

# Do clusters yield positive effects on firm performance?

## A review of cluster programme effect analyses in Sweden and internationally

A study conducted for the Swedish Agency for Economic and Regional Growth (Tillväxtverket)

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**Authors:**

Emily Wise, IEC AB, Sweden

James Wilson, Orkestra, Spain

Madeline Smith, SmithKelvin, UK

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# I. Background and Objectives of the Study

Across Europe there continues to be an interest in cluster policies and programmes, bringing together companies, researchers and government to maximise the competitiveness and innovation opportunity within a region through working collaboratively.

As interest in clusters has grown amongst companies, practitioners and policy makers, the need for effective evaluation has also risen, not least to be able to show the return on investment from such initiatives.

Tillväxtverket (the Swedish Agency for Economic and Regional Growth) is in the process of developing a new national cluster programme. As an input to this work, Tillväxtverket is interested in existing evidence that clusters have a positive effect on (quantitative indicators) of companies' performance.

**The objective of this study is to provide an overview of existing evidence of the impact of clusters (i.e. cluster initiatives) on companies' innovative capacity and performance<sup>1</sup>.**

The topic of cluster evaluation has been widely debated over the past decade among both academics and practitioners. Although attempts have been made at developing standard frameworks for evaluating cluster initiatives, no "generally accepted standards" have yet been established. Regions and countries with cluster programmes (i.e. cluster-based economic development efforts) each develop their own approach for evaluating cluster initiatives, seeking to provide evidence on the impact of clusters on companies and regional development so as to motivate continued investment in cluster efforts. (It is worth noting that cluster programmes also differ, with each region developing interventions to address specific weaknesses in their innovation system.)

Most monitoring and evaluation of cluster programmes is based on tracking quantitative outputs of the cluster efforts in terms of *critical mass* (# of actors engaged), *linkages* (# and type of new linkages established within and outside of the cluster), *innovation* (# of articles, patents, new collaborative innovation projects between knowledge institutions and industry, etc.), *commercialisation* (# new products and services), and/or *entrepreneurship* (# new companies). In addition, information on *financial leverage* and "case stories" on the cluster's contribution to *broader systemic developments* (e.g. investments in new RDI infrastructure, attraction of foreign talent, etc.) may also be collected. Most often, this data is collected from the cluster organization(s) (only).

In some cases, monitoring and evaluation efforts include qualitative data on companies' assessment of cluster efforts (including aspects such as strategy/collective vision, social capital, perceived impact on performance, etc.). And in a more limited number of cases, monitoring and evaluation efforts include quantitative data on clusters' impact on company performance (e.g. increases in revenue, productivity, employment, export, etc.).

This overview is made up of two primary sources: a review and synthesis of academic literature on the topic, and a synthesis of six relevant effect analyses conducted in Sweden<sup>2</sup> and internationally<sup>3</sup>.

Following this introduction, section two presents a short review of the overall objectives of cluster policy and an introduction to the generally-accepted effect logic for cluster programmes. Section three provides a synthesis of academic literature on clusters' impact

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<sup>1</sup> including e.g. increases in company revenue, productivity, employment and export levels

<sup>2</sup> Tillväxtverket Klusterprogrammet Slututvärdering (2011) and Vinnova Effektanalys av Vinnväxt programmet (2016)

<sup>3</sup> Denmark, France, Northern Ireland and Norway

on company performance<sup>4</sup>. This is followed in section four by a summary and comparison of key results (quantitative data on company impact) from a number of existing cluster programme effect studies. (The more detailed reviews of the six case studies are provided in Appendix I.)

### **Definitions**

In the context of this report, the following terms and definitions are used:

A **cluster** is a geographical proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and externalities. (Porter 1998, *On Competition*)

A **cluster initiative** is an organised effort to increase the growth and competitiveness of a cluster within a region, involving cluster firms, government and/or the research community". (Sölvell, Lindqvist and Ketels 2003, *The Cluster Initiative Greenbook*)

Cluster initiatives are increasingly managed by specialised institutions, known as **cluster organisations**, which take various forms, ranging from non-profit associations, through public agencies to companies. (EC Communication: Towards world-class clusters in the European Union: Implementing the broad-based innovation strategy- SEC(2008) 2637} 17 October 2008, p.8)

A cluster organisation does not necessarily have members, but it provides services to the cluster initiative participants. Services include e.g.: improving innovation capability, exploring business opportunities, fostering entrepreneurship, education & training, internationalisation, facilitating collaboration, etc.

**Cluster programmes/policies** are organised efforts taken by government to increase the growth and competitiveness of clusters in its constituency.

## **II. Cluster Policy - a generally accepted effect logic and evaluation framework**

Following Michael Porter's publication of *The Competitive Advantage of Nations* (1990), the concept of clusters<sup>5</sup> as a driver of competitiveness has become broadly accepted. Porter (1998) summarizes a number of reasons why clusters allow companies to operate more productively and innovate. These include: better access to employees and suppliers; access to specialised information; complementarities with other actors in the cluster; continual interactions and mutual learning among actors in the cluster; access to institutions and public goods; better motivation and measurement; and the capacity and flexibility to experiment at lower cost and act rapidly.

Academic discourse over the last 20+ years has also drawn a number of links between the concept of clusters and innovation processes - focusing on knowledge spillovers and dynamic relations between actors, as well as the role of the business environment in supporting innovation and ensuring sustainable competitive advantages for an economy.

Clusters can be viewed as a sort of (localised) innovation system - where interaction between the various actors supports a quicker diffusion and absorption of knowledge (and thus more efficient and effective innovation processes). The typical aim of cluster policy is

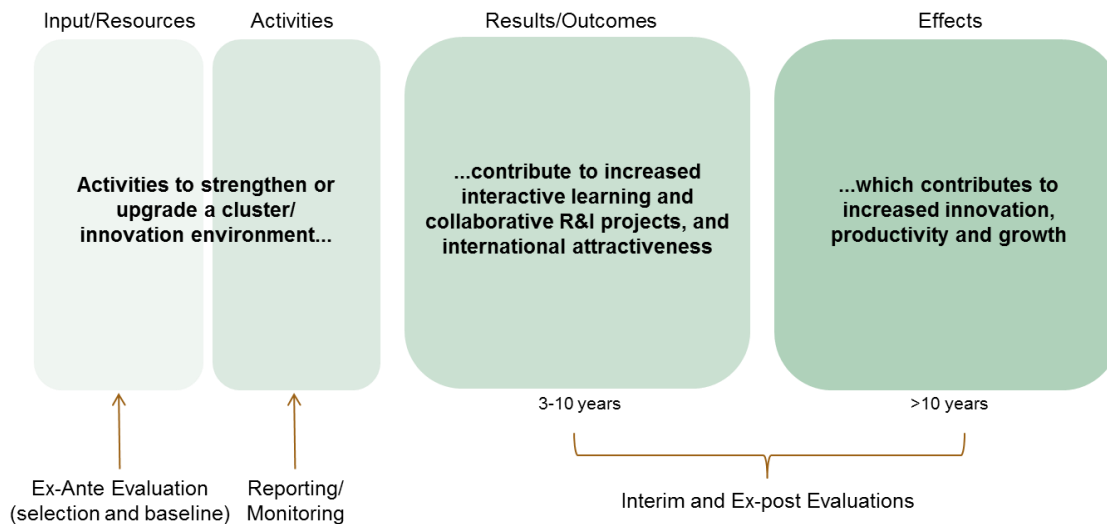
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<sup>4</sup> The literature review is organised around the impacts of clusters *per se* and of cluster policies. It addresses impacts on different types of company performance indicators (innovation, productivity, employment, growth), and reports on evidence across different types of companies (e.g. large vs. small, new ventures).

<sup>5</sup> Groups of inter-connected firms, suppliers, related industries and institutions that arise in particular locations

to address systemic or network failures (i.e. missing linkages and/or weak interaction between various actor groups) in order to strengthen learning and collaborative innovation processes in the cluster (and thus contribute to strengthened productivity and competitiveness). This “generally-accepted” effect logic for cluster policy is illustrated in Figure 1 below.

Figure 1: “Generally-accepted” effect logic of cluster policy



In simplified terms:

- Cluster initiatives aim at building on various types of input factors (both the tangible “structural capital” including people, money and various types of infrastructure, and the intangible “social/relational capital”) to strengthen or upgrade the cluster/innovation environment.
- The direct results - experienced in the near(er) term - are in the form of strengthened linkages, interactive learning processes and collaborative research and innovation projects. (This makes sense given that cluster policies are primarily focused on addressing coordination/system failures.)
- These direct results (a more efficient/coordinated and internationally attractive innovation system) then enhance longer-term outcomes/impacts on economic performance.

The rise of the cluster concept and the link that clusters were shown to have with higher productivity and strengthened competitiveness gave rise to many regional and national programmes and other policy activities. This, in turn, gave rise to the need for evaluating these public investments and providing clear evidence of the impacts on firms and territories.

### III. Review of academic literature

Given their strong (and increasing) popularity, there is significant demand to better measure and understand the impacts of cluster policies. Yet there is a paucity of academic literature that directly treats the impacts of cluster policies.

This is due in part to inherent methodological challenges. The direct outcomes of cluster policies have significant intangible elements, which makes it difficult to establish causality relationships with broader hypothesised impacts on firm performance and regional

economic development (that are simultaneously impacted by a range of other factors and policies).

The lack of convincing academic evidence also reflects the sheer variety of specific policies that fall under the broad label ‘cluster policy’, which renders the generalisation of results and implications difficult.

Finally, data issues complicate academic work on cluster policy evaluation, prompting arguments for blending academic expertise and analysis with the real-time and evolving experience of policy makers and practitioners that are potentially ‘closer’ to the most relevant data (Smith *et al.*, 2016).

Schmiedeberg (2010) provides an excellent review and analysis of the different evaluation methodologies that could be applied to cluster policies. Five groups of approaches are identified:

- Policy input-oriented or reporting methods that report on the execution of a specific policy programme, based on a quantitative and qualitative data and case studies.
- Case studies of specific clusters or participants in clusters that bring together different pieces of quantitative and qualitative information to provide insights on the functioning of a policy programme.
- Econometric models that seek to demonstrate causality between the policy programme and specific impacts at the firm level.
- Systemic approaches (such as input-output models or network analysis) that explore the size and structure of the cluster and its constituent relationships at distinct moments in time.
- Cost-related approaches that seek to explore the efficiency of the policy intervention by incorporating a consideration of the costs of the policy.

The academic literature contains studies within each of these categories, but the main interest for this report is in the third group of quantitative studies that seek to demonstrate the impacts of cluster policies on firm performance. Such studies employ a range of specific methodologies and statistical techniques, which can be oriented towards analysing a range of different performance indicators. These include sales, profit, revenue, employment and exports, alongside intermediate indicators such as innovation or productivity performance. However, the selection and collection of appropriate indicators has proved a significant challenge in itself for cluster evaluation (Arthurs *et al.*, 2009), and as noted by Schmiedeberg (2010: 397) “the choice of indicators is not trivial, since all of them are criticised for having their deficiencies”.

Alongside the underlying methodology and the choice of indicators, another factor distinguishing academic studies is the question of whether they seek to demonstrate the impacts of clustering *per se* or the impacts of a specific cluster policy programme. The remainder of the analysis is split according to this distinction.

## Analysis of the impacts of clustering

Over the last quarter of a century there has been a significant amount of research in economic geography geared towards analysing the impacts of industrial agglomeration or clustering on firm performance and/or regional economic development.

A key reference point for much of this research is Glaeser *et al.*'s (1992) influential paper integrating the earlier ideas of Marshall (1890), Arrow (1962) and Romer (1986) into the so-called M-A-R model explaining the benefits arising from the spatial concentration of firms belonging to the same industry. Alongside Jacobs (1969) ideas on the benefits of

diversity in urban agglomerations, and the rising popularity of clusters as a policy construct, the M-A-R model has prompted a great deal of academic debate around the relative importance of agglomeration and diversification in generating externalities that impact on firm and regional performance. Most recently these debates have been framed around the distinction between ‘related variety’ and ‘unrelated variety’ (Frenken *et al.*, 2007; Boschma and Iammarino, 2009; Boschma *et al.*, 2012).

