commission's Pro-Inno Net EPISIS, the Danish Ministry of Science's econometric performance measurements are singled out as being international best practice.

[7] OECD (2008), Science, Technology and Industry Outlook.

statistical analysis methods, interpretation of results achieved etc. This means that an entire string of choices has to be made when carrying out excellent performance measurements.

The purpose of the Central Innovation Manual for Impact Analyses of Innovation Policy (CIM) is to create a framework for establishing performance objectives (key performance indicators) for innovation programmes, to ensure a common framework for the methods and databases used for impact analyses and performance objectives, and to make it possible to make better comparisons of key performance indicators and performance measurements across programmes in Denmark and abroad.

1.5 Overview of the most important standards and minimum requirements

The CIM formulates a number of standards and minimum requirements for impact analyses that shed light on the effects of key performance indicators in innovation policy.

The manual is aimed at R&D and innovation programmes involving both public and private sector participants. The CIM is not aimed at programmes whose primary purpose is to further basic research at public research institutions, universities etc.

The CIM lists a common set of guidelines on what is required in an excellent econometric performance measurement to make it possible to document and verify key performance effects. This will also facilitate comparison of performance measurements across programmes in Denmark and abroad.

The CIM requirements for an excellent econometric impact analysis are high data quality, the most recent research-based statistical methods, and a high quality control group. On this basis, guidelines are set out in CIM in the form of 12 principles formulated as minimum requirements for an excellent impact analysis.

12 principles: minimum requirements for excellent econometric impact analyses

	Listing key performance indicators with regard to objective
1	Unambiguous key performance indicators (based on ex ante evaluations of the programme) formulated as indicators for effects (input variables), throughput variables and results (output variables) must be listed in performance descriptions to be approved by the management of the ministry.
	Identification and harmonisation of data collection
2	Establish standards for data collection, including standards for input variables and registration in databases. Standards for data collection are to be harmonised across all research and innovation schemes in the Danish Ministry of Science, Innovation and Higher Education through a common electronic application system.
	Data quality and long time series
3	Ensure high data quality with long time series of at least 6-15 years with a minimum of data gaps in the time series. Application of national registers for enterprise data and personal data as well as the Ministry of Science's databases for applications, appropriations, rejections and projects. Databases are to be established with time series of up to 20-25 years, depending on the instrument analysed.
	Treatment of data and quality requirements in identifying control groups
4	Use of the difference-in-differences method and balanced panel data.
5	Use of the propensity score and nearest neighbour matching method for selecting the most comparable control group / comparison group.
6	Use of alternative control groups / comparison groups with a clear and unambiguous interpretation option: e.g. propensity score matching group, group of participants in other innovation policy instruments, rejection group (group of enterprises and individuals whose applications have been rejected), group of enterprises within the same industrial sector etc. This facilitates analysis of an instrument's additionality (additional effect) and comparison

	between instruments.
7	Selection of comparable (control) enterprises must be based on matching as many relevant parameters as possible. The very highest demands on quality and interpretation of data for comparison (control) groups must be made.
8	Selection of comparable individuals (persons, researchers) must be based on matching as many relevant parameters as possible. The very highest demands on quality and interpretation of data for comparison groups must be made.
9	Outliers must be handled in accordance with the most established international methods in the fields of economic research and econometric methods.
10	The key impact indicators must be relative in order to avoid comparison of uneven entities, e.g. through differences in growth rates.
	Robustness test
11	Robustness tests are recommended in analyses with long time series and many observations. In case of data limitations in the form of limited time series and observations, it is a requirement that impact analyses are carried out using methods that thoroughly test the robustness of the results.
	Interpretation and peer review of results
12	The quality and utility value of impact analyses must be discussed with independent research organisations not involved in the analyses, e.g. through peer reviews, research seminars, policy maker workshops etc. Preferably, the results of the impact analyses should be suitable for acceptance by the most reputable international journals.

This manual does not contain standards for criteria and administration. Please refer to the evaluation and impact assessment strategy of the Danish Ministry of Science, Innovation and Higher Education and the Danish Council for Technology and Innovation Council, and to the action plans InnovationDenmark 2007-2010, InnovationDanmark 2009 and InnovationDenmark 2010-2013, describing the overall guidelines for administration, assessment criteria and key performance indicators of innovation policy instruments.

The establishment of standards for administration and assessment criteria for each innovation policy instrument is described in further detail in separate performance descriptions also detailing the correlation between the purpose of an innovation instrument and the key performance indicators for activities, effects and results alike.

1.6 Overview of the most important impact assessments and results

More than 12 impact analyses of various R&D, innovation and education initiatives and instruments have been conducted since 2007. The impact analyses have been carried out by independent researchers or organisations, and were commissioned by the ministry or by independent institutions. 9 major impact assessments of innovation policy instruments were conducted in 2010 and 2011 alone.[8]

The following are examples of impact analyses: The productivity impact of the Danish business sector's R&D and innovation investments, the Innovation Consortium Scheme, the Knowledge Pilot (Innovation Assistant scheme), the Incubator Programme, the Industrial PhD Programme, the Danish Innovation Networks Denmark Programme, EUREKA projects, research collaboration projects between universities and enterprises, and the Danish ATS system

[8] http://www.fi.dk/publikationer/2011/central-innovationsmanual-for-excellente-oekonometriske-effektmaalinger-cim-af-innovationspolitikken

