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innovation system's support to private business
in the early Covid-19 pandemic**

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Seizing the window of opportunity? The Swedish public innovation system's support to private business in the early Covid-19 pandemic

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Abstract

This paper investigates the Swedish public innovation system's response to the Covid-19 pandemic during 2020 in terms of initiatives targeting private business. It is based on a review of the websites of 181 major national and regional organisations in the Swedish public innovation system. A total of 208 initiatives were observed. The study shows that almost all national agencies and regional councils responded, but among more specialised organisations the response was scattered. The responses were on general rather swift, and most of them concerned short-term crisis management. Initiatives to build long-term strength, e.g. re-skilling or platforms for potentially more radical renewal, were much fewer and often thematically unspecified. There is a moderately strong correlation between region size and response, but also regional differences on other dimensions, for example, regions strong in innovation involved expertise in specialised innovation support organisations to a much higher extent than other. Almost all university response came from 'young' universities. The largest and most research-intensive universities are almost absent in the material. Policy implications focus on the need to strengthen the innovation system's capacity to be agile and initiate support initiatives with long-term perspectives in times of crisis.

1 Introduction

This paper investigates how the Swedish public innovation system responded to the Covid-19 pandemic during 2020 in terms of initiatives targeting private business. The background is at this point well-known: When the Covid-19 pandemic broke out in early 2020, many private businesses found core parts of the business models such as customer bases or supply chains being radically altered almost overnight. It was undoubtedly one of the most genuine shocks the world economy has experienced, particularly given the speed at which it unfolded. Countries rapidly imposed extensive restrictions or recommendations related to social distancing, and borders that had been open for decades were suddenly more or less closed. Although countries and sometimes also regions differed in their responses, the impact was felt across all the world (IMF, 2020; World Bank, 2020). To prevent what could become regional or national economic collapses, governments quickly launched very extensive initiatives to support companies (and other kinds of organisations) from going out of business. Small and medium-sized companies (SMEs) were particularly badly hit, as well as specific sectors such as tourism, retail, and manufacturing that depended on global value chains (OECD, 2020a, 2021a, 2021b).

However, crises also tend to be times of renewal. When old business models no longer work, companies naturally look in new directions (Archibugi, Filippetti, & Frenz, 2013). Government initiatives supported those needs as well, e.g. through new or adjusted innovation funding schemes, and actions to provide capital supply to start-ups and others (OECD, 2021d) as financial constraints tend to reduce innovation activities in many firms during crises (Archibugi et al., 2013; Filippetti & Archibugi, 2011; Paunov, 2012), and to make venture capitalists less risk-taking (Conti, Dass, Di Lorenzo, & Graham, 2019). Crises are also timely occasions for skills upgrading. Less demand of the companies' products results in employees either being laid off or having more time for activities out of the ordinary. In those respects, the Covid-19 crisis coincided with a widespread observation that many companies and significant parts of the labour forces needed to upgrade to stay competitive in a world increasingly permeated by digital technologies and expectations to be sustainable (European Commission, 2021; OECD, 2020b, 2021c).

Private sector renewal is, of course, an important issue for policy makers also in more ordinary times. Actors in what is often termed 'the innovation system' are identified as particularly important vehicles in that respect and are as such either targets for policy interventions or even parts of or funded by the public sector (Edler & Fagerberg, 2017; Etzkowitz & Klofsten, 2005). The composition of key actors in the innovation systems varies between countries and regions but tend to include, in a non-comprehensive list: companies of all sorts and sizes, universities and other public research institutions, other education institutions, non-profit foundations and trusts,

industry and trade associations, science parks, incubators and accelerators, venture capitalists, business angels, individual innovators and entrepreneurs, and not least governments, government agencies, and international and supranational institutions – both as funders and regulators. Of these, the fully or partly public actors normally carry a responsibility to act ‘for society’s good’. Their fundamental task is generally to support long-term competitiveness and well-being within their respective territories, by serving as knowledge hubs that provide ‘strategic intelligence’ and organise future-oriented activities for e.g. companies based on their needs (Asheim, Lawton Smith, & Oughton, 2011; Ranga & Etzkowitz, 2013).

As underlined out by e.g. the OECD (2021b), regional and local governments play a leading role in ensuring long-term supply of employment and skills to the local business, as well as to ensure swift policy responses adapted to specific local needs. In doing this, this paper argues, the publicly funded innovation support organisations constitute a potential key element, not least in the public response to a situation such as the Covid-19-crisis. They know industries and companies, not least the innovative SMEs which, arguably, are the ‘local growth assets’ for the future. They are qualified in business strategy and experienced in giving advice and in organising various events for skills-development of entrepreneurs or business managers. Not least, through their societal responsibilities these organisations represent one of the rather few tools and channels that policymakers possess to respond to the crisis, especially once it has arrived.

The key questions in this paper are i) What kinds of initiatives were made, and by which kinds of actors? ii) When were the initiatives made? iii) To what extent does the response vary between regions? Specific focus was paid to initiatives with a long-term perspective, beyond immediate crisis management support. The findings are expected to provide valuable insights on the Swedish public innovation system’s readiness and abilities to mobilise resources in crisis situations, and to give an indication of the system’s robustness.

The study is based on reviews of the activities of 181 major actors in the Swedish public innovation system. Virtually all of these are public in the sense that they either are part of the public sector as such, or fully or partly funded by public funding and charged with a ‘societal responsibility’. A couple of large private or civic research foundations were also included as they are important funders and intend to act impartially for ‘society’s good’. Taken together, the 181 actors represent such a large share of the Swedish public innovation system that the possibly missing parts most likely are negligible, given the topic of the study.

This paper is organised as follows: Next, a short theoretical and contextual background sets the scene. The following section presents the methods and how they were operationalised to compile the material. Thereafter the results are presented in several subsections, describing types of actors

and initiatives, when the initiatives were made, and the balance between long- and short-term initiatives and what themes that were concerned. There is also a comparison between regions. The final section presents the main conclusions, key reflections as well as what policy implications the conclusions indicate.

2 Points of departure: a systemic perspective

2.1 Regional resilience and sustainability transitions

The financial crisis that took off 2008, led many policymakers and researchers to use the term ‘regional resilience’ when analysing regions’ capacities to recover. Originating in ecology, the concept is typically used with systems-oriented approaches (Martin, 2018). The initially common interpretation that resilience was about the capacity to absorb or ‘bounce back’ from shocks has gradually been replaced by the view that it is about the capacity to adapt to changed circumstances and come out at least as strong after the shock, prepared for an emergent future (Fröhlich & Hassink, 2018; Martin, 2012). The latter view has opened up for a discussion on ‘adaptation’ and ‘adaptability’ in connection to regional resilience (Boschma, 2015; Pike, Dawley, & Tomaney, 2010). Adaptation is about moving towards a situation envisioned based on what used to work well, works well for others, or is prescribed ‘by leading experts’ to work well; it is fundamentally a movement towards homogeneity and from a resilience perspective a short-term strategy. Adaptability, on other hand, is about the long-term capacity to adapt; it is about preserving diversity, which in a regional economic context means to be innovative and to a certain extent break new paths (Grabher & Stark, 1997; Pike et al., 2010). Whilst there are is an obvious trade-off between the two, one must also, as Boschma (2015) points out, recognise the importance of both – too little adaptation is not a route to success.