Much of the empirical work is concerned with understanding the *innovation* externalities associated with clustering. In a cross-sectional study of 153 European regions, Gruenz (2004) finds that both agglomeration and diversification externalities significantly increase innovation, and Delgado *et al.* (2014) find that industries located in strong clusters exhibit higher patenting growth. At the firm level, Folta *et al.* (2006) and McCann and Folta (2011) have found that more densely clustered US biotechnology firms have higher rates of patenting. Moreover, studies of geographically-bounded inter-firm (and other institution) cooperation in the UK have found positive impacts on innovation outcomes (De Propris, 2000; Freel and Harrison, 2006).

Boschma (2005:71), however, suggests that the relationship between clustering and innovation is not straightforward, because “too much and too little proximity are both detrimental to learning and innovation”. In their recent review of evidence, Uyerra and Ramlogan (2012) conclude that “on balance, scholarly work seems to suggest that clustering has a positive effect on innovation”. They cite, for example, studies by Baptista and Swann (1998) and Beaudry and Breschi (2003), which use the same methodology to explore the relationship between cluster strength and firm propensity to innovate. While the Baptista and Swann (1998) study (based on UK data) finds a positive effect, the Beaudry and Breschi (2003) study (based on UK and Italian data) qualifies this by suggesting that benefits only arise where the cluster already contains many innovative firms. Such a qualification is consistent with other studies suggesting the importance of firm-specific characteristics, such as being well-connected within and without the cluster (Boschma and Wal, 2007).

Other empirical studies focus on the impact of agglomeration on firm-level *productivity*. Again the evidence is predominantly positive. Martin *et al.* (2011a), for example, analyse the effect of spatial agglomeration on plant-level productivity in France. They find that French firms benefit from localization externalities that boost their productivity. However, they suggest that these benefits are already well internalized in the location decisions of firms, leading them to question a role for policies designed to encourage clustering.

Cainelli *et al.* (2016) also find positive impacts from clustering on productivity in their study of 12,000 Italian manufacturing firms over an eight-year period. They explore the impact of both agglomeration and related variety on total factor productivity and their results suggest that the former is more significant than the latter in influencing firms’ total factor productivity. They argue that this reflects the effect of concentration on increasing the efficiency of consolidated technology, while related variety would be expected to rather have a more positive effect on the innovative performance of firms due to enhanced possibilities from cross-fertilization of ideas.

Both the Martin *et al.* (2011) and the Cainelli *et al.* (2016) studies have similar findings with regards the differential impacts on *different size firms*. Martin *et al.* (2011: 190) find that “localization economies are stronger for plants that are smaller than the average plant in the sample”, while Cainelli *et al.* (2016: 211) find that “the spatial concentration of the local system is significant for influencing the productivity of small firms but not medium and large firms”.

Stronger effects from clustering among smaller firms is also broadly consistent with McCann and Folta’s (2011) finding that younger firms tend to benefit more from

agglomeration, and with Feser *et al.*'s (2008) or Gilbert *et al.*'s (2008) analysis of the impacts of clustering on **new ventures**. Indeed, based on US data, Gilbert *et al.* (2008) find that new ventures located in clusters both absorb more knowledge from the environment and have higher growth and innovation performance than those located outside clusters.

Empirical literature on the impacts of clustering on **employment** or regional economic growth is both less common and more mixed. Spencer *et al.* (2010: 697), using data on Canadian city regions, find that “when industries locate in an urban region with a critical mass of related industries, they tend to generate both higher incomes and rates of employment growth”. This is consistent with Delgado *et al.*'s (2014) findings using US data. Feser *et al.* (2008), however, don't find evidence of impact on employment growth from technology-based clusters in the Appalachian region (US), and McDonald *et al.* (2007) find that while established UK clusters are linked to employment growth, clusters with deep collaborative networks are not.

In their review and case studies of cluster development programmes (CDPs) in South America, Maffioli *et al.* (2016) conclude that there was “solid evidence that CDPs have had a positive effect on **sales, employment and exports** and that the ways the networks of linkages develop are intimately related to results”, whilst acknowledging the challenges in cluster policy evaluation.

## Analysis of the impacts of cluster policies

Academic literature that analyses the impacts on firms of specific cluster policy programmes is considerably more difficult to find than studies exploring the impacts of clustering as a general phenomenon. Indeed, the OECD (2015: 5) maintains that “evaluation of cluster policies are rare and often not very robust”. Moreover, the enormous heterogeneity among cluster programmes in terms of rationales, objectives, focus, scope and scale of support, instruments employed and timescale of operation means that it is extremely challenging to compare the evidence that is available.

Uyarra and Ramlogan's (2012) provide an excellent synthesis that reviews evidence related to the evaluation of 16 cluster programmes of different shapes and sizes. The evaluations that they analysed cover a wide range of issues with respect to cluster operations and processes, collaboration and soft impacts, and longer term innovation and economic effects. In terms of firm-level or regional-level impacts, there is generally positive evidence on the capacity of public sector cluster funding to leverage private sector investment, but it is revealing that none of the evaluations really tackle the long-term impacts of the policies on employment or growth.

The evaluations analysed do contain significant evidence on the impacts of specific policies on firm-level **innovation**. Positive impacts on patenting and R&D project participation were detected during the treatment period of the German BioRegio/BioProfile policies, for example, although there were no significant impacts on project participation following the treatment period (Engel *et al.*, 2012). The Barcelona Knowledge Cluster initiative was also associated with an increased share of knowledge-based firms (Viladecans-Marsal and Arauzo-Carod, 2011), the Bavarian High Technology cluster policy with an increased likelihood of firm innovation (Falck *et al.*, 2010), and the Danish cluster programme with an increased probability to innovate (DAMVAD, 2011). On the other hand, there were no significant effects on R&D productivity among Japanese firms participating in cluster projects under the Industrial Cluster Policy (Nishimura and Okamuro, 2011a).

There are a limited number of studies that have sought to directly address the impacts of specific cluster programmes on firm-level **productivity**, with mixed and generally unconvincing results. This is at least in part related to the difficulty of gathering reliable and



appropriate data on firm level productivity and on the various other factors that may be influencing it.

Martin *et al.* (2011b) studied the impact of France's 'local production systems' policy - the predecessor to the more recent 'poles de compétitivité' policy - on the total factor productivity of manufacturing firms. They found a negative impact on the total factor productivity of firms receiving the subsidy, when matched against a sample of firms that hadn't received the subsidy. Aranguren *et al.* (2014) also used a matched-sample approach to test for impacts on firm-level (labour) productivity from the Basque Country's (Spain) cluster policy. Their analysis shows mixed results across different models and time periods, and overall "weak evidence that the cluster policy has had a positive impact on firm-level productivity" (p. 1560). Moreover, De la Maza-y-Aramburu *et al.* (2012) suggest that the Basque cluster associations supported by the policy play a mediation role, whereby firms exerting internal innovation activities have an indirect and positive effect on firm-level productivity through participating in the policy.

Studies of the wider regional impacts of cluster policies on **growth and employment** also exhibit very mixed evidence. Doloreux *et al.* (2016) explore the effects of a series of policies, over a decade, focused on Québec's coastal region and Maritime cluster. They compare employment growth in sectors related with Maritime activities between Québec's coastal region and the rest of Québec, finding "at best - a marginal impact on the local economy and on the particular sectors targeted" (p. 208). In their study of the French 'local production systems' policy, Martin *et al.* (2011b) were also unable to identify a statistically significant impact from the policy on firm-level employment, and Fromhold-Eisebith and Eisebith (2008) find only minor aggregate effects on the regional economy in an empirical analysis of two automotive cluster initiatives (in Germany and Austria).

Garone *et al.* (2014), however, find evidence of positive impacts from Brazil's cluster development policy on employment growth and export behavior among SMEs. Recent studies of the German 'leading-edge cluster competition' (or Spitzencluster-Wettbewerb) policy are also positive. Lehmann and Menter (2017) evaluate treated clusters against a control group and find that an active public cluster policy has a positive impact on regional GDP growth. Moreover their results highlight the particularly important role of university knowledge and corresponding university-industry collaboration within clusters. This is in line with Audretsch *et al.*'s (2016) findings related to the impacts of the same policy on **new ventures**. They suggest that the cluster policy positively affects regional entrepreneurial activities, but that the impact is "rather low compared to the impact of local research intensive universities and the innovative milieu on new venture creation" (p. 357). In particular, they conclude that "entrepreneurial activity responds to clusters only if several key conditions exist", but that there is "compelling evidence that (entrepreneurship) policy is more effective in the context of regional clusters" (*Ibid.*, p. 375). There is also some positive evidence from case studies in German regions that cluster policies can play a role in strengthening **regional resilience** to external shocks (Kiese and Hundt, 2014).

In their review, Uyarra and Ramlogan (2012: p. 35) conclude that "overall, there was no clear and unambiguous evidence that over the long term clusters are able to generate strong and sustainable impacts in terms of innovation, productivity or employment." The evidence on direct impacts of cluster policies at the firm and regional level is relatively scarce, however, and the limitations of available methodologies to isolate such impacts must be taken into account. Indeed, Schiemedeborg (2010) in her overview of the methodological state-of-art concludes that "using only a single evaluation method will provide a very limited view on the cluster policy programme". In addition, Wolfe and Gertler (2004: p. 1081) suggest that statistical methodologies to be too limited and that the "growth and innovation dynamics of clusters can only be properly captured using qualitative research techniques".

The importance of nesting together different methodological approaches to analyzing the impacts of clusters is emphasised by Aranguren *et al.* (2014) in their study of the Basque Country cluster policy, where a complementary qualitative analysis of the policy was able to highlight and clarify the limitations of the empirical analysis of productivity effects (which were sensitive to data and model selection). Indeed, the use of mixed methods is particularly important in the light of Diez’s (2002: 298) argument that “the most significant effects of these policies are produced in the social, institutional and cultural spheres”. Understanding firm-level impacts in isolation from these social and institutional effects is extremely difficult, and there are a growing number of academic studies that use social network analysis or participatory approaches to explore intermediate impacts of cluster policies on firm behaviour related to networking (for example: Aragón *et al.*, 2014a, 2014b; Calignano and Fitjar, 2017; Choi *et al.*, 2013; Giuliani and Pietrobelli, 2016; Huggins, 2001; Nishimura and Okamuro, 2011b).

Table 1: Synthesis of findings from literature review

	IMPACTS OF CLUSTERING (THEORY)	IMPACTS OF CLUSTER POLICY (SPECIFIC POLICY PROGRAMMES)
<b>INNOVATION IN FIRMS</b>	Positive impact (driven by firm connections with other firms/actors within and outside of cluster)	Significant evidence of positive impact on firm-level innovation
<b>PRODUCTIVITY OF FIRMS</b>	Positive impact (particularly for smaller firms and new ventures)	Some evidence of positive impact on firm-level productivity
<b>EMPLOYMENT IN FIRMS</b>	Positive impact (but more limited evidence)	No significant evidence of impact on firm-level employment
<b>WIDER REGIONAL IMPACTS</b>	Some evidence of positive impact on wages and on employment growth	Evidence of impact on regional GDP growth, new ventures/entrepreneurial activities, and resilience

## IV. Results from cluster programme effect studies

The effect logic for cluster policy (described in chapter 2) illustrates that the direct (and primary) effects of cluster initiatives are: new networks/knowledge sources, strengthened competencies and innovative capacity, as well as behavioral effects (such as increased investment in R&D, broadened interactive learning and collaboration, and more efficient/effective innovation processes). These direct effects should then contribute to strengthened competitiveness and international attractiveness, as well as economic impacts in companies (such as increased revenue, employment, productivity and export).

Typically, cluster programme monitoring and evaluation practices focus on the direct effects and behavioral changes that companies experience. Relatively less focus is given to the (indirect) economic impacts on companies as these are more difficult to evidence/attribute (so many other things affect firm performance as well), and as these are only expected in the longer term. Interestingly, current evaluation methodologies also often lack elaboration of collaboration and collaborative dynamics - elements that are so essential to cluster effects (i.e. through collaboration, cluster actors are able to achieve outcomes they would not be able to achieve individually).