Focus area	**Cluster and network policies**
Study no. 1	***An independent impact analysis of Innovation Networks Denmark Programme (DASTI 18/2011):*** The programme supports the establishment and running of cluster and network organisations. Among 1,200 non-innovative enterprises participating in the programme, the likelihood of becoming innovative increased 300 per cent in comparison with 1,200 statistically identical enterprises not participating in the Innovation Networks Denmark infrastructure.[9] Among R&D-active or innovative enterprises participating in the programme, the likelihood of initiating their first R&D collaboration project with a research institution increased 300 per cent in comparison with statistically identical enterprises not participating in the programme.
Focus area	**R&D collaboration projects between enterprises and knowledge institutions**
Study no. 2-4	***Three independent impact analyses (DASTI 06/2008, DASTI 03/2010, DASTI 01/2011 and Kaiser & Kuhn (2012)) of the Danish Innovation Consortium Scheme*** (public grants to large research collaboration projects between several enterprises and knowledge institutions) show that there are statistically significant impacts for enterprises as well as for individual researchers depending on the key impact indicators analysed. Key performance indicators are gross profit, individual employment, employment in enterprises, patenting activity, salary levels, and total factor productivity. Some of the analyses show positive and statistically significant impacts for small and medium sized enterprises with respect to labour productivity, patenting activity and employment. None show impact on total factor productivity or on large enterprises. One study shows a positive, statistically significant impact on the salary levels of researchers at the research institutions. Gross profits increased on average EUR 2,7 millions in the enterprise participating in an innovation consortium over a period of nine years after the innovation consortium started. Enterprises did not receive public grants.
Study no. 5	***An independent impact analysis (DASTI 17/2011) of international research and development collaboration projects (EUREKA-projects)*** was conducted in 2010. The impact of EUREKA participation with respect to labour productivity, employment, turn-over and exports were analysed. The analysis shows a positive, statistically significant impact on growth rates in labour productivity, employment, turnover and exports compared to statistically similar enterprises not participating in EUREKA projects. EUREKA participation also results in significantly higher growth rate in exports and employment compared to enterprises only participating in the Innovation Consortium Programme (and not in international projects).
Study no. 6	***An independent impact analysis (DASTI 02/2011) of national research and innovation collaboration projects between enterprises and universities or ATS institutes*** was conducted in 2010 and 2011, comprising projects both with and without grants from public research funding bodies. More than 1,500 R&D-active enterprises engaging in one or more R&D collaboration projects with knowledge institutions in the period 1999-2006 were compared to more than 1,500 statistically identical non-collaborating enterprises, selected among 20,000 Danish R&D-active enterprises. The labour productivity is 9 per cent higher for the average enterprise with R&D collaboration compared to statistically identical R&D-active enterprises without any collaboration in the period analysed. The analysis also looks at differences across branches, types of enterprises and types of knowledge institutions. Impacts are higher in large enterprises than in small enterprises. Impacts are also higher in exporting enterprises compared to non-exporting enterprises. Finally, impacts increase with the level of skills in the enterprises.
Focus area	**Education and postgraduates (master's and PhD degrees) in the private sector**
Study no. 7-8	***Two independent impact studies of the Danish Industrial PhD Programme (DASTI 2007 and DASTI 01/2011)*** show positive, statistically significant impacts. 200-300

[9] http://www.fi.dk/publikationer/2011/innovationsnetvaerk-skaber-vaekst/
http://www.fi.dk/publikationer/2011/innovationsnetvaerk-performanceregnskab-2011/

	participating enterprises and 400 participating researchers are analysed, depending on the key impact indicators. The programme provides subsidy to enterprises hiring PhD students to work on a PhD project. Key performance indicators are labour productivity, individual employment, total employment in enterprises, patenting activity, individual salary and total factor productivity. The 01/2011-analysis shows positive and statistically significant impact for small and medium-sized enterprises with respect to labour productivity, patenting activity and employment compared to statistically similar enterprises without Industrial PhD projects. Patenting activity nearly doubles while employment is nearly 2 employees higher per Industrial PhD project per year. Both analyses show a positive impact on individual employment and salaries in enterprises. Neither shows any impact on total factor productivity.
Study no. 9	***An independent impact analysis of the Danish Knowledge Pilot (Innovation Assistant) Programme (DASTI 04/2010)*** shows that there are positive but no statistically significant impacts for enterprises. Gross profits increased EUR 156,000 on average over three years after the Knowledge Pilot project started. The programme provides a subsidy of up to EUR 20,000 to SMEs hiring postgraduates. Key performance indicators analysed are gross profits, total employment and survival rate of enterprises. Because of insufficient data and observations, a new independent impact evaluation is currently being conducted. The focus of the new 2012 study is impacts at the level of enterprises as well as individual high skill workers.
Study no. 10	***An independent study of the impact of PhD graduates on productivity in enterprises (DASTI 2012, prepared by CEBR – Centre for Economic and Business Research at CBS, Copenhagen, 23. September 2011)*** shows that the average labour productivity in enterprises with minimum one PhD graduate is approximately 34 per cent higher compared to enterprises with the same mix of educations and skills but without a PhD graduate. The impact of PhD graduates seems to be smaller in small enterprises than in larger enterprises. The average labour productivity difference for small enterprises with and without PhD graduates is 11 per cent. The salary of PhD graduates is approximately 10 per cent higher than the salary of non-PhD individuals with the same educational background, age and sex, and working in the same type of enterprise and industrial sector.
Study no. 11	***A report on 'Productivity and higher education' has been conducted by the Centre for Economic and Business Research (CEBR) for the Danish Business Research Academy (DEA) in 2010.*** The effect of different types of highly-educated working capacities on productivity (added value) in 138,372 Danish enterprises over a nine-year period (from 1999 to 2007) is analysed. The analysis shows that the productivity for each individual becomes increasingly higher the longer the person's educational background is, regardless of the field of education. Education within social sciences results in the highest individual productivity. Educations within the technical and health sciences result in a slightly lower productivity than the social sciences. One percentage point increase in the share of employees with a tertiary education will cause an increase in the gross national product by approximately 1 per cent.
Focus area	**Commercial exploitation of public inventions**
Study no. 12	***An independent impact analysis of the Incubator Programme (DASTI 01/2010)*** shows that there are no statistically significant impacts for more than 300 enterprises and more than 300 entrepreneurs. The programme provides public risk capital to the establishment of new knowledge intensive enterprises. Key performance indicators analysed are individual salaries, total factor productivity, total employment and survival rates of enterprises. Because of the lack of sufficient data and observations a new independent impact evaluation will be conducted in 2014. The focus of the upcoming study will be impacts at the level of enterprises as well as individual entrepreneurs.