Parallel to regional resilience, also the two closely related concepts of sustainability transitions (Markard, Raven, & Truffer, 2012) and transformative innovation policy (TIP) (Schot & Steinmueller, 2018) have gained importance and relevance during the last decade. Also based on systems theory and focusing on long-term sustainability, but with a more explicit focus on adaptability towards climate and other environmental challenges, the concepts are used to provide empirical and theoretical grounds for policy responses to such challenges, often addressing the ‘big picture questions’. This explicitly normative stance is outspoken in the transition community (Diercks, Larsen, & Steward, 2019; Köhler et al., 2019, p. 3). Transition scholars have for instance argued that public actors should harness the Covid-crisis to accelerate the phasing-out of carbon-intensive activities and induce innovation of low-carbon solutions (Markard & Rosenbloom, 2020). Policy initiatives of this kind are generally part of long-term strategies.

Perhaps surprisingly, sustainability transitions and TIP are very rarely discussed together with regional resilience. Arguably, this is because (i) resilience has, unlike sustainability transitions and TIP, been used mainly to analyse the impact of economic crises; (ii) resilience intuitively indicate stability, whilst sustainability transitions and TIP are used to argue for change; (iii) resilience has mainly been used in regional contexts whereas sustainability transitions and TIP tend to focus on urban, national or international issues; and (iv) with a few exceptions, none of them have been particularly detailed on how policy practitioners should actually deal with the issues (as e.g. Gibbons et al (1994) argue, applied contexts tend to bring different strands of research together).

2.2 Swedish innovation policy and the public innovation system

Swedish innovation policy has been recognised for having a long-term, innovation systems perspective. At least since the 1980s, there have been generations of 6–12-year programmes focusing on long-term needs (Danell, Gadd, Lithander, & Bager-Sjögren, 2008; OECD, 2016). The currently most notable programmes are the Challenge-Driven Innovation (CDI) and the Strategic Innovation Programmes (SIPs), which both contain elements of TIP, although their objectives are broader than that (Grillitsch, Hansen, Coenen, Miörner, & Moodysson, 2019; Serger & Palmberg, 2022). In addition, the Vinnväxt programme has been running for two decades, with a primarily regional focus (Wise, Eklund, Smith, & Wilson, 2022). During the last decade, TIP and sustainability transitions have become more visible layers not only in innovation policies, but also in regional development (Swedish Government Offices, 2021; Ulmanen, Bergek, & Hellsmark, 2022).

The term ‘innovation systems’ has been around for quite some time, and has developed into subcategories such as national (Lundvall, 1992), regional (Cooke, Gomez Uranga, & Etxebarria, 1997), and technological (Bergek, Jacobsson, Carlsson, Lindmark, & Rickne, 2008) innovation systems. Albeit there are key differences between them, they all recognise a reasonably common set of functions needed for a territorially confined environment to successfully promote innovation, whether in firms or elsewhere. Hekkert and colleagues (2007) succinctly presents these in seven categories: (i) Entrepreneurial activities, (ii) Knowledge development, (iii) Knowledge diffusion through networks, (iv) Guidance of the search, i.e. ‘focusing devices’ when several options co-exist, (v) Market formation, (vi) Mobilisation of resources, and (vii) Creation of legitimacy for change. For all of these, there is a division of labour between different types of actors. This division tends to differ both between countries and across regions. For example, in Anglo-Saxon countries the private sector tends to do more than in continental European and the Nordic countries, in which the public sector is comparably more active (Etzkowitz, 2003).

Both in Swedish and international policy, public actors in the innovation support system have been identified as important vehicles for industrial renewal, not least sustainability transitions (OECD, 2019; Swedish Government Offices, 2021), manifested e.g. in *“Building up digital competencies in small and medium-sized enterprises (SMEs) can be enhanced through publicly supported training, including managerial training via webinars or through personal counselling... [and] Public-support organisations such as incubators, science parks or cluster organisations can help promote industrial diversification.”* (OECD, 2019, p. 10)

Over the years, an extensive and diverse collection of actors have come to constitute the Swedish public innovation system. First, there are public institutions that provide knowledge-based input to the innovation system through education and research and development (R&D). Universities and other higher education institutions are key players in this category, both through their educational roles and through conducting around 70 percent of the publicly funded R&D in Sweden. The research institute sector also conducts R&D but is roughly ten times smaller than the university sector in that respect (Statistics Sweden, 2021).

Second, the public R&D funders are important, as slightly more than 50 percent of the R&D funding at Swedish universities is externally funded, mostly from public sources (Swedish Higher Education Authority, 2020a). There are also government agencies and national public enterprises with responsibilities to conduct or fund R&D or in other ways support business renewal, including public venture capital organisations (Swedish Government Offices, 2020).

Third, there are publicly funded organisations instructed to provide advice and special services for entrepreneurs and business renewal. In the Swedish context, these primarily include science parks, incubators and technology transfer offices (TTOs) at universities. Science parks and incubators typically operate on a regional basis. Incubators support start-up companies in the early phases, often in a programme format (Swedish Incubators & Science Parks, 2018). Science parks tend to have a broader focus and address more established companies. They often serve as a broker between universities and companies, and to some extent the public sector, and organise events to boost long-term business renewal (Swedish Incubators & Science Parks, 2019). Science parks and incubators usually have regional owners. Their funding typically comes from a mix of sources, both regional and national, and they often rely on project funding from government agencies, ERDF etc. They often operate close to a university and are usually instructed by their owners to engage in regional development issues (Swedish Incubators & Science Parks, 2018, 2019). The universities' TTO functions largely rely on *innovationskontor*-funding, a national program of twelve TTOs that serve the 15 largest research universities (Vinnova, 2020a).

Fourth, the 21 regional councils are politically led public bodies with the responsibilities for regional development. Sweden's public administration is rather decentralised by international comparison (Lidström, 2020). The regional councils act as funders both to science parks etc. and directly to firms, as coordinators for public sector initiatives, and run business support initiatives such as capacity building – often in collaboration with other regional actors. Most regional councils are however resource constrained through their small sizes; only three regions have more than 500,000 inhabitants (Swedish Agency for Economic and Regional Growth, 2022).¹ In addition, the public organisation Almi supports business through advice and loans. Its subsidiary Almi Invest provides public venture capital. Both Almi and Almi Invest are national but operate largely through regional subsidiaries owned to 49 percent by regional actors (Almi, 2022).

Fifth, there are specific project-like institutions that support business renewal in various ways. Amongst these, the SIPs are the most prominent. They are ambitious (twelve years, significant budgets) instruments to boost innovation and to function as, to some extent, 'national powerhouses' and coordinators within their respective areas (Technopolis Group, 2019).