The table below provides a listing of typical elements and indicators included in cluster programme monitoring and evaluation efforts.

Table 2: Overview of typical elements and indicators in cluster programme monitoring and evaluation

ELEMENTS OF DIRECT/BEHAVIORAL EFFECTS	EXAMPLE INDICATORS
COLLABORATION AND COLLABORATIVE DYNAMICS	<ul style="list-style-type: none"> <li>Engagement of different actor groups (level/critical mass and diversity)</li> <li>Linkages and dynamics of linkages between actors over time (# and types of collaborations)</li> <li>Capacity to collaborate</li> </ul>
INNOVATION AND INNOVATIVE CAPACITY	<ul style="list-style-type: none"> <li>Competence development of staff</li> <li>Knowledge exchange (between companies and universities/other actors)</li> <li>Capacity to innovate; collaborative research and innovation projects</li> <li>Introduction of new products/services</li> </ul>
ELEMENTS OF INDIRECT EFFECTS	EXAMPLE INDICATORS
COMPETITIVENESS AND INTERNATIONAL ATTRACTIVENESS	<ul style="list-style-type: none"> <li>Entrepreneurship; new companies</li> <li>Attraction of investment or talent</li> <li>Entry into new markets</li> </ul>
FIRM-LEVEL ECONOMIC PERFORMANCE	<ul style="list-style-type: none"> <li>Revenue growth</li> <li>Productivity growth</li> <li>Employment growth</li> <li>Export growth</li> </ul>
SYSTEM LEVEL	<ul style="list-style-type: none"> <li>Broader spillover effects on the region (e.g. regional GDP growth, resilience/capacity for transformation)</li> <li>Changes to regional/national innovation system or policies</li> </ul>

Qualitative data (i.e. perceptions) on some or all of these aspects is collected (through reporting templates, surveys and interviews) from cluster organisations (typically) and from participating companies and other actors (less often). As discussed in the previous chapter, only few cluster policy evaluation efforts include quantitative data on firm-level **economic performance** (e.g. growth in revenue, productivity, employment, export) collected through firm-level statistics and analysed in relation to “control groups” of companies who have not participated in cluster initiatives. This level of data collection and analysis is typically done after a longer span of time in order to motivate or re-visit the rationale for the policy/programme effort - in so-called impact or effect studies.

Of the regions and countries in the world who have implemented cluster policies, only a limited number have conducted regular evaluation efforts or impact/effect studies that include quantitative data on firm performance. Even though there is a demand for more focus on firm-level impacts, the large majority of evaluation practices are still primarily based on surveys of firm perspectives (rather than statistical data), and do not typically include an analytical comparison with “control groups” of companies (often due to the challenge of finding suitable comparable control groups).

The six cases selected for this report<sup>6</sup> represent regions/countries with similar objectives (and effect logics) for their cluster programmes, while also representing a variety of geographies and methodological approaches to the impact evaluations that they have conducted.

For each of the six case studies, a detailed description was prepared (see Appendix I), including:

- A short summary of the cluster programme
- An overview of cluster evaluation activities
- Key results (both quantitative data on firm-level economic performance, and other results structured according to the categories in Table 2 above)
- Learning points

An overview of key results from across the six cases is presented in Table 3 below.

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<sup>6</sup> From Denmark, France, Northern Ireland, Norway, and Sweden (2 different programmes)

Table 3: Summary of key results from cluster programme effect studies

	Denmark	France	Northern Ireland <sup>7</sup>	Norway	Sweden (TVV)	Sweden (Vinnova)
Collaboration and collaborative dynamics	<p>Participation in clusters increases probability of entering R&amp;D collaboration by more than 4 times after one year of participation</p> <p>Companies gain new collaborations with other companies (49%), with knowledge institutions (36%), with public sector actors (23%) and with international partners (14%)</p>	<p>60% of companies gained new collaboration partners as a result of cluster activities</p>	<p>The purpose of the CNPs is to promote collaborative innovation opportunities (see below).</p> <p>54% of companies reported that CNPs had had a significant impact on helping companies establish and maintain business contacts</p>	<p>Each cluster company establishes an average of 11 new collaboration partners each year</p> <p>Stronger growth in number of new collaboration partners and breadth of collaborative linkages (in comparison to control group)</p>	<p>83% of companies gained new network contacts as a result of cluster activities</p> <p>57% of companies perceive cluster initiative contributed to new R&amp;D contacts</p>	<p>50% of companies initiated new collaborations with other companies or reserach actors as a result of cluster activities</p> <p>40% of companies initiated new collaborations with suppliers, partners, experts, etc. ss a result of cluster activities</p> <p>43% of companies report more effective collaboration with universities as a result of cluster activities</p>
Innovation and Innovative capacity	<p>Participation in clusters increases probability to innovate more than 4,5 times after one year of participation</p> <p>55% of companies have or plan to develop new</p>	<p>Initiated collaborative R&amp;D projects have led to nearly 1000 patent filings (2008-11)</p> <p>2500 collaborative R&amp;D projects generated innovations, of</p>	<p>84% of companies gained new information/ knowledge sharing</p> <p>56% of companies engaged in collaborative research,</p>	<p>494 new collaborative knowledge development projects (2016)</p> <p>434 new collaborative research and</p>	<p>77% of companies perceive cluster initiative contributed to competence development</p> <p>65% of companies perceive cluster initiative supports innovation and</p>	<p>33% of companies report increased competence levels of employees as a result of cluster activities</p> <p>42% of companies report that cluster activities have led to developing,</p>

<sup>7</sup> Results for formal (phase 2) collaborative growth initiatives

	products, services or processes as a result of cluster activities	which 75% are new products or processes 1042 collaborative R&D projects (2005-11) attracted 1,25 MEUR additional investment	development or design activities 40% of companies developed new processes	innovation projects (2016) Stronger growth in intensity of collaboration (# and size of collaborative R&D projects) (in comparison to control group)	renewal (53% to develop new services; 41% to develop new processes)	testing or protecting new products/services/solutions 27% of companies have introduced new products or services
Competitiveness and international attractiveness	27% of companies experience that cluster activities contributed to growth in revenues 12% of companies experience that cluster activities contributed to increased exports	Collaborative R&D projects led to creation of 93 start-ups 33% of companies experience that cluster activities contributed to growth in revenues Companies experience that cluster activities help boost exports Companies experience that cluster activities helped sustain jobs (84%) or create employment (66%)	68% of companies experience that cluster activities contributed to improved competitiveness 58% of companies experience that cluster activities contributed to improved productivity	313 new international collaboration projects (2016) 114 new cluster-to-cluster collaboration projects (2016)	81% of companies perceive cluster initiative contributed to increased visibility for the cluster and region	
Firm-level economic performance	Companies in R&D collaboration increase productivity with an average of 9% a year over 9 years		Created 239 jobs; safeguarded 687 jobs Created turnover of £15,36 M;	Cluster companies experience 7,3% higher sales revenue (compared to control group)	71,2% of cluster companies with higher revenue growth and 50,9% with higher employment	Faster employment growth (over last 5 years) in cluster companies relative to control group

			<p>safeguarded £16,28 M</p> <p>RoI (gross value added): 1£ : 3,71£</p>	<p>Cluster companies experience 7,3% higher value creation (compared to control group)</p>	<p>growth compared to national average for the sector</p>	<p>Faster revenue growth per employee (over last 5 years) in cluster companies relative to control group</p> <p>Higher share of companies who export in cluster relative to control group</p>
System level	<p>Companies in clusters experience significantly higher probability of participating in other innovation programmes</p>		<p>51% of companies reported that CNP has had a significant impact on improving the image of their sector</p>		<p>Cluster programme contributed to new collaboration between policy actors on regional and national levels and with clusters in other countries</p> <p>Regional actors perceive that cluster initiatives have contributed to attracting resources</p>	<p>Stronger anchoring of the Triple Helix model and collaborative approach to innovation and regional development</p> <p>Strengthened capability to manage structural change</p> <p>Strengthened regions' work with environmental sustainability and equality (as integrated part of innovation and growth strategies)</p>

NOTE: non-shaded cells indicate direct effects on companies/company behavior; shaded cells indicate indirect effects on companies or spillover effects on other actors/aspects

## V. Conclusions

Cluster programmes' main aim is to strengthen interactive learning and collaboration - directly fostering collaborative innovation projects and attraction of new resources. These results create the conditions that lead to strengthened economic performance.

The impact of cluster programmes is generally measured in terms of the direct results (in terms of collaboration, innovation and perceived contribution to competitiveness). Impact measures in terms of companies' economic performance are less prevalent.

Findings from academic literature (chapter 3) and results from (six) cluster programme effect studies (chapter 4) support the same conclusion - namely that **clustering efforts have a strong positive impact on collaboration and innovation, which often contributes to stronger revenue and productivity growth<sup>8</sup> for companies engaged in cluster efforts** (relative to "non-cluster" companies). In some cases, effect studies also show higher relative employment growth, as well as broader benefits to regional competitiveness (in terms of more effective "system performance"<sup>9</sup>, conditions for renewal and regional resilience).

Although academic literature and effect studies demonstrate that cluster efforts contribute to stronger innovation and economic performance among participating firms, there are no 'standard measures' or 'expected performance ranges' for either type of results (i.e. direct or indirect results).

In addition to confirming the positive effects of clustering efforts on firm-level economic performance, the effect studies have highlighted a number of factors that contribute to the realisation of results. These key factors include:

- Firm connections/collaborative linkages within and outside of the cluster (including international linkages) drive innovative behaviours. Continued dynamism in interactive learning processes (i.e. exposure to new linkages with new actors) is important.
- A strong/professional cluster management (and advisory boards) are important to proactively mobilise and facilitate collaborative activities and ensure their alignment with regional and national strategic priorities.
- Firms engaged more deeply and over longer periods of time in cluster efforts are those that experience the strongest results (in terms of economic performance).

And most importantly, effect studies highlight that it takes time for firms to reap the benefits of interactive learning and collaborative innovation processes fostered through clusters. Results in terms of commercialisation and improvements to economic performance indicators (such as revenue and productivity) take time to materialise. Cluster programme goals related to company turnover and employment are not areas that cluster initiatives can directly affect (even though these are often the focus of quantitative measures).

That being said, despite the challenges in capturing evidence (especially the link between policy and impact) and the lack of standard evaluation approaches, the review of literature and the case studies included in this report all point to positive effects on firm performance and regional competitiveness through cluster efforts.

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<sup>8</sup> Companies engaged in clusters experience 5-9% higher revenue and productivity growth, relative to control groups.