2 Standard for performance objectives: key performance indicators

Within the EU PRO-INNO initiative, the Danish Ministry of Science, Innovation and Higher Education has headed an international collaboration called EPISIS on performance indicators. This collaboration has participants representing government agencies, ministries and researchers from Denmark, Sweden, Germany, United Kingdom and Finland as well as the EU Commission. Good practice on evaluations and performance measurements was exchanged, and a manual was elaborated with recommendations for indicators that can be used for setting out performance objectives and key performance indicators.[10]

2.1. Independence and excellence

Decisive emphasis is placed on carrying out independent evaluations and performance measurements. The intent is to carry out external performance measurements based on the best and most accepted international research and statistical methods. Evaluations are carried out by independent researchers and knowledge consultants. Efforts are made to ensure the quality and utility value of all impact analyses by having the external and independent parties discuss the evaluations with other independent research organisations not involved in the analyses. This can be achieved e.g. by establishing steering groups or conducting peer reviews, seminars etc. on par with procedures and processes that also apply to publication in international journals. Emphasis is placed on publication of the results of the completed impact analyses, e.g. in the most accepted international journals or at high-level international conferences.

2.2. Ex ante evaluation

Each innovation instrument (or programme, scheme or initiative – the terms are interchangeable) is given an account of objectives and expected effects in separate performance descriptions which are approved by the management of the ministry. Thus, the performance description includes, among other things, an ex ante evaluation of the programme. On this basis, the Danish Ministry of Science, Innovation and Higher Education sets out key performance indicators for each innovation programme, which can be key performance objectives in the form of both so-called output and input objectives. The assessments for the selection of indicators follow the EPISIS project results as well as national legislation.

In each performance description, the Danish Ministry of Science, Innovation and Higher Education has aimed to document the choice of the listed performance objectives, the work to follow up on the performance objectives and the plans for verification of the effects of the innovation programme in question.

The overview below shows known key performance indicators for output (results), input (effects) and assessment criteria for each innovation policy instrument in the Danish Ministry of Science, Innovation and Higher Education.

2.3 Baseline measurement at ex post evaluation

Emphasis is placed on ensuring baseline measurements of the initiatives in order to be able to document the situation before the launch of the innovation programme and the situation if the programme had not been implemented. This allows estimation of the effect of the innovation programme relative to the situation if the programme did not exist.

In this regard, the most recent research based methods are applied by choosing advanced control groups that represent the situation if the programme had not been implemented. If the analysis includes a sufficiently large number of observations, the propensity score matching method can be used for making baseline measurements, cf. below. On this basis, ex post evaluations can be carried out with estimations of the effects of the programme.

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[10] FI (2011), Impact analysis and assessment indicators with regard to innovation in services, EPISIS project

Key performance indicators (output) for each instrument	Open funds	Innovation voucher	Innovation con-sortia	Knowledge pilot	Euro-stars	Industrial PhD	Networks and clusters	ATS network	Business incubators
Individual employment				X		X			X
Effect on employment in enterprise	X	X	X	X	X	X			X
Added value growth in enterprise (gross product)	X	X	X	X	X	X	X	X	X
Productivity per employee in enterprise	X	X	X	X	X	X	X	X	X
Individual salary effect			X	X		X			X
Survival degree for enterprises		X		X					X

Key performance indicators (input) for each instrument	Open funds	Innovation voucher	Innovation con-sortia	Knowledge pilot	Euro-stars	Industrial PhD	Networks and clusters	ATS network	Innovation environments
Innovation ability	X	X	X	X	X	X	X	X	
Investments in private research	X	X	X		X	X	X	X	X
Investments in innovation		X	X	X			X	X	
PhD production, patenting etc.			X		X	X		X	
Mobility of labour between public and private sector				X		X			
Regional distribution of activities	X	X	X	X	X	X	X	X	X
Collaboration projects between enterprises and knowledge institutions	X	X	X	X	X	X	X	X	X
Gender distribution				X		X			
Participation of small enterprises		X	X	X	X	X	X	X	
Number of enterprises	X		X		X	X	X	X	
Number of newly established enterprises									X

Assessment criteria	Open funds	Innovation voucher	Innovation con-sortia	Knowledge pilot	Euro-stars	Industrial PhD	Networks and clusters	ATS network
Research height			X		X	X		X
Innovation height	X	X	X		X			X
Commercial utility	X		X		X		X	X
Social utility	X		X		X		X	
Education				X		X		(X)
Employment				X				
Project control and project management	X		X		X	X		
Knowledge spreading and dissemination	X		X				X	X
Requirement on participation of small enterprises		X		X	X		X	X
Partner composition and enterprise participation	X	X	X		X	X	X	
Economy and private co-funding	X	X	X	X	X	X	X	X
Professional focus area	X	X	X	X	X	X	X	X

2.4 Key performance indicators/objectives: results of impact analyses

Econometric impact analyses have been carried out for most instruments. Table 1-3 shows whether there are significant effects of the innovation intruments relative to a number of control groups. The control groups may consist of either highly educated people (Knowledge Pilot, Industrial PhD, innovation consortia or business incubators) or similar enterprises not included in the scheme.

Table 1 looks at the schemes that involve direct enterprise grants.

Table 2 looks at the schemes that focus on research and development work, but where there are no direct enterprise grants. As a rule, national business-research collaboration projects only receive indirect enterprise grants through funding of research and development at research and technology institutions.

Table 3 looks at schemes where patenting activities have been analysed.