3 Methods

The study was conducted in June 2020 and January 2021 by systematically reviewing the websites of virtually all major organisations in the Swedish public innovation system, filing all examples of initiatives related to the pandemic in a database to enable a systematic analysis. The organisations were identified by compiling i) the largest funders of research at Swedish universities (Swedish Higher Education Authority, 2020a)²; ii) Government agencies and national public enterprises with responsibilities for research, innovation and/or business renewal as a main part of their instruction (Swedish Government Offices, 2020); iii) Public venture capital organisations that are members of Swedish Private Equity & Venture Capital Association (2020); iv) all Swedish universities and other higher education institutions (Swedish Higher Education Authority, 2020b)³; v) all public TTOs (*innovationskontor*) (Vinnova, 2020a); vi) all Strategic

¹ There is in effect also a level between the national and the regional, based on the European so-called NUTS2 regions, in this context relevant in the distribution of resources from the European Regional Development Fund (ERDF) and the European Social Fund (ESF). The NUTS2 regions are made up by one or several of the 21 regions, which are each represented in the respective committees that make decisions on the funding. The project databases of the government agencies that administrate ERDF and ESF projects indicate which of the 21 regions that each project covers. The NUTS2 regions are therefore not meaningful as analytical categories in this study.

² A few large funders with sectoral or other responsibilities that clearly lay outside the scope of this study were omitted, e.g. the Swedish Transport Administration, the Swedish National Space Agency and the Swedish International Development Cooperation Agency (SIDA).

³ The university sector consists of three rather distinctive groups of institutions: twelve larger, older and comparably research-intensive universities, 16 more recently established universities and university colleges with less resources for research per employee, and ten specialised (e.g. in arts, nursing, theology) institutions with comparably little research (Ljungberg, Johansson, & McKelvey, 2009). In this study all 38

innovation programmes (Vinnova, 2020b); vii) all members of Swedish Incubators & Science Parks (2020)⁴; and viii) all regional councils.

The final list comprised 181 organisations. These were re-categorised after their respective function in the innovation system. For organisations listed in steps iv–vii, the categories in the study are the same as the categories above. Organisations listed in steps i–iii were re-categorised as either national research and innovation (R&I) funder (which include government agencies as well as foundations), research institute, national specialised business support and venture capital, or other government agency. Table 1 in section 4.1 shows the number of organisations per category.

In order to collect initiatives, the webpages of the organisations were systematically researched, with a focus on the 'News' and 'Activities' sections. The term 'initiative' was operationalised as an activity primarily directed towards the private business sector, either to companies or to employees or future employees in companies. All initiatives that were presented between February 1 and December 31, 2020 as a response to the pandemic and led by the organisation in question were listed and classified along a set of analytical categories developed following the research questions.:

- i) Basic facts. This includes type and name of organisation, date when the initiative was launched
- ii) Region(s) covered by the initiative.
- iii) Type of initiative. The cases were categorised according to what type of initiative they represented. The following labels are used in the analysis: new R&I programme; new programme for education or capacity building (defined as initiatives where each participant took part in at least two subsequent events, e.g. a course); new education project (defined as a single event, e.g. a webinar or a conference); specific advisory role (e.g. to companies hit by the crisis), and financial contribution or economic subsidy (e.g. cheques to hire business consultants, or temporary tax reliefs). Each case was assigned to the most fitting category. Thus, even if a new R&I programme also included financial contributions, it was only assigned to the 'new R&I programme' category. The first two categories (new R&I programme and new programme for education or capacity building) are classified as 'deep' in terms of knowledge content whilst the others are 'shallow'.

institutions are referred to as universities, which is the conventional English translation, although only 17 of them are *universitet* by Swedish standards (cf Swedish Higher Education Authority, 2021).

⁴ One additional organisation was added to this group, the entrepreneurship association Venture cup

- iv) Theme. In the analysis the three most frequently mentioned themes were kept: digitalisation, sustainability transition, and crisis management. The rest were grouped in ‘other specific theme’ and ‘no theme specified’.
- v) Sector. In the analysis the three most frequently mentioned sectors were kept: manufacturing, tourism, and cultural and creative industries. The rest were grouped in ‘other specific sector’ and ‘no sector specified’.
- vi) Size of targeted companies. Partly due to state aid rules, many initiatives only targeted small and medium-sized enterprises (SMEs). The target groups were often even more strictly defined, e.g. SME with less than 10 employees, SME with less than 50 employees.
- vii) Objective. In the analysis the three most common objectives for the initiatives were kept: business strategy development, capacity building of specialists (defined as education on university level or the equivalent), and capacity building of low-educated employees (defined as education below university level, e.g. vocational training). The rest were grouped in ‘other objective’.
- viii) Temporality. Each initiative was categorised as ‘long-term’ or ‘short-term’ given its objectives, where the former in practice refers to business renewal and the latter to more or less acute crisis management
- ix) Partners. Some initiatives were made in partnerships with other actors. In those cases, the partners were noted. Some of the 180 actors in the study also figure as partners to initiatives led by others.

The subcategories under iii–viii were developed iteratively as the population of initiatives grew and distinctive differences were identified. Links to the webpages for each case were saved to enable quality assurance.

A first mapping was made in June 2020 for all initiatives between February and early June. That exercise and informal conversations with staff in a few of the organisations indicated that significant initiatives could be expected later in the year, as decisionmakers in many companies (the target groups) until then had been overwhelmed by acute crisis management and therefore lacked capacity to engage in activities with more long-term objectives. A second mapping was therefore made in January 2021 for all activities from the first mapping until the end of the year. All categorisations were revisited after the second mapping to ensure consistency. Cases which were difficult to assign to a certain category were highlighted and revisited one or several times again. In some cases, organisations were contacted and asked to provide additional information to enable a category to be assigned. Initiatives initiated by a funding body (e.g. the government or an R&I funder) and carried out by another actor in the study (e.g. a science park or a university

that gets a project application funded) are counted twice: first as an initiative by the funder (i.e. one count), then as an initiative for each performer (i.e. one count per project).

Although the mapping is systematic and extensive enough for claiming that a vast majority of the initiatives are likely to be included, some words of caution are in place. In some cases, it was challenging to assess whether an initiative was a response to the pandemic or not. Since the organisations had incentives to show their capacities to act in a crisis and therefore could be assumed to boast about (rather than hide) their initiatives, we opted for a rather conservative approach and only included initiatives that were explicitly presented as a response to the pandemic. Another challenge was to handle already planned or ongoing initiatives that were adjusted following the pandemic. Those cases were generally included if the changes were significant, for instance to include new topics, or adjusted in time or scale to better cater for urgent company needs. Initiatives with only minor changes, such as shifting from physical to digital modes, were not included.

It is difficult to assess whether the method has led to systematic gaps or biases in the material, but it is likely that the largest organisations, primarily the largest universities, are underrepresented as they are more selective of what they present on their main webpages. That said, many of the cases for e.g. smaller universities are of a kind that are quite likely to be presented also on the largest universities' webpage. Some of the organisations have also made initiatives of other kinds than those studied, for instance by taking coordinating roles, or by providing mappings or analyses of company needs following the crisis. These were excluded from the study due to insecure data; partly because of indications that these roles were not always presented on the webpages, partly because it was difficult to assess what 'coordinating roles' they took: were they regional leaders or merely one part of many in regional dialogue meetings, not really taking action? In addition, many new research projects have been started, mainly at universities. These were also omitted since it was evident that only a fraction of them were presented on the webpages. The study should be read with these points in mind.