<sup>9</sup> Including strengthened synergies between public sector actors and policies, and cluster companies' successful participation in other innovation programmes (on national and EU levels)



## References

- Aranguren, M. J., de la Maza, X., Parrilli, M. D., Vendrell-Herrero, F., and Wilson, J. R. (2014), 'Nested Methodological Approaches for Cluster Policy Evaluation: An Application to the Basque Country', *Regional Studies*, 48(9): 1547-1562.
- Aragon, C., Aranguren, M.-J., Iturrioz, C. and Wilson, J. R. (2014a). 'A social capital approach to network policy learning: The case of an established cluster initiative', *European Urban and Regional Studies*, 21(2) 128-145.
- Aragon, C., Aranguren, M.J., Diez, M.A., Iturrioz, C. and Wilson, J.R. (2014b). 'Participatory evaluation: a useful tool for contextualizing cluster policy?', *Policy Studies*, 35 (1): 1-21.
- Arrow, K. (1962). 'The economic implications of learning by doing', *Review of Economic Studies*, 29: 155-173.
- Arthurs, D., Cassidy, E., Davis, C. H. and Wolfe, D. (2009). 'Indicators to support innovation cluster policy', *International Journal of Technology Management*, 46(3/4): 263-279.
- Audretsch, D.B., Lehmann, E.E. & Menter, M. (2016). 'Public cluster policy and new venture creation', *Econ Polit Ind*, 43: 357-381.
- Baptista, R. and Swann, G. M. P. (1998). 'Do firms in clusters innovate more?', *Research Policy*, 27: 525-40.
- Beaudry, C. and Breschi, S. (2003). 'Are firms in clusters really more innovative?', *Economics of Innovation and New Technology*, 4: 325-342.
- Boschma, R. (2005). 'Proximity and innovation: A critical assessment', *Regional Studies*, 39(1): 61-74.
- Boschma, R., and Iammarino, S. (2009). 'Related variety, trade linkages, and regional growth in Italy', *Economic Geography*, 85: 289-311.
- Boschma, R., Minondo, A. and Navarro, M. (2012). 'Related variety and regional growth in Spain', *Papers in Regional Science*, 91: 241-256.
- Boschma, R. and ter Wal, A. L. J. (2007). 'Knowledge Networks and Innovative Performance in an Industrial District: The Case of a Footwear District in the South of Italy', *Industry and Innovation*, 14(2): 177-199.
- Cainelli, G., Ganau, R. and Iacobucci, D. (2016). 'Do Geographic Concentration and Vertically Related Variety Foster Firm Productivity? Micro-Evidence from Italy', *Growth Change*, 47: 197-217.
- Calignano, G. and Fitjar, R. (2017). 'Strengthening relationships in clusters: How effective is an indirect policy measure carried out in a peripheral technology district', *Annals of Regional Science*, 59: 139-169.
- Choi, J., Sang-Hyun, A. and Min-Seok, C. (2013). 'The effects of network characteristics on performance of innovation clusters', *Expert Systems with Applications*, 40(11): 4511-4518.
- DAMVAD. (2011). *The impacts of cluster policy in Denmark: An impact study on behaviour and economical effects of Innovation Network Denmark*, Danish Agency for Science, Technology and Innovation.
- De la Maza-y-Aramburu, X., Vendrell-Herrero, F. and Wilson, J. R. (2012). 'Where is the value of cluster associations for SMEs?', *Intangible Capital*, 8(2): 472-496.
- De Propriis, L. (2000). Innovation and inter-firm co-operation: The case of the West Midlands. *Economics of Innovation and New Technology*, 9: 421-446.
- Delgado, M., Porter, M. E. and Stern, S. (2014). 'Clusters, convergence and economic performance', *Research Policy*, 43(10): 1785-1799.
- Diez, M-A. (2002). 'The evaluation of regional innovation and cluster policies: towards a participatory approach', *European Planning Studies*, 9: 907-924.
- Doloreux, D., Shearmur, R. and Figueiredo, D. (2016). 'Québec' coastal maritime cluster: Its impact on regional development, 2001-2011', *Marine Policy*, 71: 201-209.
- Engel, D., Mitze, T., Patuelli, R. and Reinkowski, J. (2012). 'Does cluster policy trigger R&D activity? Evidence from German biotech contexts', *Ruhr Economic Paper No. 11*, [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1988305](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1988305).

- Falck, O., Heblich, S. And Kipar, S. (2010). 'Industrial innovation: Evidence from a cluster-oriented policy', *Regional Science and Urban Economics*, 40(6): 574-582.
- Feser, E., Renski, H., & Goldstein, H. (2008). 'Clusters and economic development outcomes: An analysis of the link between clustering and industry growth', *Economic Development Quarterly*, 22(4), 324-344.
- Folta, T., B., Cooper, A. C. and Baik, Y. (2006). 'Geographic cluster size and firm performance', *Journal of Business Venturing*, 21(2): 271-242.
- Freel, M.S. and Harrison, R.T. (2006). Innovation and cooperation in the small firm sector: Evidence from "Northern Britain". *Regional Studies*, 40(4): 289-305.
- Frenken, K., Van Oort, F. and Verburg, T. (2007). 'Related Variety, Unrelated Variety and Regional Economic Growth', *Regional Studies*, 41(5): 685-697.
- Fromhold-Eisebith, M. and Eisebith, G. (2008). 'Looking behind facades: Evaluating effects of (automotive) cluster promotion', *Regional Studies*, 42(10): 1343-1356.
- Garone, L. F., Maffioli, A., de Negri, J. A., Rodriguez, C. M. and Vázquez-Baré, G. (2014). 'Cluster development policy, SME's performance, and spillovers: Evidence from Brazil', *Small Business Economics*, 44: 925-948.
- Gilbert, B. A., McDougall, P. P. and Audretsch, D. B. (2008). 'Clusters, knowledge spillovers and new venture performance: An empirical examination', *Journal of Business Venturing*, 23(4): 405-422.
- Giuliani, E. and Pietrobelli, C. (2016). 'Social network analysis to evaluate cluster development programs', in: A. Maffioli, C. Pietrobelli and R. Stucchi (Eds) *The impact evaluation of cluster development programs. Methods and practices*. Washington: Inter-American Development Bank.
- Glaeser, E. L., Kallal, H. D., Scheinkman, J. A. and Shleifer, A. (1992). 'Growth in cities', *Journal of Political Economy*, 100: 1126-1152.
- Gruenz, L. (2004). 'Industrial structure and innovation: Evidence from European regions', *Journal of Evolutionary Economics*, 14: 563-592.
- Huggins R. (2001). 'Inter-firm network policies and firm performance: Evaluating the impact of initiatives in the United Kingdom', *Research Policy*, 30: 443-458.
- Jacobs, J. (1969). *The economy of cities*. New York: Vintage.
- Kiese, M. and Hundt, C. (2014). 'Cluster policies, organising capacity and regional resilience: Evidence from German case studies', *Raumforsch Raumordn*, 72: 117-131.
- Lehmann, E. E. and Menter, M. (2017, forthcoming). 'Public cluster policy and performance', *Journal of Technology Transfer*, DOI 10.1007/s10961-017-9626-4.
- Maffioli, A., Pietrobelli, C. and Stucchi, R. (Eds) (2016). *The Impact Evaluation of Cluster Development Programmes: Methods and Practices*. Washington: Inter-American Development Bank.
- Marshall, A. (1890). *Principles of Economics*. Macmillan, London.
- Martin, P., Mayer, T. and Mayneris, F. (2011a). 'Spatial concentration and plant-level productivity in France', *Journal of Urban Economics*, 69: 182-195.
- Martin, F., Mayer, T. and Mayneris, F. (2011b). 'Spatial Concentration and Firm-Level Productivity in France', *Journal of Urban Economics*, 69 (2): 182-195.
- McCann, B. T. and Folta, T., B. (2011). 'Performance differentials within geographic clusters', *Journal of Business Venturing*, 26(1): 104-123.
- McDonald, F., Huang, Q., Tsagdis, D. and Tuselmann, H. J. (2007). 'Is there evidence to support Porter-type cluster policies', *Regional Studies*, 41(1): 39-49.
- Nishimura, J. and Okamuro, H. (2011a). 'R&D productivity and the organization of cluster policy: an empirical evaluation of the Industrial Cluster Project in Japan', *Journal of Technology Transfer*, 36(2): 117-144.
- Nishimura, J. and Okamuro, H. (2011b) 'Subsidy and networking: the effects of direct and indirect support programs of the cluster policy', *Research Policy*, 40: 714-727.
- OECD. (2015). *OECD innovation strategy 2015—an agenda for policy action*, Paris: OECD Publishing.
- Porter, M.E. (1990). *The Competitive Advantage of Nations*, Free Press, New York.

- Porter, M.E. (1998). 'Clusters and the new economics of competition', *Harvard Business Review*, November-December: 77-90.
- Romer, P. (1986). 'Increasing returns and long-run growth', *Journal of Political Economy*, 94: 1002-1037.
- Schmiedeberg, C. (2010). 'Evaluation of Cluster Policy: A Methodological Overview', *Evaluation*, 16 (4): 389-412.
- Smith, M., Wilson, J. R. and Wise, E. (2016). 'In search of indicators to support the 'perfect cluster': where evaluation theory collides with policy practice', paper presented at the OECD Blue Sky Forum on Science and Innovation Indicators, Ghent, Belgium.
- Spencer, G. M., Vinodrai, T., Gertler, M. S and Wolfe, D. A. (2010). 'Do Clusters Make a Difference? Defining and Assessing their Economic Performance', *Regional Studies*, 44: 697-715.
- Sölvell, Ö., Lindqvist, G., and Ketels, C. (2003). *The Cluster Initiative Greenbook*.
- Uyarra, E. and Ramlogan, R. (2012). 'The effects of cluster policy on innovation', *Nesta Working Paper No. 12/05*, [www.nesta.org.uk/wp12-05](http://www.nesta.org.uk/wp12-05).
- Uyarra, E. and Ramlogan, R. (2016). 'The impact of cluster policy on innovation', in J. Edler, P. Cunningham, A. Gok and P. Shapira (Eds.), *Handbook of Innovation Policy Impact*, Cheltenham, Edward Elgar.
- Viladecans-Marsal, E. and Arauzo-Carod, J-M. (2012). 'Can a knowledge-based cluster be created? The case of the Barcelona 22@ district', *Papers in Regional Science*, 91(2): 377-400.
- Wolfe, D. and Gertler, M. S. (2004). 'Clusters from the inside and out: Local dynamics and global linkages', *Urban Studies*, 41(5-6): 1071-1093.

# Appendix I: Cluster programme effect analyses - case studies

## Denmark

### Short Summary of Cluster Programme

The national cluster programme in Denmark (the Innovation Network programme) was first initiated by the Ministry of Science, Innovation and Higher Education in 2008. The current cluster strategy has the vision of “strong and professional clusters that create high value for enterprises and society in the form of innovation, knowledge provision, growth, solutions to societal challenges, international collaboration and attraction of investments.”

In April 2013, the Ministry published its first Strategy for Cluster Policy, establishing a number of key targets (related to cluster management excellence, firm engagement, knowledge exchange and collaboration, innovation, and firm growth and employment). This was followed by a Cluster Strategy 2.0 which established updated key targets in five areas (see below).

#### INDICATORS 2018

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, reflecting 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 clusters (status 2014: 900).
5. Denmark has at least 10 Gold and 10 Silver clusters (certified according to the EU's Cluster Label system).

Source: Danish Ministry of Higher Education and Science (2016), *Cluster Strategy 2.0 - Strategy for Denmark's Cluster and Network Policy 2016-2018*

The Ministry's agency (the Danish Agency for Institutions and Educational Grants<sup>10</sup>) is responsible for administering the programme (including selection and funding). The programme finances up to half of the innovation network activities for a period of five years.<sup>11</sup> The networks have to obtain the other half of the funding from private companies, regional funds, etc. Funding is used for setting up a network secretariat, matchmaking activities, specific collaboration projects within research, education, knowledge dissemination, etc.

<sup>10</sup> Following a re-organisation in January 2017, the Innovation Network programme is now administered by the Danish Agency for Institutions and Educational Grants (Danish abbreviation “SIU”), rather than the Danish Agency for Science, Technology and Innovation – DASTI.

<sup>11</sup> Each network receives approximately 0,5 MEUR (approximately 4,75 MSEK) from the Innovation Network programme per year. The total programme funding is around 10 MEUR per year.

## Overview of Cluster Evaluation Activities

The **objective of cluster evaluation** in Denmark is primarily focused on providing evidence that public investment has achieved targeted results and impacts.

The **cluster evaluation process** is comprised of two main elements:

- Annual monitoring of each innovation network (i.e. cluster initiatives)
- Biennial evaluation of the effect of cluster/network activity on firms

**Monitoring** of the innovation networks is conducted by Cluster Excellence Denmark<sup>12</sup> (a support function procured by SIU and the National Cluster Forum). The annual monitoring process collects data/information from the **cluster-level** through annual “performance reports” - a standard set of questions that each innovation network fills in (as a self-assessment).<sup>13</sup>

In addition to the annual cluster-level performance reports, SIU collects **firm-level data** through a biennial survey of companies participating in the cluster - gathering information on the effects of companies’ participation in clusters/innovation networks. These firm-level analyses (conducted in 2014 and 2016, published in 2015 and 2017) are available in Danish [here](#).