Table 1. Direct enterprise grants: status of performance measurements
(effect relative to control group)

Performance objective and documented effect in analyses	**Productivity per employee**	**Added value in enterprises**	**Employment in enterprises**	**Individual salary effect**	**Enterprise survival rate**	**Individual employment**
Knowledge pilot	Insignificant	Insignificant	Not studied	Insignificant	Not studied	Not studied
Industrial PhD	Significant	Significant	Significant	Significant	Not a performance objective	Significant
Business incubators	Insignificant	Insignificant	Not studied	Insignificant	Insignificant	Not a performance objective
Proof of concept projects*	Insignificant	Insignificant	Not studied	Insignificant	Insignificant	Not a performance objective
Eureka/Eurostars	Significant	Significant	Significant	Insignificant	Not a performance objective	Not a performance objective

* 50 % are continued in innovation environments and the results from these follow impact evaluations from business incubators environments.

Table 2. No direct enterprise grants: status of performance measurements
(effect in relation to control group)

Performance objective and documented effect in evaluations	**Productivity per employee**	**Added value in enterprises**	**Employment in enterprises**	**Individual salary effect**	**Export growth**	**Share of innovative enterprises in Denmark**
Innovation consortia	Significant	Significant	Significant	Significant	Not a performance objective	Not a performance objective
Innovation networks	Significant*	Significant*	Not a performance objective*	Not a performance objective	Not a performance objective	Significant
ATS collaboration	Significant	Significant	Not a performance objective	Not a performance objective	Not a performance objective	Not a performance objective
University collaboration	Significant	Significant	Not a performance objective	Not a performance objective	Not a performance objective	Not a performance objective
Purchase of R&D at knowledge institution	Insignificant	Insignificant	Not a performance objective	Not a performance objective	Not a performance objective	Not a performance objective
Private sector's R&D investments	Significant	Significant	Significant	Not a performance objective	Not a performance objective	Not a performance objective

* The innovation networks generate, among other things, collaborative projects with universities, ATS institutes and innovation consortia, and the results follow the performance measurements for innovation consortia, ATS institutes and universities.

Table 3. Patenting activity
(effect in relation to control group)

Documented effect in impact evaluations	**Patenting activity**
Innovation consortia	Significant*
Industrial PhD	Significant*

* CEBR research projects and FI 01/2011

3 Standards for comparison groups (control groups)

In order to assess the isolated results and effects of an innovation policy instrument or the difference in results and effects between two instruments, the development of key performance indicators for the enterprises or individuals participating in an innovation policy instrument must always include a comparison group (control group) of enterprises or individuals. The purpose is to study the difference in the results between two instruments or whether there is an added effect from participating in an instrument as compared to not participating in the instrument in question.

3.1 Minimum requirements for the selection of comparable enterprises

When selecting enterprise control groups, it is important to consider that the enterprises participating in an initiative or programme are to be compared with non-participating enterprises similar in as many relevant parameters as possible that may be significant for the effect of the instrument analysed. The minimum requirements are to take as many different factors as possible into account, but this also depends on the instrument being analysed. Control groups are to be comprised of enterprises approximately equally likely to use or participate in the instrument, but yet have not. The probability model can be based on the following variables:

- Educational level of the enterprise’s employees
- R&D intensity
- R&D department
- Export intensity
- R&D investments
- Profit, surplus or contribution margin
- Enterprise size
- Industry affiliation

It is recommended that a propensity score matching is used. The aim of the control group is to find out what would have happened at participating enterprises if the instrument had not been implemented. If the alternative were that the participating enterprises had taken part in a similar initiative, it would make sense to compare with other enterprises participating in a similar initiative (otherwise, it does not).

However, it is important to avoid including too many explanatory variables, since this can give overlapping results, either individually or in combination. By including too many identical variables, there is a risk that multicollinearity will occur along with too great a correlation between the explanatory variables. This means that the parameters become insignificant and the result becomes biased. An example is if R&D intensity is included along with R&D investments, R&D department and enterprise size, as there is interdependency between these variables.

3.2 Minimum requirements for the selection of comparable individuals/people

When selecting people control groups, individuals must be chosen who are approximately equally likely to participate, yet have not. The probability model can be based on the following variables:

- Education
- Institution
- Enterprise size
- Industry affiliation
- Gender and age
- Any other socioeconomic variables, such as salary, background etc.

It is recommended that a propensity score matching is used. For comparing with what would have happened if the person had participated in another initiative, a control group can also be a group of people participating in the other similar initiative.

3.3 Standard method for selection of comparable control groups

3.3.1 Control groups may be selected using a so-called 'propensity score matching' and 'nearest neighbour' method.

The recommended standard method is the 'Propensity Score Nearest Neighbour Matching Method', which is used to establish and delimit, on a one-to-one scale, the group of R&D-active enterprises (or innovative enterprises) participating in an instrument, and a statistically comparable control group of R&D-active enterprises (or innovative enterprises) that do not participate, but could have done so. It is impossible to find a control group that is completely identical.[11] The probability models for enterprises' participation in an instrument used for identification of factors that have an impact on whether the R&D-active enterprises are included in the instrument in question, are set out as logistic regressions and used in connection with the Propensity Score Matching method.

In most cases, it will be an advantage to put together a control group that has as many control enterprises as possible – based on the law of large numbers. Accordingly, one-to-one is a minimum requirement, but the standard should be one-to-many. Furthermore, this should be supplemented by balance tests in order to analyse the difference between the treatment group and the control group.

The so-called propensity score matching method is used to match enterprises or individuals who have participated in the analysed activity with comparable R&D-active or innovative enterprises or individuals who have not participated in an equivalent activity. The idea of the method is that for a enterprise T, which has the desired activity, an enterprise C is found among the other enterprises in the relevant statistics, and which for a number of statistical parameters resembles enterprise T by having the same probability ('propensity score') of taking part in the relevant activity, except that in actual fact, enterprise C has not participated in the activity. In this way, enterprise T (designated as 'treatment' or 'participating' enterprise) can be compared to a similar enterprise C (designated as 'comparison' or 'control' enterprise) located in the statistics. Statistically, enterprise C must resemble enterprise T with regard to industrial sector, enterprise size, export pattern, staff education, profit, contribution margin and composition as well as R&D activities or innovation activities.