4 Results

4.1 Types of actors and initiatives

As Table 1 shows, the initiatives are unevenly spread between the different types of organisations. Virtually all organisations in the public sector with a sectoral or general responsibility to support the business sector have taken action, e.g. national government agencies and regional councils. Two national R&I funders – the government's innovation agency, Vinnova, and a semi-public foundation, the Knowledge Foundation – have launched initiatives targeting the business sector, and one has participated as a partner (and several others have

addressed medical issues related to the pandemic, outside the scope of this study). A couple of public VCs have injected additional capital in start-ups. Amongst public research organisations – universities and research institutes – the picture varies more. Roughly half of the universities have taken action, and one of the three research institutes. The university initiatives are concentrated to the 16 more recently established universities and university colleges; these represent 30 of the 36 identified cases. The picture also varies amongst the specialised innovation support organisations – TTOs, science parks and incubators, and the SIPs. A little more than one third of the science parks and incubators have led an initiative, besides one in four TTOs and two in 17 SIPs. Ten science parks and incubators have participated only as partners, which means that roughly half of the science parks and incubators have been active.

Table 1: Organisations

Type	Total	Has led initiative	Has only been partner	Has led or been partner (share)
National R&I funder	14	2	1	21%
National business support and public VC organisations	7	4		57%
Government or government agency	6	5		83%
Regional council	21	20		95%
University	38	18	1	50%
Research institute	3	1		33%
Science park or incubator	62	23	10	53%
Technology transfer office	13	3		23%
Strategic innovation programme	17	2		12%
Total	181	78	12	50%

Table 2 shows initiatives that each type of organisation has led. A total of 208 initiatives were observed. Naturally, they reflect what means each organisation has at its disposal. The government, government agencies and the regional councils have above all taken initiatives that implicate financial contributions and subsidies, including in the form of programmes that distribute project funding for R&I and educational activities. Almi and the regional councils have also engaged in giving specific advice to companies in crisis, often by using their own staff, and sometimes also by bringing together staff from other public actors in the innovation system or

hiring external consultants. In addition, 14 of the 21 regional councils have launched a total of 29 educational or capacity building programmes, courses or single events. A few government agencies and R&I funders have made similar initiatives.

Amongst universities educational initiatives strongly dominate. Thirteen of the 27 programme or course initiatives are courses or course packages fully or partly funded by the semi-public KK Foundation after a special call in May 2020, with decisions made in June. Only the 16 more recently established universities and university colleges were eligible to participate in that call. Five universities have arranged webinars or conferences, and two have offered researchers' advice to companies in one-to-one meetings. (Universities have most likely also launched a considerable amount of research projects. As mentioned in section 3 they are outside the scope of this study as they proved impossible to track. However, the impression from the webpage reviews is that university top managements have launched very few research initiatives related to the business sector. Almost all projects can thus be expected to have been born at department levels or in relations between researchers and external funders.) One research institute, the by far largest and broadest, RISE, has offered advice and provided test infrastructure for rapid assessment of whether new products (primarily to healthcare uses) meet European safety, health, and environmental protection requirements.

The specialised innovation support organisations have primarily engaged in giving specific advice, either in one-to-one meetings or by organising webinars and similar events. Some of them have also organised courses or programme-like activities. It is also evident from their webpages that many of the science parks and incubators have engaged in strategic dialogue with other regional actors following the pandemic. A closer look at the material indicates that science parks have been more active than incubators, which is expected given that incubators have a rather narrow focus on start-ups – usually only the start-ups they work with – while science parks are more broadly engaged in business development issues. TTOs and SIPs appear to have been less active than science parks and incubators, probably because they do not have regional responsibilities to the same extent – or at all, in the case of SIPs. The response of this group of actors, in which a majority have not led any initiative, probably also reflects their typically small sizes; many of them only have a handful of full-time employments (FTEs). The ten science parks and incubators which have only participated as partners have usually done that in relation to one specific incubator conference, or in specific advisory roles. Our impression from the review is that partner participations generally mean considerably smaller roles than leading an initiative.

Table 2 Initiatives

Lead organisation	R&I prog.	Education prog. or course	Education, single event	Specific advisory role	Financial contrib., investm., or subsidy	Total
National R&I funder	4	2	2			8
National business support and public VC organisations			1	1	7	9
Government or government agency	2	4	2		12	20
Regional council		18	11	20	48	97
University		26	6	2		34
Research institute				2		2
Science park or incubator		9	10	13		32
Technology transfer office			1	2		3
Strategic innovation programme		1	1		1	3
Total	6	60	34	40	68	208

Our hypothesis is that specialised innovation support organisations generally represent higher strategic competence than other actors in the study (otherwise their existence would hardly be legitimate). These organisations are unproportionally concentrated to small number of regions. Five of the 21 regions, which are also the five most populous (61% of Sweden’s population) and home to an unproportionate share (85%) of the research and development (R&D) expenses in Sweden (Statistics Sweden, 2020), host 43 of the 74 specialised innovation support organisations. There is no difference between these five and the other 16 regions regarding to what extent the specialised innovation support organisations have been active (49% and 45% of the organisations, respectively). However, as Table 3 shows, there is a significant difference between the two types of regions when considering the involvement of specialised innovation support organisations in each initiative. In the large R&D regions, two in three initiatives are led by or involve these kinds of organisations as partners. In the other regions, the share is only one in four.

Table 3 Participation of specialised innovation support organisations

Type of region	Number of initiatives*	Initiatives with specialised innovation support organisation	Share of initiatives with specialised innovation support organisations
Large R&D region	48	32	67%
Other region	96	25	26%

*National initiatives and university courses are not included

Table 4 shows the occurrence of the mapped types of initiative across regions. Whilst R&I programmes have only been commenced by national actors, the other types of initiatives have all been initiated by actors in a majority of the 21 regions.

Table 4 Types of initiatives per region

Type of initiative	Provided regionally (number of regions, n=21)	Provided nationally
R&I programme	0	Yes
Education prog. or course	17	Yes
Education, single event	15	Yes
Specific advisory role	19	Yes
Financial contribution, investment, or subsidy	18	Yes