### Basic facts on most recent “Effect of companies’ participation in clusters and innovation networks” study (2017)

The survey was sent to 3700 companies participating in 42 clusters. Responses were received from 888 companies (24% response rate) of which 54% small companies (with under 50 employees), 13% medium-sized companies (51-199 employees), and 14% large companies (200 or more employees). (19% of respondents did not report company size.)

Firms were asked about their level of engagement in different cluster activities, as well as about the perceived value/contribution of cluster activities related to companies’ competence development, innovation and product development, existing and new collaboration partners, and visibility.

Key results from this study are elaborated as part of “other results” below.

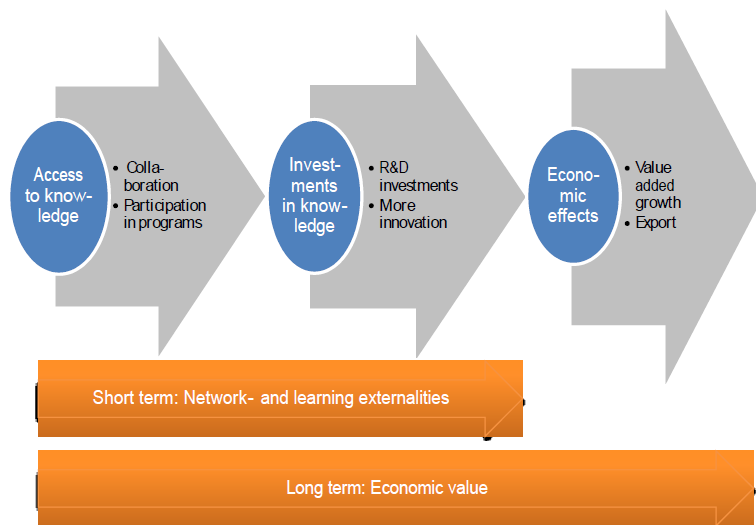
In addition to the regular monitoring activities described above, SIU procures other studies and evaluations on an *ad hoc* basis. Among these is an **impact study**<sup>14</sup> of the portfolio of innovation networks - procured by DAMVAD in 2011 to provide evidence of the policy effectiveness (i.e. to validate the public investment to support clusters). The study focused on analysing both behavioral and economic impacts of companies’ participation in clusters (see Figure below). “Behavioral impact focuses on increased ability to innovate, increases in R&D collaboration and a better use of the innovation system in Denmark. A change in the behavior is expected to lead to economical impact for the participating companies in innovation networks (DASTI/DAMVAD 2011, p.6).”

<sup>12</sup> [Cluster Excellence Denmark](#) provides a number of support functions to clusters in Denmark (both Innovation Networks, participating in the national programme, and other regional cluster initiatives).

<sup>13</sup> See latest performance reports (in Danish) at: <http://www.clusterexcellencedenmark.dk/da-DK/Quickmenu/Publikationer.aspx>

<sup>14</sup> See: [The impacts of cluster policy in Denmark – an impact study on behaviour and economical effects of Innovation Network Denmark](#) (2011)

Figure 2: Effects of participation in Innovation Networks



Source: DAMVAD 2011

The impact assessment covers 1225 companies (out of a total population of 3388 unique companies) participating in 22 Innovation Networks during the period 2003-2008. The analysis was based on data from firm-level statistics<sup>15</sup> - comparing performance of “cluster firms” to a control group of “non-cluster firms”<sup>16</sup>.

## Key Results

The purpose of the impact study was to show company effects of participation in innovation networks (the Danish equivalent of “cluster initiatives”). The impact study analysed both behavioral and economic impacts.

### Quantitative Results related to company performance

Based on the behavioral impacts (notably companies’ increased probability for entering R&D collaboration - see below) and results from [another study that analysed the impact of entering R&D collaboration](#), the impact study projects a number of “possible economic impacts of company participation in innovation networks”.

“Companies that enter R&D collaboration increase **productivity** with an average of 9 percent a year over a 9 years’ time period. Thus, increased R&D collaboration is expected to have a significant economic impact on the participating companies in innovation networks. One cannot expect the economic impact to show within the first few years after participation. The economic impact will not show before the increased ability to innovate and the effects from R&D collaboration materialize in terms of new products or efficiency in the production process. This will in turn either increase revenue or reduce production cost, which in turn both will result in an improved bottom line (DASTI/DAMVAD 2011, p.5).”

### Other Results

The impact analysis focused on measuring the behavioral impacts of participating in an Innovation Network - in terms of: increased probability of being innovative, increased

<sup>15</sup> Data was collected from: information on participating companies Innovation Network reports; statistics on research, development and innovation in the Danish business sector; general enterprise statistics; and the DAMVAD database on knowledge collaboration

<sup>16</sup> determined through the propensity score matching approach

probability of entering into a R&D collaboration, and by a better use of existing national and international R&D and innovation programs.

**Participation increases the probability of R&D collaboration by 4 times after one year of participation.** Innovation networks assist companies to enter joint R&D and innovation projects by providing companies with a platform as well as competencies/services to identify potential collaboration partners. Innovation networks increase network externalities, and provide the opportunity to identify collaboration partners and launch projects.

**Participation in innovation networks increases the probability to innovate by more than 4,5 times after one year of participation.** The analysis highlights that participation in innovation networks helps companies gain access to new knowledge (from researchers, users or other companies), strengthen their competencies and benefit from learning externalities, participate in common knowledge transfer and idea generation, and apply new knowledge/ideas in the development of new products and services.

In addition, the impact analysis explored **system level efficiency - showing that companies participating in innovation networks experience a significantly higher probability of participating in other innovation programmes.** The analysis highlights the role that innovation networks play in providing participating companies with an overview of and contact to other R&D and innovation programmes (in addition to the network of possible collaboration partners). Furthermore, innovation networks help inexperienced users of the research and innovation system to become more familiar with the system and move up the “knowledge and innovation ladder”.

The most recent biennial evaluation of the effect of cluster/network activity on firms supports the impact study’s findings - highlighting a number of complementary results for participating firms.

In relation to **collaboration and cluster dynamics:**

- Companies report that cluster activities have led to **new collaborations** between companies within the cluster (49%), between companies and knowledge institutions (36%), between companies and public sector actors (23%) and between companies and international partners (14%)
- 40% of responding companies have found **new company collaboration partners** through the cluster
- 21% of responding companies have found **new research collaboration partners** through the cluster

In relation to **innovation:**

- 55% of responding companies have or plan to **develop new products, services or processes** as a result of participating in cluster activities

In relation to strengthened **competitiveness and economic performance:**

- 12% of responding companies experience that participation in cluster activities has contributed (directly or indirectly) to **increased exports**
- 27% of responding companies experience that participation in cluster activities has contributed (directly or indirectly) to **growth in revenues**

## Learning points

The biennial firm-level survey highlights that companies who have been engaged over a longer period - taking part in many different types of cluster activities and services - are those who experience the strongest benefits. Through participation over time, these

companies receive support to developing their innovation processes. The survey also highlights that companies who have been engaged for three years or longer experience stronger benefits from cluster activities (in terms of revenue growth).

These findings support the impact study's conclusion that economic impacts can first be shown after the effects from strengthened innovation processes and R&D collaboration begin to materialise - over the longer-term. This emphasizes both the benefits of companies' longer-term engagement in clusters, as well as the fact that economic impacts from clusters cannot be expected in the short term.



# France

## Short Summary of Cluster Programme

### *Aims*

The aim of the Pole de Competitivite (PdC) programme is to bring together large and small firms, research laboratories and educational establishments, in a specific region to work together on collaborative opportunities.

The ambition of the programme is to boost the competitiveness of the French economy and to help develop growth and jobs in key markets, by:

- accelerating innovation efforts
- providing support for high-tech and innovation activities, in the various regions of France
- improving the attractiveness of France via greater international visibility

### *What is financed*

Each cluster draws up a five-year strategic plan based on the shared vision of various participants. This allows the cluster to:

- establish partnerships between participants with recognized, complementary skills
- set up collaborative R&D projects, as well as structuring projects such as innovation platforms<sup>17</sup> that can draw in additional public financing
- promote an overall environment that fosters both innovation and growth among the cluster's members. This is done by providing leadership, exchange and support for members in areas such as private funding for firms, industrial property, capability and skills management including needs for new skills and qualifications, developing international technological partnerships, etc.

Nationally 71 PdC are supported across a range of sectors, reflecting the key sectors in France. These include emerging technologies (nanotechnology, biotechnology, eco-technology, health sciences, ITC etc.) as well as more mature sectors (automotive, aerospace, agri-food, Chemicals, Energy, etc.).

### *Level and duration of financing*

The State provides support for cluster development, at both national and regional levels:

- through partial financing of cluster governance structures, alongside local authorities and firms
- by funding R&D projects and innovation platforms, through calls for projects from the Single Interministerial Fund (FUI- where projects have to be through a recognized PdC)
- Local/regional authorities also provide financial support.

Since 2005, 889 R&D projects have received €1.7 billion in public-sector financing, of which €1.1 billion was provided by the State. These projects have involved nearly 15,000 researchers.

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<sup>17</sup> An innovation platform provides a structure that is open to various innovative stakeholders, particularly cluster members, in which participants have access to high-quality facilities and services. The goal is to facilitate R&D projects, testing, and the development of pre-series and prototypes. A platform can even serve as a "living lab".

PdC largely focus on collaborative R&D projects but some of them have also progresses Innovation Platforms, skills “pooling” and training and international R&D collaborations (e.g. joint programmes with German clusters).

In 2011 the 71 PdC across France were reporting 9287 organisational members of which 6253 were SMEs.

## Overview of Cluster Evaluation Activities

### *Date (and reference) of evaluation*

In November 2011 the consortium of BearingPoint-Erdyn-Technopolis was commissioned to undertake the evaluation of the 2<sup>nd</sup> phase of PdC (2009-2011) The 1<sup>st</sup> phase had run from 2005 - 2008). A summary (in French) can be found at:

[http://competitivite.gouv.fr/documents/commun/Politique\\_des\\_poles/2eme\\_phase\\_2009-2011/evaluation/Synthese-rapport-evaluation-2012.pdf](http://competitivite.gouv.fr/documents/commun/Politique_des_poles/2eme_phase_2009-2011/evaluation/Synthese-rapport-evaluation-2012.pdf)

### *Aspects evaluated*

The evaluation focused on reviewing the financing of R&D projects and the structures (governance) and the PdC, the improvement in the regional innovation ecosystem and how successful the PdC were in leveraging in pother R&D finance.

In addition, the evaluators conducted an analysis of the performance and the results achieved by each PdC since their creation. These individual assessments, were coOfidnetial and used for discussion with the individual PdC and their main funders.

### *Approach to data collection/analysis*

A large survey of firms online received 5500 respondents, as well as 1500 in regional local events. In addition, responses from 80 regional and 70 national government officials contributed to the evaluation. The survey collated perceptions of improvements in exports, skills and capability, collaboration and regional impact as well as participation in R&D projects.

## Key Results

### Quantitative Results related to company performance

The evaluation identified that impacts were long term, and although there were very positive results on innovations from R&D projects many of them were at the moment too far away from commercial delivery to capture the economic impact.

Most of the impact recorded was in relation to innovation (particularly leveraging further finance and collaborative innovation project activity) and regional attractiveness.

Of the direct impacts reported through the survey, 93 startups had been created directly from funded R&D projects. In addition, 66% of the survey respondents reported that the PdC helped create employment and 84% sustained jobs as a result on PdC involvement. Firms also reported involvement in the PdC improved their export capability.

A third of the companies reported that they increase their turnover due to participation and the majority reported an increase in R&D investment.

### Other Results

#### Collaboration and cluster dynamics

Nearly 60% of business respondents reported new partners as a result of PdC involvement. Whereas there was less impact reported on the research organizations they did highlight a significant increase in SME partners.

There also been much more collaboration between PdC and with other clusters (both nationally and internationally) during the period 2008 - 2011, maximizing the French capability in certain sectors.

### Innovation

Collaborative R&D is the core focus on the majority of PdC.

As well as direct funding through the PdC the FUI funding supported 1042 projects between 2005 and 2011 resulting in 1.25Meuros additional investment in the collaborative R&D endeavors.