Fundamentally, it is not possible to find a control group completely identical in every partially unobservable factor using this or other methods. Another control group selection may give different results. Accordingly, it is important to be able to interpret the characteristics found in the control group.

3.3.2 The control group may be selected to compare with other innovation programmes

When comparing effects across innovation programmes, the standard is that the comparison group is found among participating individuals or enterprises in the innovation programmes to be compared. At a minimum, it is important that observation sorting and data cleaning is done in the same way for the programmes to be compared.[12]

4 Standards for statistical methods of analysis

The possibilities depend on the design of the innovation policy instruments. For instance, some innovation policy instruments may allow considerably more precise estimates of effects than the matching method described above and the difference-in-differences method described below. This depends on whether, for instance, a regression-discontinuity design is possible.

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[11] Examples of application of this method are found in FI (01/2010) and FI (02/2011).

[12] Examples of a comparison of programmes is the comparison between ordinary PhDs and Industrial PhDs found in FI (01/2011), and the comparison of enterprises participating in EUREKA projects and innovation consortia found in FI (15/2011).

4.1 The difference-in-differences method

One of the recommended central statistical methods that has been used until now is the difference-in-differences method. This method is used to calculate differences in the development of the treatment group and the control group of statistically identical enterprises or individuals not participating in the instrument or activity being analysed.[13]

The difference-in-differences method is based on comparing output changes (the performance objective). Accordingly, the model looks as follows:

$$\delta = Y_1^T - Y_0^T - \left(Y_1^C - Y_0^C\right)$$

- in which δ is the effect of the activity, calculated on the basis of the difference between the development in the performance indicator, called Y, of the treatment group (T), defined as the performance indicator at time 1 minus the performance indicator at time 0, and the development in the performance indicator of the control group (C), defined as the performance indicator in time 1 minus the performance indicator in time 0. Whether there is a significant difference between the two can be tested subsequently by means of e.g. standard t-tests or linear regression.

Box 1 Central analysis method: Difference-in-differences

Difference-in-differences:

(a) before/after comparison for enterprises participating in the scheme (treatment)

(b) before/after comparison for enterprises not participating in the scheme (control)

See whether (a) is more positive than (b).

T1 – success parameter of participant before.

T2 – success parameter of participant after.

C1 – success parameter of non-participant before.

C2 – success parameter of non-participant after.

The difference (T2-T1)-(C2-C1) measures the difference in the increases.

4.2 Balanced panel data

The effect of enterprises' research and development investments on added value and productivity per employee is a dynamic process that may vary over time. Cross-sectional analyses based on a single year are not adequate for analysis of the variation over time. Furthermore, there may be unobservable effects on the individual enterprise which the models are not able to take into consideration. The before-and-after comparison that results from applying the difference-in-differences method means that panel data (cross-sectional data over time) and methods are needed to check these unobservable effects.

Large enterprises are included in the research and development statistics every year while samples from small and medium-sized enterprises are selected at random. The result is a very 'unbalanced' panel. For some enterprises, observations are available for every year, while others only have data for one or few years.

Because of this, it is recommended that the panel data set is put together as follows:

- Panel data analyses are only to be made for enterprises with at least two observations. To ensure that the analyses are as representative as possible, all enterprises with two or more observations are to be included. If the data basis allows, the requirements may be made more strict, so only

[13] Examples of application of this method may be found in FI (1/2010) and FI (2/2011).

enterprises with three or more observations are included. Naturally, this will reduce the number of enterprises in the analysis.

- The following approach is recommended for missing observations in time series: If a single observation is missing in a time series, the single missing observation should be estimated. If two or more years are missing in the time series, the most recent continuous part of the time series should be kept.
- Extensive changes in the variables may indicate a merger or division of the enterprise. Such changes may have a disproportionately large effect on the results. It is recommended that the standard in part of the international literature is followed, and that enterprises with annual growth rates in added value, fixed assets, number of employees or R&D capital of less than - 50 % or more than 300 % be removed. This is in accordance with the standard set out in international literature.
- It is recommended that sensitivity analyses are carried out when basic data are changed.

5 Standards for calculating economic effects

The Cobb-Douglas productivity function is used as a standard for indicating the effects of a given instrument in pounds and pence in the form of increased productivity per employee, profit etc. This is typically modelled as an OLS regression.[14]

Depending on the chosen key performance indicator (the analysed success variable), changes of levels over time may also be seen as one considers annual growth rate changes over time. An example of changes in levels would be changes in the number of employees and in the level of employment.

An example of relative changes would be employment quotas or survival rate of enterprises. Examples of changes in growth rates are growth in productivity per employee, growth in turnover, or growth in added value of enterprises. In general, the standard for calculating economic effects depends on the key performance objectives that are assessed and estimated.

When selecting background factors, it is important to consider how the individual background factors influence both outcome and treatment. For instance, there may be a time-related challenge with background variables that might be affected by treatment in a model which includes lagged variables.

6 Standards for data treatment

6.1 Causality and use of control groups

The effect of research and development investments and an instrument are often indirect and therefore difficult to measure and identify. It is difficult to isolate the actual effect, which may be the result of many different external factors. It is also difficult to identify the causality. The selection of control groups is important for the issue of causality.

Accordingly, a standard is recommended for the establishment of control groups based on information about the enterprises' industrial sector, export, size, internationalisation, R&D characteristics, employee composition, and employee education. This establishes a basis for determining the likelihood of a causal connection between the factor to be analysed and the performance objective, along with the basis for measuring the isolated effect.