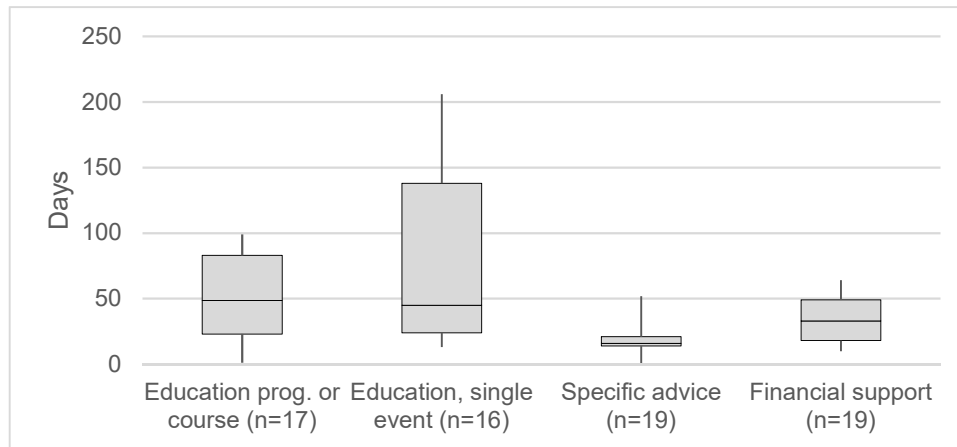
4.2 Speed

On March 10, 2020, the government declared a pandemic state. Figure 1 shows how many days after that date it took for actors in the 21 regions to launch a certain type of initiatives. The figure presents only the most common types of initiatives. As the figure shows, specific advice was quickly introduced. By 31 March it was present in 14 of the 21 regions, in every instance in the form of a telephone support or the equivalent to which companies in crisis could turn for advice. April 20 one region, Jönköping, got the responsibility to offer such support on a national basis. Most regions were also relatively fast to launch financial support, usually as ‘cheques’ of €10k–€20k that SMEs in sectors hit hard by the crisis (e.g. tourism) could apply for and use to make strategic measures, for example buy consultancy services. In a quarter of the regions financial support had been introduced by the end of March, and one month later in 14 of the 21 regions.

Education activities were generally introduced later, and with more variety across the regions. By the end of April courses or programmes were launched in nine regions, mostly to SMEs in the hardest-hit sectors. Following an ‘emergency call’ by ESF March 20, around ten capacity building initiatives were introduced in early June. In mid-June new courses were launched at 15 universities as a result of the KK Foundation’s ‘crisis call’ a month earlier. Many of those courses started in the fall semester. A handful universities also initiated courses on their own or co-funded from other sources. Single event educations, typically webinars, were most intensively

launched during the fall but continued throughout the year in a more scattered pattern across the regions.

Figure 1: Response time per region



Note: Some of the 'regional' initiatives are accessible also for companies from other regions, most notably university courses. Our assumption is however that the participation is predominantly regional also in those cases. Initiatives on the national level are not included.

The different types of initiatives were launched in somewhat different waves. Advice and financial support initiatives were concentrated to March, April, and May, and only 14 of the 104 such initiatives were launched after the summer. Education programmes and courses were also largely introduced before the summer with a peak in June; merely 6 of 60 were presented in the second half of the year. Single education events were however more continuously spread throughout the year, with two-thirds before the summer and one-third after.

4.3 Crisis management or long-term renewal?

As argued in the introduction, a crisis is also a window of opportunity for long-term renewal of business or whole sectors. Table 5 shows that 54 of the 208 initiatives (26%) combined long-term objectives with opportunities for 'deep learning' (i.e., R&I programmes or educational programmes or courses), hereafter referred to as long-term initiatives. The rest, 154 initiatives, were either short-term, for instance to prevent businesses from going under, or 'shallow' by implicating a one-time activity such as a webinar or a few hours of business advice; hereafter referred to as short-term initiatives. There is no evidence of conditionalities in the government's financial support schemes, for instance obligations to invest more in sustainability. There are also very few cases where initiatives are connected to larger, long-term programmes or other schemes.

Just over half of the long-term initiatives addressed a specified sector. Manufacturing and tourism were the most common sectors to address, but with quite different approaches: In manufacturing digitalisation is a common theme, and (not shown in the table) most initiatives concern capacity building by educating or up-grading skills of specialists. Initiatives towards the tourist sector

rarely had a specified theme, but usually concerned general development of business strategies. Initiatives towards other or unspecified sectors often concern either digitalisation courses on university level, vocational courses to upgrade skills for (potential) employees who lack tertiary education, or general development of business strategies. Digitalisation and sustainability, the two dominant themes in contemporary business strategy discourse, were thus explicit themes in merely 15.5 and 6 long-term initiatives each. Our impression is however that also general business strategy development initiatives quite frequently were geared towards those two topics.

Two in three of the short-term initiatives did not target any specific sector. When they did, tourism and cultural and creative industries were usually in focus. These two sectors, dominated by small companies with very limited financial margins, were severely hit by the crisis (Swedish Agency for Cultural Policy Analysis, 2020; Swedish Agency for Economic and Regional Growth, 2020). They also operate in sectors which are high on the agenda for regional authorities and politicians, as they are important employers across the country and often identified as having future potential; they are targets for public investments also in ordinary times through e.g. regionally funded visit organisations, cultural events etc (Swedish Agency for Economic and Regional Growth, 2019). Short-term initiatives that did not target any specific sector typically concerned advice on business strategies or financial support.

Table 5 Long- and short-term initiatives

Sector	Long-term					Short-term	Total
	<i>Digitalisation</i>	<i>Sustainability</i>	<i>Other</i>	<i>No theme specified</i>	Total		
Tourism	1	2	2	7	12	19	31
Cultural and creative industries	1	0	0	0	1	21	22
Manufacturing	5.5	1	1.5	5	13	6	19
Other specified sector	1	1	1	1	4	5	9
No sector specified	7	2	2	13	24	103	127
Total	15.5	6	6.5	26	54	154	208

There is quite a considerable difference between the 21 regions when it comes to initiatives for long-term renewal. If the analysis includes distance courses offered by universities in the respective regions – which are equally accessible by individuals all across the country, but arguably tend to attract local participants to a higher degree – the number of long-term initiatives vary between 0 and 8 per region. Region Västra Götaland (with Gothenburg) counts 8 initiatives, followed by the regions Jönköping County (6), Blekinge, Kalmar County and Kronoberg (5 each), and Skåne (4). In the other end of the list, three regions have no long-term initiatives and another five regions only one each. If distance courses at universities are excluded, the distribution is even more skewed, with four regions Västra Götaland (6), Jönköping County and Skåne (4 each) and Blekinge (3) in top, and seven regions with no initiatives and another seven with only one each.

The regions with the most initiatives display somewhat different patterns:

- Västra Götaland and Skåne have made use of the ESIF funds to initiate extensive programmes focusing on skills-upgrading for thousands of manufacturing employees, in Västra Götaland focusing on the automotive industry's shift towards electric vehicles and in Skåne on digitalisation, in a shared initiative with Blekinge
- Jönköping County particularly addressed capacity building in the struggling tourism sector and cultural and creative industries, and Västra Götaland launched several similar initiatives
- In Kalmar County and Kronoberg, the Linnaeus University represents most of the long-term initiatives. The university, with campuses in Kalmar and in Kronoberg's county seat Växjö, has initiated several packages of distance courses within tourism as well as digital manufacturing, partly funded by the Kamprad Family Foundation and KK Foundation respectively

Other regions with comparably active universities are Västra Götaland, Jönköping County, Blekinge, and Västmanland/Sörmland (Mälardalen University has one campus in each of the two regions). Almost all new university courses have been partly funded by external sources, usually the KK Foundation. Also Halland is home to an extensive capacity building initiative, primarily directed towards the tourism sector, funded by ESF and lead by Halmstad University.