2,500 of the projects of R & D poles have generated innovations which nearly three-quarters are of products and process innovations

R & D projects have led between 2008 and 2011 to filing of nearly a thousand patents particularly in the fields of ICT, biotechnology / health and energy.

Nearly 6500 academic articles have been published as a result of the work in the R&D projects.

However many of the innovations were far from market and there was seen to be a lack of support for commercialization in public sector finance and so many firm (especially SMEs) had so far found difficulty in realizing the benefits of the R&D outputs.

### Competitiveness

The PdC projects had leveraged in additional funding to the region. In addition both capability an skills improvement were reported.

### System level

The impacts of the PdC were seen to be long term but already there were reported to be strengthening of the regional innovation ecosystem, and a strong contribution to the attractiveness of the regions.

In addition, the improved collaboration between SMEs and research organisations was identified as a key benefit.

## Learning points

The evaluation put forward a number of recommendations.

Firstly they recognized that the financial benefit they were able to identify directly was at present modest as innovations still needed to get to the market. They recommended a refocus of the PdC strategies on commercial outcomes, and called for there to be a reconfiguration of financial support towards this more market oriented implementation of innovation results. This recommendation was taken forward into the new programme, with a focus on commercial outcomes (described as “from R&D to market”), with a call on the PdC to focus on concrete economic results.

The evaluation also recommended revising the classifications of PdC to only two:

- PdC International (where there was national significance)
- PdC Innovation (where there was regional importance)

And furthermore to focus national funding on the first category and devolve funding for the second classification to regional authorities.

Most importantly the evaluation, recognizing the long term potential impact of R&D projects, recommended the next round of PdC programme was funded from 2013 - 2020, which gave the benefit of matching the Horizon 2020 timescale across Europe.

# Northern Ireland

## Short Summary of Cluster Programme

### *Aims*

The Collaborative Network Programme (CNP) had a number of aims to address weaknesses in performance of the innovation system in Northern Ireland (NI). Research and Innovation system analysis shows that NI lags behind the rest of UK (and therefore other regions across Europe) on Innovation performance and exports. Although R&D performance is relatively strong this relies heavily on a few large companies. As such focus of support is to build the innovation and competitiveness capability of SMEs in the region.

In particular, the focus was identified to be:

- Develop the capability and capacity of NI's businesses by facilitating the creation of regional clusters/networks involving private sector companies and other stakeholders (e.g. investors, researchers and academia) for the purposes of developing new products, processes and/or services
- Contribute towards the development of NI's Innovation Ecosystem through encouraging firms undertaking innovative collaborative networking activities; and
- Contribute to promoting NI as an innovative region.

### *What is financed*

CNP was initially launched as a pilot programme running from (2007 to 2011). After an economic appraisal, further investment to support the full programme was confirmed. To find appropriate networks Invest NI issues thematic calls for the CNP linked to sector (innovation system) priorities. These have included (over the period of the programme) ICT, Digital Media, Connected Health and Life Sciences, Big Data/IT, Agri-food, Advanced Materials, Advanced Engineering and Sustainable Energy. The programme also accepts applications on an on-going basis from high growth emerging sectors. The CNPs, supported through an appointed facilitator, focus on innovation opportunities, particularly at an early stage.

Funding was made available in two distinct but interrelated phases, namely:

- Phase 1 Feasibility / Scoping Studies: to identify market opportunities, business capabilities and define a collaborative opportunity and proposed project plan. Funding ranged from 75% of cost or £15,000 (whichever was lesser) under the Pilot to 50% of cost or up to £25,000 whichever was lesser under the Formal programme.
- Phase 2 Facilitation: support was available up to a maximum of 50% of eligible costs (including funding of the network facilitator - equivalent to cluster manager role) or £250,000, whichever was the lesser.

### *Level and duration of financing*

Reporting on investment is split into the two periods of the programme (pilot and formal).

Actual cost of pilot CNPs - Overall £6,080,661 was spent, 44% (£2,654,501) of which came from Invest NI and the remaining 56% (£3,426,160) from participating companies in the form of industry personnel / cash.

The actual cost of formal CNP incurred to Autumn 2015 (i.e. the time of evaluation) was £2,843,459; 38% (£1,090,727) of which has come from Invest NI and the remainder (62% or £1,752,732) from participating companies in the form of industry personnel / cash.

## Overview of Cluster Evaluation Activities

### *Date (and reference) of evaluation*

In 2015 Invest NI commissioned an independent evaluation of the CNP programme.

The evaluation from which this information was sourced was undertaken by PACEC (Evaluation of CNP for Invest NI 2015) and is available at:

<https://secure.investni.com/static/library/invest-ni/documents/collaborative-networks-programme-evaluation-report-december-2015.pdf>

### *Aspects evaluated*

The evaluation encompassed the Final evaluation of the Pilot CNPs and interim evaluation of formal CNPs. This aimed to establish the impact of the CNPs, including additionality and return on investment to the economy from Invest NI's financial contribution. **The focus was on turnover and jobs created and safeguarded.**

As well as drawing on the extensive monitoring data (described below), the evaluation included company surveys for both pilot and formal CNP members (N.B. non-members were not surveyed) together with reporting on results and interviews with network facilitators, lead companies, and other partners and stakeholders.

### *Approach to data collection/analysis*

The company survey included both pilot and formal CNPs. Overall 101 organisations responded to the survey (25.6%), although more responded from the more recent interventions (formal CNPs).

Pilot CNPs attracted 259 companies to work together through 24 networks. (42 responded to survey- 16.2%).

The Formal Programme supported 136 organisations to work together through 24 networks (59 responded to survey - 43.3%).

### *Other complementary monitoring activities*

On an ongoing basis Invest NI established a comprehensive ongoing monitoring framework against which all CNPs reported. As well as membership, project and spend this also reported against a range of indicators covering Human Capital, Physical Capital, Social Capital, Intellectual Capital, Market Capital (more details below)

## Key Results

### Quantitative Results related to company performance

#### Pilot CNPs

Economic impact, drawn largely from the company survey and extrapolated for the full population of pilot CNP members, taking account displacement, leverage and additionality factors showed the following. The programme was estimated to have:

- Safeguarded turnover of £8.633M-£14.8M;
- Created £24.05M in increased turnover; and
- Created 318 jobs and safeguarded a further 49 jobs.

The Pilot CNP also leveraged contributions of £3,426,160 from participating companies in the form of industry personnel / cash.

Comparing the estimate of GVA achieved (between £5.05M and £6M) and Invest NI costs (£3,234,456) yields a ratio of between £1.56: £1.00 and £1.86: £1.00.

Based on company survey results the level of additionality is 52%, indicating that more than half of the impacts reported would not have happened without the CNP.

### **Formal CNPs**

Economic impact, drawn largely from the company survey and extrapolated for the full population of formal CNP members, taking account displacement, leverage and additionality factors showed the following. The programme was estimated to have:

- Safeguarded turnover of £16.28M;
- Created turnover of £15.36M; and
- Created 239 jobs and safeguarded a further 687 jobs

The Formal CNP also leveraged contributions of £1.75M (to December 2014) from participating companies in the form of industry personnel / cash.

In terms of cost-effectiveness, comparing the estimate of GVA (£6.34M) and Invest NI costs (£1,708,808) yields a ratio of £3.71: £1.00.

Based on company survey results the level of additionality is 67.5%, indicating that two thirds of the impacts might not have happened without the CNP.

Evaluation numbers were relatively low but were felt to be reasonably representative given the size of the programme. Some of the survey respondents were able to point to significant returns/improvements (4 respondents reported increased turnover of £3.12M and 2 respondents reported safeguarded sales of between £700K and £1.2M overall)

### **Other Results**

#### Collaboration and cluster dynamics

The whole purpose of the CNPs is to promote collaborative innovation opportunities. As part of the evaluation involvement in more structured collaborative research was tracked.

In the Pilot CNP almost half (46%) reported engagement in collaborative research. For the Formal CNP over half (56%) reported engagement in collaborative research.

#### Innovation

Both the Pilot and Formal CNPs were focused on developing the innovation capabilities of companies. Survey respondents indicated that they had benefited in a number of ways:

- Information / knowledge sharing (76% of companies from the Pilot Programme and 84% from the Formal Programme);
- Increased knowledge of the marketplace (68% of companies from the Pilot Programme and 70% from the Formal Programme);
- The development of new behaviours such as engaging in collaborative research, development and design activities (46% of companies from the Pilot Programme and 56% of Formal Programme respondents); and
- The development of processes (32% of companies from the Pilot Programme and 40% of Formal Programme respondents).

#### Competitiveness

Both pilot and formal CNPs reported improvements around competitive performance.

For the Pilot CNP, 69% of respondents stated there had been an improvement in the competitiveness of their company and 57% stated that there had been an improvement in the productivity of their company

For the interim evaluation of the Formal CNP 68% of respondents stated there had been an improvement in the competitiveness of their company and 58%<sup>1</sup> reported that there had been an improvement in the productivity of their company.

### System level

Invest NI developed a broad ranging monitoring framework which the CNPs reported against, to enable broader impacts to be tracked. These were categorised as:

- Human Capital - Relating to 'people' objectives such as enhancement of staff skills, management skills, ability to attract skilled staff, ability to keep graduates in Northern Ireland
- Physical Capital - including aspects such as shared facilities, shared equipment or shared raw materials
- Market Capital - relating to increased knowledge of the marketplace, identification of potential new suppliers and entering new markets
- Intellectual Capital - Including aspects such as the sharing of information / knowledge, engaging in collaborative research, developing new processes with other network members and developing new products / services
- Social Capital - capturing evidence of collaborative development such as the establishment / maintenance of business contracts, improvements to the image of the industry and addressing local concerns and / or community needs

The evaluation survey also asked questions round these elements, and highlighted in particular evidence of improvement in Human Capital (particular skills training and improvement), Physical capital (shared equipment), Market Capital (eg, information on access to US markets), and collaborative research with universities (as highlighted above). The survey also showed an improvement in these elements since the interim evaluation carried out in 2011.

### Learning points

From the evaluation, a number of learning points were raised. Some of these were internal around processes of selection etc.

One related to how CNP fitted with other support mechanisms in NI. Whereas it was felt that there was no duplication on innovation support, particularly as CNP focused on collaborative opportunities, and most other innovation support were delivered for individual businesses, it was felt that there was potential to link better with other departments to maximise other support mechanisms (e.g. export/internationalisation).

There was also a proposal to create improved formal monitoring and KPIs across all the aspects that were deemed to be important to show impact. I.e. this included not only economic returns, but also the important wider aspects of CNP return on investment for the region (including human, intellectual and social capital etc. described above). In the formal CNPs Invest NI had developed a series of SMART KPIs which were seen to be a step forward but perhaps could be reduced to a more limited number.

The evaluation also proposed a maturity assessment for networks at end of funding to assess how able the networks were to be self-sustaining. The evaluation also proposed exploring facilitator training (acknowledging the importance of the facilitator role) and benchmarking through the cluster excellence framework.

Ultimately the return on investment for Invest NI was felt to be positive, particularly for the formal CNPs at this interim stage, and gave positive evidence of the impact of the CNPs for the region.

## Norway

### Short Summary of Cluster Programme

The national cluster programme in Norway (Norwegian Innovation Clusters programme) has developed over time since its establishment (with the Arena programme) in 2003. The overall objective of the national programme is to strengthen cooperative development activities - fostering increased interaction/dynamism, attractiveness, and innovative capacity of firms, and contributing to clusters' and companies' competitiveness and value creation through innovation. The national cluster programme currently has three levels, each with their own specific goals and effect logics (yet all following the “generally-accepted effect logic” for cluster policy described earlier).