6.2 Standard for analysis of R&D-active enterprises or innovative enterprises

In general, analyses of research and development instruments are based on employee productivity, employment, profit, survival rates, patent activity etc. at R&D-active enterprises only. If enterprises not carrying out research and development (e.g. innovative or non-innovative enterprises) were to be included in the econometric analysis, it would be necessary to apply suitable methods allowing for differences between R&D-active and non-R&D-active enterprises. The methods are relatively

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[14] Examples of application of this method may be found in FI (02/2011).

complex and require an extensive analysis of the factors that make enterprises choose to invest or not invest in research and development.[15]

It should be assessed whether a control group should be selected from R&D-active enterprises only, or if innovative and non-innovative enterprises should also be included.

If the control group consists solely of R&D-active enterprises, this must be justified, e.g. by the fact that the analysed activity or the analysed programme is not an activity that all enterprises can launch overnight, but is restricted to R&D-active enterprises only.

This is a strict assumption that will undoubtedly exclude enterprises predisposed for the analysed activity. Conversely, it may also be a conservative assumption that helps ensure robustness in the results as it avoids comparison with enterprises where the probability of participation in the activity in question is very small.

6.3 Treatment of outliers

In order for results to be as representative as possible, econometric models should be able to measure effects in a wide range of enterprises. However, extreme values may distort the effects and reduce precision. In some cases, there may be good reasons for removing extreme values. An example is young enterprises where large and risky investments are made, affecting the enterprises' added value for a short period of time. Such enterprises will potentially experience extreme increases from one year to another.

However, whether or not extreme values should be removed depends on the purpose of the analysis and the innovation policy instrument. Accordingly, a careful assessment of outliers should be made for each analysis and each instrument before any decision is made to exclude these from the analysis.

Furthermore, data have been found to include extreme values measured against e.g. enterprises' average productivity per employee, added value, employment etc. These are assumed to be incorrect registrations that are connected either to the enterprise's added value or to the number of full-year equivalents. Regardless of where the incorrect registration is found, it is recommended that such values are removed from the data.

However, there may be other methods, e.g. to include or exclude extreme data to see whether this has any effect on the results, or to consider medians etc.

6.4 Structure of output variable and valuation

It is not always easy to identify and delimit effects. Furthermore, differences occur in valuation depending on players and stakeholders. An example is the market value of a company. One might use the market's valuation of the individual company as a measure for the price or value of the total ‘tangible’ and ‘intangible’ assets. However, this would require the companies in the analysis to be quoted on the stock exchange. Accordingly, this method is not used, since most companies are not quoted on the stock exchange.

When effects in enterprises are to be analysed, it is recommended that a key performance indicator relative to labour input is used. By making the indicator relative to labour input, it is ensured that the effects cannot be attributed to an endless supply of labour.

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[15] The methods first estimate the tendency to invest in R&D and then estimate what the companies' R&D activities would have been if the enterprises had chosen to invest in R&D. These estimated values can be used in productivity analyses or other performance measurements. The so-called CDM model (Crépon et al, 1998) applies a similar approach to analysing the relationship between innovation and e.g. productivity, albeit only in part. Crépon et al estimate the tendency to be innovative in order to check for selection bias, but only include R&D-active enterprises in the analysis.

6.5 Modelling the connection between instrument and effect

Effect measuring is complex, since a linear connection between the analysed activity and a subsequent effect is hardly ever found. Accordingly, there are a number of conditions that can make it difficult to measure the effect, such as potential time layers before the effect sets in, different starting points for the enterprises, differences between the enterprises' characteristics, and the enterprises' experience and competences with regard to the instrument.

Accordingly, as a standard the econometric models must be able to allow for:

- Time lag between the analysed activity and its effect. The effect may set in with varying delays.
- Correction for enterprise differences. The enterprises in the analyses will vary in size, industry, market conditions, globalisation and other objective factors. It is important to check for these factors when the effects are to be isolated. In order to avoid 'losing' some of the effects in the analyses because the data set includes many different enterprises where there will be different effects, the analyses should both treat data as a whole and include information about each enterprise/individual on their industrial sector and number of employees.
- It is also recommended to seek to carry out enterprise analyses for different industries and enterprise sizes if the data basis permits.

6.6 Spillover effects

The transaction mechanisms between activities and their yield are complex, as there is no linear connection between activities and yield. Besides, there may be multiple gains that can be difficult to delimit and valuate.[16]

One of the challenges in measuring the effect of innovation programmes is that knowledge is a 'non-competing' advantage. This means that enterprises, individuals or public institutions may benefit from knowledge produced by others. And if such knowledge is transferred, it can be further developed through other innovation programmes. This becomes even more evident in relation to the innovation policy instruments that are created to be combined with other instruments, e.g. if an Industrial PhD student is associated with an innovation consortium, and innovation consortia, projects under the auspices of the Danish National Advanced Technology Foundation and knowledge vouchers are created through activities in the innovation networks of the Ministry of Science, Innovation and Higher Education. In literature, a number of researchers argue that knowledge increases in value when it is shared and used by several different players and enterprises. The increase of knowledge and spreading of knowledge from the different players and enterprises is achieved by collecting knowledge and by labour mobility, as employees carry knowledge they have gained through other enterprises and research institutions' investments in research, development and innovation.

Other enterprises than the one which has participated in the analysed activity will have higher marginal earnings on a product, either because production of the product has become more efficient and thus cheaper, or because the production value has increased and the product can be sold at a higher price. However, the effect not only benefits the manufacturer but all links in the value chain, right through to the wholesaler or retailer.

The spillover effect from knowledge can also create so-called creative destruction. Here, innovation and development of new products and services will remove value from existing products and services. As a result, it has a negative impact on the effects for other enterprises. Accordingly, performance measurements should be supplemented by other types of economic models that may pick up transmission mechanisms and spillover effects better than the micro-economic models, if the full effect of the analysed activity at a socio-economic level is to be exposed.

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[16] In OECD contexts, the concept of behaviour additionality is used increasingly to measure and define the multiple gains from innovation programmes, among other things. However, it is still very difficult to put a value on the additionalities.