On the national level somewhat scattered initiatives have been made. The innovation agency Vinnova, the semi-public KK Foundation and the agency for administration of the ESF launched specific 'crisis calls' targeting companies and the labour markets (Vinnova and several other R&I funders also launched other crisis-related calls, but not directed towards companies). The Swedish Agency for Economic and Regional Growth was very busy channelling all government

crisis support to companies but used national ERUF-funding in a call to the tourism sector in July. Following a government decree, the agency launched more support to the tourism sector in December. One science park got an ESF-project to address skills-upgrading in retailing on a national level, and the Strategic Innovation Programme Produktion2030 decided in the end of March to speed up and extend its initiative to provide skills-upgrading and new education within digital manufacturing together with a number of universities, to seize the opportunity when many manufacturing employees were on short-term furloughs.

4.4 Regional ranks

Table 6 shows a comprehensive list of the 21 regions ranked according to their performances on three of the analysed dimensions. A possible fourth dimension, 'speed in crisis management' is not included as almost all regions had such initiatives in place within a couple of weeks. The rank should be interpreted with some caution, particularly since it does not consider the relative sizes of the initiatives (for example how many in the target groups that were able to take part). It also favours large regions since these contain more organisations able to make initiatives.

Nonetheless, the list shows obvious disparities between different parts of the country. The nine regions in top are by far ahead of the others in terms of number of (long-term) activities, whilst the average rank is somewhat levelled out when involvement of specialised innovation support organisations is added. The top six yet comes out well on all three dimensions, whilst the bottom seven are more or less on the bottom half on all the three. Measured statistically, there a moderately high correlation between rank in population size and average rank in the table (Spearman's rank correlation coefficient is 0.47). But the three by far largest regions are also the three in top. Most other regions are of reasonably the same size. Three regions are notably smaller, and two of those, Jämtland-Härjedalen and Gotland, occupy the two places in the bottom of the table – but the third one, Blekinge, is on fourth place.

Table 6 Rank of regions

Region	Rank in total number of activities	Rank in number of long-term initiatives	Rank in involvement of specialised innovation support organisations	Average rank
Skåne	2	6	2	3.3
Västra Götaland	1	1	8	3.3
Stockholm	3	9	6	6.0

Blekinge	6	3	11	6.7
Örebro County	5	7	9	7.0
Västmanland	6	7	10	7.7
Kronoberg	6	3	15	8.0
Jönköping County	6	2	17	8.3
Kalmar County	4	3	18	8.3
Värmland	18	9	3	10.0
Sörmland	10	9	12	10.3
Halland	18	9	5	10.7
Östergötland	11	19	3	11.0
Uppsala	14	19	1	11.3
Norrbottn	14	9	12	11.7
Västerbotten	11	14	12	12.3
Västernorrland	11	14	16	13.7
Gävleborg	21	14	7	14.0
Dalarna	14	14	19	15.7
Jämtland-Härjedalen	20	14	19	17.7
Gotland	17	19	19	18.3

5 Concluding discussion

5.1 Main empirical conclusions

Five main conclusions are drawn in this study. Firstly, almost all national agencies and regional councils responded to the crisis, whereas the response was much more scattered among the more specialised actors: R&I funders, universities, science parks and incubators, TTOs and strategic innovation programmes. The character of the responses was in line with the respective actor's means of disposal. Actors with mainly financial resources typically distributed funding, usually as projects or 'cheques' to hire consultants, whilst others mainly contributed through advice, courses, etc.

Secondly, the responses were generally quite swift. In most regions, financial support and advice services were rather quickly introduced, often within a month, and the great majority of them before the summer. Given the time it often takes to set up an education course or programme, the fact that most of those were initiated by June should be considered quick.

Thirdly, most responses were short-term crisis management rather than initiatives to build long-term strength. Moreover, the latter kind of initiatives, concerning for example re-skilling or

platforms for potentially more path-breaking solutions or strategies, were often thematically unspecified. One might expect that digitalisation and sustainability would dominate, since these are very much in focus in current innovation and enterprise policy. On the other hand, unspecified themes may very well cover those topics, as well as other themes that are relevant in specific sectors or contexts.

Fourthly, there was a considerable variation in response between actors in different regions. There is a moderately strong correlation between region size and response, which indicates that quite a few regions are too small to maintain organisations powerful enough for agile actions such as these. However, there are also differences on other dimensions. In eight of the 21 regions there were either none or only one initiative of a long-term character, whilst six regions saw four or more such initiatives, which in a few cases were very ambitious. In strong R&I regions expertise in specialised innovation support actors was used to a much higher extent than in other regions. One hypothesis is that the strategic management and networks are stronger in those regions, meaning that a number of specialised actors were ready to be activated with short prior notice, or initiated initiatives themselves, partnering with e.g. regional administrations along the way. Another hypothesis is that the active specialised actors in the strong R&I regions have larger capacities, and therefore can be involved to a higher extent. Since specialised actors tend to be funded largely by regional public funding, the pattern also indicates that the strong R&I regions were more capable of getting strategic returns on their investments.

Fifthly, almost all university response came from ‘young’ universities, which generally have more of a regional strategic focus. ‘Crisis calls’ from the KK Foundation (which only funds this type of universities) and to some extent ESF were important, but a number of those universities also launched courses and other initiatives on their own. It yet appears that agile educational initiatives at universities often require funding from external sources. The largest and most research-intensive universities are almost absent in the material, arguably due to strategic foci and institutional traditions that make them less inclined to engage in the kind of initiatives studied.

5.2 Reflections on the lack of long-term initiatives

The study reveals an apparent lack of initiatives with a long-term perspective. This finding however deserves a more nuanced discussion. Firstly, short-term responses such as immediate advice on to stay afloat in a time of crisis must not be underestimated. Investments for long-term prosperity and sustainability depend on the protection of otherwise stable companies from going out of business or being relocated because of the crisis. In other words, what in a resilience

context may be called ‘bouncing-back measures’ are important too. The many short-term activities documented by this study should thus not be criticised by principle.⁵

Secondly, as mentioned, rather few initiatives concern digitalisation and sustainability with a long-term focus. That indicates an untimely lack of transition-oriented initiatives. The ‘blame’ for this should be put on national rather than regional actors. Transitions are large-scale and systemic processes that hardly can be driven by single organisations, especially not on the local or regional levels. On the one hand, it is possible that the presence of several ambitious TIP initiatives made national policy actors choose to focus on other issues in the crisis support, but it would on the other hand have been more in line with the overarching policies to seize the opportunity and reinforce that perspective, or at least relate more initiatives more clearly to long-term schemes.

Thirdly, following the regional resilience literature, both ‘adaptation’ and ‘adaptability’ are needed (Boschma, 2015). As set out in the beginning of this paper, the former refers to activities based on a template of what can be supposed to work, whereas the latter is about preserving a certain uniqueness and creating one’s own path. Although the two terms are not fully translatable to the empirical material (the concepts are theoretical rather than operational, and many of the studied initiatives can be expected to contain both), the short-term initiatives in this study cannot really be expected to support adaptability, particularly since there is little evidence of relatedness to long-term schemes or policies. The studied long-term initiatives with their more ‘deep learning’ character can be expected to contribute to adaptability to a greater extent. It is thus likely that the mapped initiatives taken together, to a significantly higher degree support adaptation rather than adaptability.