Programme Level	Arena	NCE	GCE
<b>Overall effect goal and Targeted results</b> (in five areas):	<b>Increase capacity for innovation and renewal</b>	<b>Increase value-creation in the cluster</b>	<b>Increase value-creation and strengthened attractiveness and positioning in global value chains</b>
• <i>Innovation capacity</i>	Increased innovation cooperation and increased innovation activity	Increased innovation activity based on systemic cooperation between companies and knowledge institutions	Increased innovation activity with a notable element of radical innovation processes
• <i>International orientation</i>	New or strengthened relations to international partners	Increased cooperation with international partners	Increased strategic cooperation with globally-leading partners
• <i>Access to competence</i>	Better access to relevant competencies	Better access to relevant competencies through strategic cooperation with educational institutions	Better access to relevant competencies through strategic cooperation with leading national and international educational institutions
• <i>Visibility and attractiveness</i>	Increased regional recognition as an innovative growth environment	Increased recognition as a nationally-important environment for innovation and growth	Increased recognition as hub or node in a global innovation system
• <i>Interaction and collaboration</i>	Increased dialogue and cooperation internally and externally	Increased targeted cooperation internally and externally	Increased strategic cooperation internally and externally

The cluster programme provides both funding and other support services<sup>18</sup> over a 3-10+ year period (depending on programme level<sup>19</sup>). To be eligible for selection, applying Norwegian Innovation Cluster initiatives have to mobilise a matching level of funding from participating actors. Funding from the cluster programme is used for cluster development, knowledge linkages, collaborative innovation, and cluster-to-cluster (including international) activities.

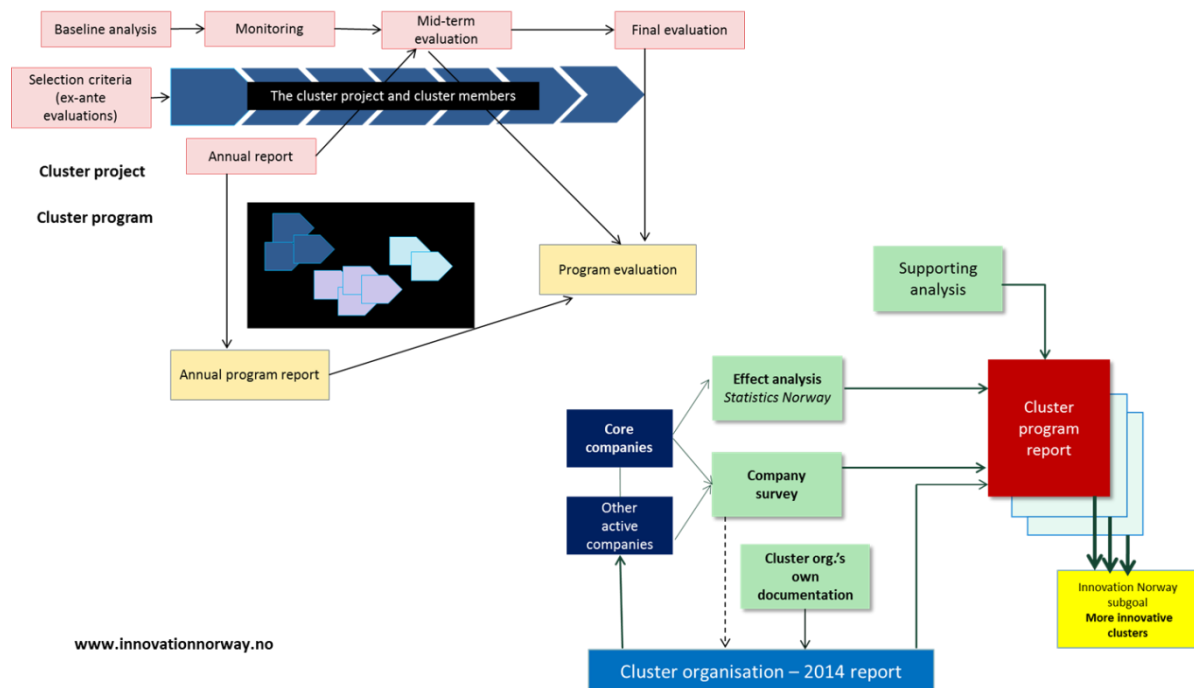
<sup>18</sup> Including advisory services, knowledge and skills development, networking/experience exchange and profiling

<sup>19</sup> Arena = 200-300.000 EUR/year for 3-5 years; NCE = 500-600.000 EUR/year for 5-10 years; GCE = 1 MEUR/year for up to 10 years



## Overview of Cluster Evaluation Activities

The **objective of cluster evaluation** in Norway has been focused both on providing evidence that public investments have achieved targeted results and impacts, and on providing insights on how to improve the effectiveness of cluster policy. Norway has always worked proactively with policy learning - i.e. evaluating programme results, considering latest academic theories and the market context, and updating the cluster policy strategy. Parallel to this, it has become increasingly important to provide evidence that public investments have achieved targeted results and impacts - in order to validate continued public investment and other support to clusters. Thus, evaluation practices are being updated to include firm-level data (and analysis with comparable “non-cluster firms”).



The **cluster evaluation process** is comprised of four main elements, conducted at regular intervals over the contract period (see illustration above):

- Ex-ante evaluation - comprised of a baseline analysis following a standard methodology (and set of structural and process indicators) developed by the programme, conducted in the cluster initiative’s first contract year; the baseline analysis is used to evaluate the cluster initiative’s results and development over time
- Annual monitoring of cluster initiatives participating in all programme levels through reports submitted by cluster managers and surveys to participating firms, complemented by regular dialogues with programme management and experience exchange workshops
- Interim evaluations of cluster initiatives conducted by external evaluators after the 3<sup>rd</sup> and 6<sup>th</sup> year of the contract period (depending on the programme level and contract phase)
- Ex-post evaluation - conducted by external evaluators following a standard process during the cluster initiative’s last contract year

**Monitoring** of the cluster initiatives is conducted by Innovation Norway. The annual monitoring process collects data/information from both the cluster-level and the firm-level.

**Cluster-level data** is collected through annual reports - a standard set of questions that each cluster initiative fills in (as a self-assessment), covering aspects such as:

- Key activities for the year just ended
- Vision and goals for the new year
- Participation in activities for the year just ended (including # of companies, knowledge institutions and other actors; which type of activities; international involvement; # of innovation projects; amount new research and innovation financing)
- Results and effects for the year just ended (including # of new innovations and projected effects; visibility)

These annual reports are supplemented by regular dialogues between the programme management and the cluster management (and its Steering Group).

**Firm-level data** is also collected annually (since 2014) through two sources:

- A survey to “core cluster companies” gathering information on their interaction/cooperation with other actors (within and outside the cluster), and on their perspectives regarding the impact of cluster activities on the firm’s innovation results
- Business register data (compiled by the national statistical agency), tracing the economic development of “core cluster companies” who have participated in the cluster initiative for at least three years

In addition to the annual cluster-level and firm-level data collection, cluster organisations participate in regular **cluster management benchmarking** exercises coordinated by the European Secretariat for Cluster Analysis.

The combination of qualitative and (new bulk of) quantitative data are compiled and analysed by Innovation Norway, and submitted in connection with **annual programme reporting** to the management of Innovation Norway and to the two ministries financing the cluster programme<sup>20</sup>. This annual report serves as a key input to the ministries’ decision on the following year’s cluster programme budget.

In addition to the regular monitoring activities, Innovation Norway has very detailed processes for its **ex-ante, interim and ex-post evaluations** of individual cluster initiatives, as well as **comprehensive evaluations of the programme as a whole** (undertaken every 5-7 years as set out in the evaluation strategy). These evaluations incorporate external evaluators in the process. Innovation Norway also commissions “knowledge inputs” from various researchers as an additional input to its continual policy development.

Innovation Norway is currently undertaking its most recent **programme-level evaluation**<sup>21</sup> - examining the relevance<sup>22</sup>, effectiveness<sup>23</sup> and efficiency<sup>24</sup> of the Norwegian Innovation Clusters Programme. **Effectiveness (including impact) of the cluster program** is one of the aspects being evaluated - through a variety of methods (including interviews, network mapping, input-output models, and difference in differences to compare results for participating companies with relevant “non-treated” companies).

Results from the programme-level evaluation provide additional robustness to the results identified in the **annual programme reporting** (synthesising data from 2019 companies

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<sup>20</sup> The Ministry of Trade and Industry, and the Ministry of Local Government and Modernisation

<sup>21</sup> Conducted by Samfunnsøkonomisk analyse A/S, to be finalised during October/November 2017

<sup>22</sup> Including questions such as: To what extent are the activities and outputs consistent with programme objectives and intended effects? To what extent are the programme objectives still valid?

<sup>23</sup> Including questions such as: To what extent were the intended objectives achieved? What real difference has the activity made to the beneficiaries?

<sup>24</sup> Including questions such as: Were activities cost efficient? Was/is the programme implemented in the most efficient way?

participating in 36 cluster initiatives during 2016). Results from both sources are included in the section below.

## Key Results

The ongoing programme-level evaluation is analysing effects on companies' employment, sales revenues, value added, and productivity (value added per employee). The evaluation is also analysing network effects (in terms of collaborative R&D/innovation projects) for companies.

This complements the annual programme reporting (latest from 2016), which includes data/analysis of collaborative linkages and projects, as well as of economic performance for participating companies (relative to a control group).

### Quantitative Results related to company performance

Preliminary results from the programme-level evaluation highlight that companies experience **higher<sup>25</sup> employment levels and higher value creation** after the first year of participation in the cluster (and continue these positive trends over a 3-4 year period).

Results from annual programme reporting in 2016 highlight **7.3% higher sales revenue and 7.3% higher value creation** occurred in companies engaged in clusters over the first three years compared to control group companies that are not cluster members. This is a positive high figure, and actually even higher for last year's reporting (6.6%). The figures are significant on sales revenue and value creation. In the indicators for productivity and employment, results are not significant.

### Other Results

Preliminary results from the programme-level evaluation also highlight a number of interesting results related to **collaboration** and **innovation**. Relative to the control group, companies engaged in clusters experience:

- A much stronger **growth in number of new collaboration partners** as well as the **breadth of collaborative linkages (within and outside of the cluster)**
- Stronger **growth in intensity of collaboration** (in terms of number of collaborative R&D projects with the same partners)
- **Growth in the size of projects/amount of R&D funding that is awarded to companies** in these collaborative projects

Results from the annual programme reporting in 2016 provides additional evidence of these results.

In relation to **collaboration and cluster dynamics**:

- Companies report that cluster activities have led to **new collaborations<sup>26</sup>** between companies within the cluster, with other companies within the region but outside of the cluster, and with other companies outside of the region

In relation to **innovation**:

- Companies participated in 494 new collaborative **knowledge development projects**
- Companies participated in 434 new collaborative **research and innovation projects**

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<sup>25</sup> Relative to a control group

<sup>26</sup> On average, each company established collaborative links (of different levels of intensity) with 11 new partners over the course of 2016. (In 2015, companies reported an average of 15 new collaborative links.)

In relation to **competitiveness**:

- Companies participated in 313 new **international collaboration projects**
- Companies participated in 114 new **cluster-to-cluster collaboration projects**

## Learning points

The annual programme reporting (and ongoing strategic dialogue activities) confirm the importance of strong and professional cluster management (and advisory boards) to proactively mobilise and facilitate collaborative activities and ensure their alignment with regional (and national) strategic priorities.

An important point raised in the ongoing programme-level evaluation is that the overall effectiveness is not dependent on each project's effectiveness, but rather that the projects (collectively) contribute to achieving the cluster programme's common objectives. In other words, the Norwegian Innovation Clusters programme is being evaluated as a whole (portfolio).

## Sweden - Regional Cluster Programme (Tillväxtverket)

### Short Summary of Cluster Programme

Tillväxtverket (The Swedish Agency for Economic and Regional Growth) implemented the Regional Cluster Programme during 2005-2010. The programme aimed at strengthening international competitiveness for supported regional clusters, and at developing knowledge and methods (on cluster development). Each overall objective had a number of concrete goals (listed in the table below).