7 Statistics for performance measurements

The impact analyses make use of the following national statistics:

- R&D statistics (Denmark’s National Statistical Bureau)
- Accounts statistics (Denmark’s National Statistical Bureau)
- Community Innovation Survey (CIS) (Denmark’s National Statistical Bureau)
- Education statistics (Denmark’s National Statistical Bureau)
- Project databases in ministries and funding agencies
- Patent statistics (Denmark’s National Statistical Bureau)
- Labour market statistics (Denmark’s National Statistical Bureau)
- Salary statistics (Denmark’s National Statistical Bureau)
- The Danish Commerce and Enterprises Agency's Central Business Register / *Købmandsstandens Oplysningsbureau/Experian A/S* (Danish Business World's Information Agency)

8 Publications from the Danish Council of Technology and Innovation, and the Danish Agency for Science, Technology and Innovation in the series *Innovation: Analyse og evaluering* (Innovation: Analysis and Evaluation)

2008

01/2008 *Performanceregnskab for GTS-net* (Performance accounts for ATS network)
02/2008 *Kommercialiseringsstatistik* (Commercialisation statistics)
03/2008 *Performanceregnskab for Innovationsnetværk* (Performance Accounts for Innovation Networks)
04/2008 *Performanceregnskab for Innovationsmiljøer* (Performance Accounts for Innovation Environments)
05/2008 *Evaluering af IDEA* (Evaluation of IDEA)
06/2008 *Effektmåling af forsknings- og innovationssamarbejder* (Performance Measurement of R&D collaborations)
07/2008 Open innovation and globalisation: Theory, evidence and implications
08/2008 *Brugeranalyse af GTS-nettet* (User Analysis of the ATS Network)
09/2008 Evaluation of Danish Industrial Activities in European Space Agency
10/2008 Evaluation of the Danish Contributions to Space Research
11/2008 *Evaluering af public service for opfindere (Opfinderrådgivningen)* (Evaluation of Public Service for Inventors (Inventors Consultancy))
12/2008 *Den danske erhvervsstruktur – udviklingstendenser og dynamikker* (The Danish Business Structure – Development Trends and Dynamics)
13/2008 *Innovation og innovationsbehov i servicesektoren* (Innovation and Innovation Needs in the Service Sector)
14/2008 *Kortlægning af iværksætter- og entrepreneurshipkurser ved universiteter* (Mapping of Start-up and Entrepreneurship Courses at Universities)
15/2008 *Kortlægning af indsatsen for fremme af innovation og entreprenørskab i de danske uddannelser – 2008* (Mapping of the Effort to Promote Innovation and Entrepreneurship in Danish Educational Programmes – 2008)
16/2008 *Matchmaking mellem virksomheder og videninstitutioner* (Matchmaking between Enterprises and Knowledge Institutions)
16/2008 *Innovation i IKT – indsatser og effecter* (Innovation in ICT – Efforts and Effects)
17/2008 Major challenges in national research and innovation policy governance: Comparison and assessment of the approaches in the VISION era-net partner countries
18/2008 Inside Service Innovation – Challenging Policy
19/2008 *Håndbog om Innovationsnetværk* (Handbook on Innovation Networks)
20/2008 *Videnpiloter – eksempler på vækst og innovation i små og mellemstore virksomheder* (Knowledge Pilots – Examples of Growth and Innovation in Small and Medium-sized Enterprises)
21/2008 *Fra inspiration til innovation – casesamling fra offentlige og private organisationer* (From Inspiration to Innovation – Cases from Public and Private Organisations)
22/2008 *Barriereranalyse for ErhvervsPhD-programmet* (Barrier Analysis for the Industrial PhD Programme)

2009

01/2009	*Effektmåling af innovationsmiljøernes støtte til danske iværksættere* (Performance Measurement of the Innovation Environments' Support to Danish Entrepreneurs)
02/2009	*Rammer for innovativ IKT-anvendelse – erfaringer fra Den Regionale IKTsatsning* (Framework for Innovative ICT Use – Experience from The Regional ICT Effort)
03/2009	*Analyse af forsknings- og udviklingssamarbejde mellem virksomheder og videninstitutioner* (Analysis of R&D Collaboration between Enterprises and Knowledge Institutions)
04/2009	International Evaluation of the Danish GTS system – A step beyond
05/2009	*Proof of concept-finansiering til offentlige forskningsinstitutioner – Midtvejsevaluering* (Proof of Concept Funding for Public Research Institutions – Mid-term Evaluation)
06/2009	Mapping of the Danish knowledge system with focus on the role and function of the GTS net
07/2009	International Comparison of Five Institute Systems
08/2009	Review of science and technology foresight studies and comparison with GTS2015
09/2009	*Analyse af små og mellemstore virksomheders internationale FoU-samarbejde* (Analysis of Small and Medium-sized Enterprises' International R&D Collaboration)
10/2009	*Ikt-anvendelse og innovationsresultater i små og mellemstore virksomheder* (Use of ICT and Innovation Results in Small and Medium-sized Enterprises)
11/2009	*Virksomhedernes alternative strategier til fremme af privat forskning, udvikling og innovation* (Enterprises' Alternative Strategies for Promotion of Research, Development and Innovation)
12/2009	*Rådet for Teknologi og Innovation måler sin indsats inden for metrologi i perioden 2007-2009* (The Technology and Innovation Council Measures its Efforts in Metrology for the Period 2007-2009)
13/2009	*Kommercialisering af forskningsresultater - Statistik 2008* (Commercialisation of Research Results – Statistics 2008)
14/2009	*Erhvervslivets forskning, udvikling og innovation i Danmark 2009 – Den økonomiske krises betydning* (Research, Development and Innovation in the Danish Business Sector 2009 – The Impact of the Recession)
15/2009	*Finanskrisens påvirkning på IT-startups* (The Recession's Impact on IT Start-ups)
16/2009	*Universiteternes Iværksætterbarometer 2009* (The Universities' Entrepreneur Barometer 2009)
17/2009	*Kortlægning af iværksætter- og entreprenørskabsfag ved de 8 danske universiteter – 2009* (Mapping of Start-up and Entrepreneurship Subjects at the 8 Danish Universities – 2009)
18/2009	The Gazelle Growth Programme – Mid Term Evaluation
19/2009	*Nye former for samarbejde om privat forskning, udvikling og innovation - midtvejsevaluering af åbne midler* (New Forms of Collaboration on Research, Development and Innovation – Mid-term Evaluation of Open Funds))
20/2009	*Innovationsagenter – Nye veje til innovation i små og mellemstore virksomheder. Erfaringer fra midtvejsevaluering af pilotprojektet Regionale Innovationsagenter* (Innovation Agents – New Paths to Innovation in Small and Medium-sized Enterprises. Experience from Mid-term Evaluation of the Pilot Project ‘Regional Innovation