Notwithstanding those three cautionary points, the ‘window of opportunity’ for long-term renewal seems to have been seized too rarely. Society needs renewal, and both companies and others tend to experience a considerable uncertainty about what to do, and what future markets, regulations, and other conditions to imagine. Arguably, the public innovation system is (or should be!) the prime public carrier of knowledge and strategic capacity to help companies prepare more effectively for the future. Almost overnight, the crisis left many company employees with empty spaces in their calendars, and a sense that a different world may wait around the corner – but significant parts of the public innovation system were not quite there to help.

However, it should be noted that the crisis as such may yet have launched transitions. For instance, global transportation networks were severely disturbed, individuals’ mobility patterns

⁵ An evaluation of Sweden’s public financial support to private companies suggests a positive impact during the first year of the crisis (Swedish Agency for Growth Policy Analysis, 2022)

were considerably altered, and new business models and digital solutions were considerably boosted whilst other (generally less sustainable) lost ground. Quite a few initiatives in this study may be able to contribute to these and other transformative developments, albeit with contributions that one-by-one appear minor. It remains to be seen to what extent such changes were persistent.

5.3 Policy implications

The differences between regions carries important implications. Above all there is a political question to what extent it is tolerable that firms in some regions receive weaker support in a time of crisis than their equivalents in other regions, particularly since the support was typically stronger in regions that are stronger also in other economic and innovation-related aspects.

The study also suggests that government and the largest national R&I funders should, if a similar crisis occurs again, take a large responsibility for the long-term perspective, particularly related to the digital and sustainable transformation, since other actors often appear too short-term. They should also note that already existing national long-term initiatives such as the SIPs were mostly non-responsive to the crisis, arguably because their ‘toolboxes’ were not flexible enough.

Moreover, the results indicate considerable potential for regions to either work more together to share resources, and to learn from each other in terms of strategies and practices to be more agile. The study suggests that a certain degree of stability, size and strategic capacity among the specialised actors in the innovation systems is needed in order for the public sector to reap the benefits of its investment in them in situations like this.

Finally, the varying activities among universities should send a message to policymakers on both national and regional levels, since universities can take on roles in crisis situations that hardly any other actors can, most notably by offering quality education for e.g. re-skilling.

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The author reports there are no competing interests to declare.

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Data availability statement

Data can be shared upon request.

References

- Almi. (2022). About Almi. Retrieved from <https://www.almi.se/en/in-english/>
- Archibugi, D., Filippetti, A., & Frenz, M. (2013). Economic crisis and innovation: Is destruction prevailing over accumulation? *Research Policy*, 42(2), 303-314.
doi:<https://doi.org/10.1016/j.respol.2012.07.002>
- Asheim, B. T., Lawton Smith, H., & Oughton, C. (2011). Regional Innovation Systems: Theory, Empirics and Policy. *Regional Studies*, 45(7), 875–891.
- Bergek, A., Jacobsson, S., Carlsson, B., Lindmark, S., & Rickne, A. (2008). Analyzing the functional dynamics of technological innovation systems: A scheme of analysis. *Research Policy*, 37(3), 407-429. doi:<https://doi.org/10.1016/j.respol.2007.12.003>
- Boschma, R. (2015). Towards an Evolutionary Perspective on Regional Resilience. *Regional Studies*, 49(5), 733-751. doi:10.1080/00343404.2014.959481
- Conti, A., Dass, N., Di Lorenzo, F., & Graham, S. J. H. (2019). Venture capital investment strategies under financing constraints: Evidence from the 2008 financial crisis. *Research Policy*, 48(3), 799-812. doi:<https://doi.org/10.1016/j.respol.2018.11.009>
- Cooke, P., Gomez Uranga, M., & Etxebarria, G. (1997). Regional innovation systems: Institutional and organisational dimensions. *Research Policy*, 26(4), 475-491.
doi:[https://doi.org/10.1016/S0048-7333\(97\)00025-5](https://doi.org/10.1016/S0048-7333(97)00025-5)
- Danell, T., Gadd, H., Lithander, J., & Bager-Sjögren, L. (2008). *Den svenska innovationspolitikens framväxt, organisering och utvärderbarhet*. Retrieved from
- Diercks, G., Larsen, H., & Steward, F. (2019). Transformative innovation policy: Addressing variety in an emerging policy paradigm. *Research Policy*, 48(4), 880-894.
doi:<https://doi.org/10.1016/j.respol.2018.10.028>
- Edler, J., & Fagerberg, J. (2017). Innovation policy: what, why, and how. *Oxford Review of Economic Policy*, 33(1), 2-23. doi:10.1093/oxrep/grx001
- Etzkowitz, H. (2003). Innovation in Innovation: The Triple Helix of University-Industry-Government Relations. *Social Science Information*, 42(3), 293-337.
doi:10.1177/05390184030423002
- Etzkowitz, H., & Klofsten, M. (2005). The innovating region: toward a theory of knowledge-based regional development. *R&D Management*, 35(3), 243-255.
doi:<https://doi.org/10.1111/j.1467-9310.2005.00387.x>

- European Commission. (2021). *2030 Digital Compass: the European way for the Digital Decade*. Retrieved from
- Filippetti, A., & Archibugi, D. (2011). Innovation in times of crisis: National Systems of Innovation, structure, and demand. *Research Policy*, *40*(2), 179-192.
doi:<https://doi.org/10.1016/j.respol.2010.09.001>
- Fröhlich, K., & Hassink, R. (2018). Regional resilience: a stretched concept? *European Planning Studies*, *26*(9), 1763-1778.
- Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., & Trow, M. (1994). *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*. London: SAGE Publications.
- Grabher, G., & Stark, D. (1997). Organizing diversity: evolutionary theory, network analysis and postsocialism. *Regional Studies*, *31*(5), 533-544.
- Grillitsch, M., Hansen, T., Coenen, L., Miörner, J., & Moodysson, J. (2019). Innovation policy for system-wide transformation: The case of strategic innovation programmes (SIPs) in Sweden. *Research Policy*, *48*(4), 1048-1061.
- Hekkert, M. P., Suurs, R. A. A., Negro, S. O., Kuhlmann, S., & Smits, R. E. H. M. (2007). Functions of innovation systems: A new approach for analysing technological change. *Technological Forecasting and Social Change*, *74*(4), 413-432.
doi:<https://doi.org/10.1016/j.techfore.2006.03.002>
- IMF. (2020). *Global Financial Stability Report: Markets in the Time of COVID-19*. Retrieved from
- Köhler, J., Geels, F. W., Kern, F., Markard, J., Onsongo, E., Wieczorek, A., . . . Wells, P. (2019). An agenda for sustainability transitions research: State of the art and future directions. *Environmental Innovation and Societal Transitions*, *31*, 1-32.
doi:<https://doi.org/10.1016/j.eist.2019.01.004>
- Lidström, A. (2020). Subnational Sweden, the national state and the EU. *Regional and Federal Studies*, *30*(2), 137-154.
- Ljungberg, D., Johansson, M., & McKelvey, M. (2009). Polarization of the Swedish university sector: Structural characteristics and positioning. In M. McKelvey & M. Holmén (Eds.), *Learning to compete in European universities: From social institution to knowledge business* (pp. 128-160). Cheltenham, UK and Northampton MA, USA: Edward Elgar.
- Lundvall, B.-Å. (Ed.) (1992). *National Innovation Systems: Towards a Theory of Innovation and Interactive Learning*. London: Pinter.
- Markard, J., Raven, R., & Truffer, B. (2012). Sustainability transitions: An emerging field of research and its prospects. *Research Policy*, *41*(6), 955-967.
doi:<https://doi.org/10.1016/j.respol.2012.02.013>
- Markard, J., & Rosenbloom, D. (2020). A tale of two crises: COVID-19 and climate. *Sustainability: Science, Practice and Policy*, *16*(1), 53-60.
doi:10.1080/15487733.2020.1765679
- Martin, R. (2012). Regional economic resilience, hysteresis and recessionary shocks. *Journal of economic geography*, *12*(1), 1-32.
- Martin, R. (2018). Shocking Aspects of Regional Development: Towards an Economic Geography of Resilience. In G. L. Clark, M. Feldman, M. S. Gertler, & D. Wójcik (Eds.), *The New Oxford Handbook of Economic Geography* (pp. 839-864): Oxford University Press.
- OECD. (2016). *OECD Reviews of Innovation Policy: Sweden 2016*.
- OECD. (2019). *Regions in Industrial Transition: Policies for People and Places*. Retrieved from Paris:
- OECD. (2020a). *Financing SMEs and Entrepreneurs: An OECD Scoreboard. Special edition: The impact of COVID-19*. Retrieved from
- OECD. (2020b). *OECD Digital Economy Outlook 2020*. Retrieved from
- OECD. (2021a). *Liquidity shortfalls during the COVID-19 outbreak: Assessment and policy responses*. Retrieved from
- OECD. (2021b). *OECD Regional Outlook 2021: Addressing COVID-19 and Moving to Net Zero Greenhouse Gas Emissions*. Retrieved from