Strengthen international competitiveness	Contribute to developing knowledge and methods on clustering processes
<ol style="list-style-type: none"> <li>1. Increase companies' innovation capacity (e.g. new products, services, processes)</li> <li>2. Increase companies' revenue, productivity and/or employment</li> <li>3. Cluster initiative attracts new resources in the form of new companies or R&amp;D funding</li> <li>4. Increase the number of cluster initiatives who actively work with sustainability</li> <li>5. Increase the number of cluster initiatives that participate in EU programmes and other international collaborations</li> </ol>	<ol style="list-style-type: none"> <li>1. Implement at least 2 network meetings per year for cluster managers (starting 2007) for knowledge and experience exchange</li> <li>2. Participate in the implementation of at least 2 knowledge development studies per year (2008-2010)</li> <li>3. Contribute to strengthened coordination between regional and national cluster development activities</li> </ol>

Tillväxtverket provided 50% co-funding<sup>27</sup> totaling 52,1 MSEK to 22 cluster initiatives over the five-year period. Financing from Tillväxtverket was used mainly for facilitation/process support in cluster initiatives, as well as market intelligence and developing collaborative networks between actors within the cluster and with other clusters. Financing was also used to support the development of knowledge and tools.

### Overview of Cluster Evaluation Activities

A mid-term evaluation of the Regional Cluster Programme was conducted (by Ledningskonsulterna) in 2008, and a final evaluation was conducted (by Ramböll Management Consulting) in 2011<sup>28</sup>. The evaluation explored the relevance, efficiency, realization of goals, and sustainability achieved by the Regional Cluster Programme.

Data was collected through interviews with six (mature) cluster initiatives and surveys to 215<sup>29</sup> of their participating companies. In addition, a survey was conducted with those responsible for innovation and growth policy in the regions. An analysis of cluster companies' revenue and employment data (in comparison with national trends for the relevant sector) was also conducted.

### Key Results

The final evaluation of the Regional Cluster Programme explored the realisation of programme goals - concluding that programmes goals and sub-goals had been realised. Extracts of particular results are presented below.

<sup>27</sup> Of up to 1,5 MSEK per year per cluster initiative

<sup>28</sup> See "Klusterprogrammet Slututvärdering Version 2011-10-24", Ramböll Management Consulting Report

<sup>29</sup> Of which 147 responded (68% response rate)

## Quantitative Results related to company performance

The analysis of cluster companies' revenue and employment data revealed that **71,2% of cluster companies had higher revenue growth** and that **50,9% of cluster companies had higher employment growth** compared to the national average for their respective sectors.

At the same time, the evaluation was careful to highlight that these results should be interpreted with care as the data sample was limited (only 50% of the total number of cluster companies), and as companies who engage in cluster initiatives are generally those that have growth ambitions<sup>30</sup>.

## Other Results

The evaluation of the Regional Cluster Programme also provides evidence of the benefit to companies in terms of strengthened collaboration, innovative capacity and strengthened competitiveness.

In relation to **collaboration and cluster dynamics**:

- 83% of companies perceive that the cluster initiative has contributed to new network contacts
- 57% of companies perceive that the cluster initiative has contributed to new R&D contacts

In relation to **innovation**:

- 77% of companies perceive that the cluster initiative has contributed to competence development (and 62% perceive that the cluster initiative has contributed to new competencies)
- 65% of companies perceive that the cluster initiative supports innovation and renewal
  - 53% perceive that the cluster initiative has contributed to new services (vs. 47% no or don't know)
  - 41% perceive that the cluster initiative has contributed to new processes (vs. 59% no or don't know)
  - 24% perceive that the cluster initiative has contributed to new products (vs. 76% no or don't know)

In relation to **competitiveness**:

- 81% of companies perceive that the cluster initiative has contributed to increased visibility for the cluster and the region

In addition, the Regional Cluster Programme contributed a number of **system-level results** in terms of:

- New collaboration between different programmes
  - between policy actors on regional and national levels
  - with cluster programmes in other countries
- Regional actors perceive that the cluster initiatives have contributing to attracting resources to the region (primarily new R&D contacts, networks and knowledge development)

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<sup>30</sup> In the survey to cluster companies, 77% responded that they have the ambition to grow (both in terms of revenue and employment).

## Learning points

The results of the evaluation highlight that the main benefit to companies of the Regional Cluster Programme has been in terms of providing “conditions for renewal” (new knowledge, knowledge development, networks, R&D contacts, and investments). In the longer-term, these aspects may contribute to strengthened economic performance.

In the recommendations, the authors encourage that an eventual future cluster programme should have goals that are more directly related to the cluster initiatives’ work. (Goals related to company turnover and employment are not areas that cluster initiatives can directly affect.)

## Sweden - Vinnväxt (Vinnova)

### Short Summary of Cluster Programme

The national cluster programme in Sweden (Vinnväxt - Regional Growth through Dynamic Innovation Systems) was initiated in 2001, with the mission of promoting sustainable regional growth by developing internationally competitive research and innovation milieus in specific growth fields. Vinnväxt also aims to catalyse a broader transformational change in society, towards innovation-driven sustainable growth in the Swedish regions.

The cluster programme provides funding<sup>31</sup> and other support services over a 10-year period - targeted at building nationally and internationally strong and attractive innovation environments. To be eligible for selection, applying Vinnväxt initiatives have to mobilise a matching level of financing from regional actors (private companies, regional funds, etc.). Funding is used for institutional development and needs-driven R&D to strengthen the cutting-edge competence of the various milieus. Funding is also used for strategic efforts aimed at developing innovation systems.

### Overview of Cluster Evaluation Activities

With a clear programme focus on developing dynamic innovation systems, the **objective of cluster evaluation** in Sweden has been on understanding how these systemic upgrading and renewal processes work - to provide insights on how to improve the effectiveness of cluster policy and to develop new policies/programmes. Sweden has always placed a priority on policy learning activities (ear-marking 5% of funding to cluster initiatives for learning activities, hosting experience exchange between cluster initiatives, and initiating studies, etc.) in order to ensure strategic learning and continual programme development. Cluster evaluations are also used to provide evidence that public investment achieved targeted results and impacts (although no specific targeted results/impacts have been established at the programme level; these are set by each cluster initiative).

The **cluster evaluation process** is comprised of four main elements, conducted at regular intervals over the contract period:

- Ex-ante evaluation - comprised of a “base report” submitted to Vinnova by the cluster manager; the “base report” includes the initial action plan and budget
- Regular monitoring of cluster initiatives participating in the programme through biannual reports submitted by cluster managers, regular dialogues with programme management and experience exchange workshops
- Interim evaluations of cluster initiatives conducted by external international evaluators after the 3<sup>rd</sup> and 6<sup>th</sup> year of the contract period
- Ex-post evaluations (of system impacts) conducted two years after the end of the contract period

**Monitoring** of the cluster initiatives is conducted by Vinnova. The biannual monitoring process collects data/information from the cluster-level only. **Cluster-level data** is collected through biannual reports (including a web survey and excel worksheets providing additional details), with a standard set of questions that each cluster initiative fills in (as a self-assessment).

In addition to the regular monitoring activities, Vinnova has a well-developed process for its external **interim evaluations**, incorporating external (international) evaluators in the process. Vinnova also organizes workshops, and commissions “knowledge inputs” from

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<sup>31</sup> Funding from Vinnova is in the range of 2-8 MSEK per year over the ten-year period.



various researchers and consultancies as additional inputs to its continual policy development.

The first **ex-post evaluation** ([Effektanalys av Vinnväxt-programmet - Analys av effekter och nytta](#)) was conducted by Kontigo AB (consultancy) and published April 2016. The effect analysis focused on assessing the overall effects of the VINNVÄXT programme on regional and national policy, on the innovation system and regions, and on the participating Triple Helix actors (companies, academic institutions and the public sector).

The analysis was based on data from 12 Vinnväxt initiatives that had begun to receive financing during the period 2003-2008. Data was collected and analysed through a variety of methods:

- Review and analysis of previous evaluations, as well as of quantitative and qualitative data collected through annual reporting to Vinnova
- Review and analysis of regional and national policy documents
- 120 interviews with key actors involved in Vinnväxt initiatives, with action researchers who followed Vinnväxt initiatives, and with regions who did not have any Vinnväxt initiatives
- Survey to companies participating in Vinnväxt initiatives
- Statistical analysis of regional economic benchmarking data and company data (including data for both participating companies and control group companies)
- Statistical analysis of patent data, and a bibliometric study

## Key Results

Although the effect analysis was focused on providing insights on the effects Vinnväxt has had on developing more effective regional innovation systems and regional/national policies, the analysis also provided an in-depth look at the effects for Triple Helix actors (participating companies, academic institutions and the public sector).

The effects of the Vinnväxt cluster programme on participating companies is detailed in pp.48-53 of the effect analysis. A summary of quantitative economic effects, as well as other results, are provided below.

### Quantitative Results related to company performance

The effect analysis explored the quantitative results related to company performance through an analysis of statistical indicators (employment, productivity and export) of participating “cluster companies” compared to a “control group” of similar companies.

The analysis revealed that companies participating in clusters have had a more positive development in revenue, employment levels, productivity (as measured by revenue per employee) and export compared to the control group (see table below).

Vinnväxt initiative	Growth/rate of change relative to control group		
	<i>Growth in Employment last 5 years</i>	<i>Growth in Revenue per employee last 5 years</i>	<i>Change in share of companies who export</i>
Future Bio refineries	Faster	Faster	> 5% larger share
New Tools for Health	Faster	> 5% faster	Smaller share
Skåne Food Innovation Network	> 5% faster	> 5% faster	Larger share
Peak Innovation	Faster	Faster	No difference

Process IT Innovation	Faster	> 5% faster	No difference
Robotic Valley	> 5% faster	> 5% faster	> 5% larger share
Smart Textiles	Faster	Faster	> 5% larger share
Triple Steelix	Faster	Slower	> 5% larger share
Uppsala Bio	> 5% faster	Slower	> 5% larger share
Fiber Optic Valley	Slower	> 5% faster	Larger share

## Other Results

The effect analysis also explored (through a survey to participating companies) what impact the Vinnväxt programme has had on companies' collaborative capacity and new collaborations, innovation and technical development, and overall competitiveness.

The effect analysis has highlighted a number of positive effects on **collaboration and cluster dynamics**, including:

- **New collaborations:** 50% of companies report that cluster activities have led to new collaborations between companies and research actors; nearly 40% report new collaborations with suppliers, partners, experts, etc.
- **Capacity to collaborate:** 43% of companies report that cluster activities have led to easier/more effective collaboration with universities; 25% of companies report that it is easier to find relevant collaboration partners for product and business development

In addition to reporting that cluster activities have helped to strengthen knowledge exchange and collaboration with universities, companies report that cluster activities have strengthened their **capacity to innovate**, including:

- **Increasing competence levels of employees** (33%)
- **Involving more external actors in product and business development** (27%)
- **Strengthening capacity to develop and introduce new products and services on the market** (22%)

Companies also report that the cluster activities have contributed to a strong degree to a number of activities that create value and **strengthen companies' competitiveness**, including:

- **Developing, testing, or protecting new products/services/solutions** (42%)
- **Introducing new products or services on the market** (27%)
- **Making notable improvements to existing products/services** (26%)

Companies report less strong impacts (from cluster activities) on changes to business models (12%) and strengthened position on international markets (10%).

On the **system level**, the effect analysis has highlighted that Vinnväxt has contributed to a stronger anchoring of the Triple Helix model and the use of a collaborative approach to strengthening innovation and regional development. In addition, Vinnväxt regions perceive that they are now more capable of managing structural change. Vinnväxt has also contributed to strengthening regions' work with environmental sustainability and equality.

## Learning points

The effect analysis provides evidence of the benefit of the Vinnväxt programme on companies' innovative and collaborative capacity, and overall competitiveness. The analysis also provides evidence that companies who engage in clusters experience stronger growth in revenue, employment, productivity and export in comparison to peer companies who are not engaged in clusters.

Furthermore, the analysis highlights that companies who are most strongly engaged in cluster initiatives experience stronger results (in e.g. use of research for product and business development) compared to those companies who have lower engagement.

In addition to the positive effects on participating companies, academic institutions and public sector actors, the effect analysis has highlighted a number of indicators of positive changes on the system level (including strengthened resilience and capacity to manage structural change). However, these system level effects are primarily based on perceptions. A more structured approach to following and grounding system-level effects will be a focus of future strategic learning activities within the Vinnväxt programme.