Agents’)

21/2009 *Forskning, udvikling og innovation i små og mellemstore virksomheder - erfaringer fra midtvejsevaluering af videnkuponer* (Research, Development and Innovation in Small and Medium-sized Enterprises – Experience from Mid-term Evaluation of Knowldege Vouchers)

22/2009 *Dansk innovationspolitik 2009 – Den økonomiske krises betydning for fremme af erhvervslivets forskning, udvikling og innovation* (Danish Innovation Policy 2009 – The Recession's Impact on Promotion of Research, Development and Innovation in the Busines Sector)

23/2009 *Serviceinnovation og innovationsfremmesystemet* (Service Innovation and the Innovation Promotion System)

24/2009 *Performanceregnskab for Videnskabsministeriets innovationsnetværk 2009* (Performance Accounts for the Ministry of Science's Innovation Networks 2009)

25/2009 *Performanceregnskab for innovationsmiljøerne 2009* (Performance Accounts for the Innovation Environments 2009)

2010

01/2010 *Produktivitetseffekter af erhvervslivets forskning, udvikling og innovation* (Productivity Effects of Research, Development and Innovation in the Business Sector)

02/2010 *Erhvervslivets forskning, udvikling og innovation i Danmark 2010* (Research, Development and Innovation in the Danish Business Sector 2010)

03/2010 An Analysis of Firm Growth Effects of the Danish Innovation Consortium Scheme

04/2010 *Effektmåling af videnpilotordningens betydning for små og mellemstore virksomheder* (Performance Measurement of the Knowledge Pilot (Innovation Assistant) Programme's Impact on Small and Medium-sized Enterprises)

05/2010 *InnovationDanmark 2009 - resultater og evalueringsstrategi* (InnovationDanmark 2009 – Results and Evaluation Strategy)

06/2010 *Kommercialisering af forskningsresultater - Statistik 2009* (Commercialisation of Research Results – Statistics 2009)

07/2010 *Performanceregnskab for Videnskabsministeriets GTS-net 2010* (Performance Accounts for the Ministry of Science's ATS network 2010)

08/2010 *Innovationsnetværk Danmark - Performanceregnskab 2010* (Innovation Network Denmark – Performance Accounts 2010)

09/2010 *Performanceregnskab for Videnskabsministeriets Innovationsmiljøer 2010* (Performance Accounts for the Ministry of Science's Innovation Environments 2010)

10/2010 *Universiteternes Iværksætterbarometer 2010* (The Universities' Entrepreneur Barometer 2010)

12/2010 *Brugerundersøgelse af GTS-institutterne 2010* (User Survey of the ATS Institutes 2010)

2011

01/2011	Analysis of Danish Innovation Policy – The Industrial PhD Programme and the Innovation Consortium Scheme
02/2011	*Økonomiske effekter af erhvervslivets forskningssamarbejde med offentlige videninstitutioner* (Economic Effects of the Business Sector's Research Collaboration with Public Knowledge Institutions)
03/2011	*Erhvervslivets forskning, udvikling og innovation i Danmark 2011* (Research, Development and Innovation in the Danish Business Sector 2011)
04/2011	*Evaluering af GTS-instituttet DHI* (Evaluation of the ATS Institute DHI)
05/2011	*Evaluering af GTS-instituttet Bioneer* (Evaluation of the ATS Institute Bioneer)
06/2011	*Evaluering af GTS-instituttet FORCE Technology* (Evaluation of the ATS Institute FORCE Technology)
07/2011	*Erhvervslivets forskning, udvikling og international outsourcing* (Research, Development and International Outsourcing in the Business Sector)
08/2011	*Innovationsmiljøernes Performanceregnskab* (The Innovation Environments' Performance Accounts)
09/2011	*Performanceregnskab for Videnskabsministeriets Innovationsmiljøer 2011* (Performance Accounts for the Ministry of Science's Innovation Environments 2011)
10/2011	*Performanceregnskab for Videnskabsministeriets GTS-net 2011* (Performance Accounts for the Ministry of Science's ATS network 2011)
11/2011	*Kommercialisering af forskningsresultater – Statistik 2010* (Public Research Commercialisation Survey – Denmark 2010)
12/2011	*Evaluering af GTS-instituttet DELTA* (Evaluation of the ATS Institute DELTA)
13/2011	*Evaluering af GTS-instituttet DBI* (Evaluation of the ATS Institute DBI)
14/2011	*Evaluering af GTS-instituttet Teknologisk Institut* (Evaluation of the ATS Institute Danish Technological Institute)
15/2011	Impact Study of Eureka Projects
16/2011	Benchmarking of Cluster Policies in Europe
17/2011	Clusters Are Individuals: Creating Economic Growth through Cluster Policies for Cluster Management Excellence – Nordic-German-Polish Cluster Policy Benchmarking Project
18/2011	Impact Study: The Innovation Network Programme
19/2011	*Universiteternes Iværksætterbarometer 2011* (The Universities' Entrepreneur Barometer 2011)
20/2011	Access to Research and Technical Information in Denmark