- OECD. (2021c). *OECD Science, Technology and Innovation Outlook 2021 : Times of Crisis and Opportunity*. Retrieved from
- OECD. (2021d). *Science, technology and innovation in the time of COVID-19*. Retrieved from
- Paunov, C. (2012). The global crisis and firms' investments in innovation. *Research Policy*, 41(1), 24-35. doi:<https://doi.org/10.1016/j.respol.2011.07.007>
- Pike, A., Dawley, S., & Tomaney, J. (2010). Resilience, adaptation and adaptability. *Cambridge journal of regions, economy and society*, 3(1), 59-70.
- Ranga, M., & Etzkowitz, H. (2013). Triple Helix systems: an analytical framework for innovation policy and practice in the Knowledge Society. *Industry & Higher Education*, 27(3), 237-262.
- Schot, J., & Steinmueller, W. E. (2018). Three frames for innovation policy: R&D, systems of innovation and transformative change. *Research Policy*, 47(9), 1554-1567. doi:<https://doi.org/10.1016/j.respol.2018.08.011>
- Serger, S. S., & Palmberg, C. (2022). Towards transformative policy in Finland and Sweden: some viewpoints from practice. In *Smart Policies for Societies in Transition* (pp. 143-188): Edward Elgar Publishing.
- Statistics Sweden. (2020). Regional distribution of intramural R&D expenditure. In di03-fou-i-sverige---region.xlsx (Ed.).
- Statistics Sweden. (2021). *Research and development in Sweden 2019*. Retrieved from
- Swedish Agency for Cultural Policy Analysis. (2020). *En översyn av pandemins effekter inom kulturområdet*. Retrieved from
- Swedish Agency for Economic and Regional Growth. (2019). *Regionalt tillväxtarbete 2019: Insatser och resultat under det gångna året*. Retrieved from
- Swedish Agency for Economic and Regional Growth. (2020). *Turism och besöksnäring efter coronapandemin: En nuläges- och scenarioanalys*. Retrieved from Stockholm:
- Swedish Agency for Economic and Regional Growth. (2022). *Regionalt utvecklingsarbete 2021*. Retrieved from
- Swedish Agency for Growth Policy Analysis. (2022). *Korttidsarbetets effekter på sysselsättningen under pandemiåret 2020*. Retrieved from https://www.tillvaxtanalys.se/download/18.d45083118258961b7fc327b/1665134655773/PM_2022_12_Korttidsarbetets%20effekter%20pa%CC%8A%20sysselsa%CC%88ttning%20under%20pandemia%CC%8Aret%202020.pdf
- Swedish Government Offices. (2020). Myndigheter med flera. Retrieved from <https://www.regeringen.se/myndigheter-med-flera/>
- Swedish Government Offices. (2021). *Nationell strategi för hållbar regional utveckling i hela landet 2021–2030*.
- Swedish Higher Education Authority. (2020a). Högskolan i siffror. Retrieved from <https://www.uka.se/statistik--analys/hogskolan-i-siffror/>. <https://www.uka.se/statistik--analys/hogskolan-i-siffror/>
- Swedish Higher Education Authority. (2020b). Universitet och högskolor. Retrieved from <https://www.uka.se/fakta-om-hogskolan/universitet-och-hogskolor/>
- Swedish Higher Education Authority. (2021, May 20, 2020). Universities, university colleges and other education providers. Retrieved from <https://english.uka.se/facts-about-higher-education-in-sweden/universities-university-colleges-and-other-education-providers.html>
- Swedish Incubators & Science Parks. (2018). *Sveriges inkubatorer 2018*. Retrieved from
- Swedish Incubators & Science Parks. (2019). *Sveriges science parks 2019*. Retrieved from
- Swedish Incubators & Science Parks. (2020). Medlemmar. Retrieved from <https://www.sisp.se/medlemmar>
- Swedish Private Equity & Venture Capital Association. (2020). Ordinarie medlemmar. Retrieved from <https://www.svca.se/ordinarie-medlemmar/>
- Technopolis Group. (2019). *Metautvärdering av första omgången strategiska innovationsprogram efter sex år* (Vinnova Report VR 2019:15). Retrieved from Stockholm:

- Ulmanen, J., Bergek, A., & Hellsmark, H. (2022). Lost in translation: Challenges in creating new transformative innovation policy practices. *PLOS Sustainability and Transformation*, *1*(10), e0000031.
- Vinnova. (2020a). Medel till innovationskontor. Retrieved from <https://www.vinnova.se/m/avpublicerade-mikrosajter/universitet-och-hogskolors-strategiska-samverkan/medel-till-innovationskontor/>
- Vinnova. (2020b). Strategiska innovationsprogram: Samarbete för hållbar innovation. Retrieved from <https://www.vinnova.se/m/strategiska-innovationsprogram/>
- Wise, E., Eklund, M., Smith, M., & Wilson, J. (2022). A participatory approach to tracking system transformation in clusters and innovation ecosystems—Evolving practice in Sweden's Vinnväxt programme. *Research evaluation*, *31*(2), 271-287.
doi:10.1093/reseval/rvac006
- World Bank. (2020). *Unmasking the Impact of COVID-19 on Businesses: Firm Level Evidence from Across the World*. Retrieved from