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Country Study: Sweden

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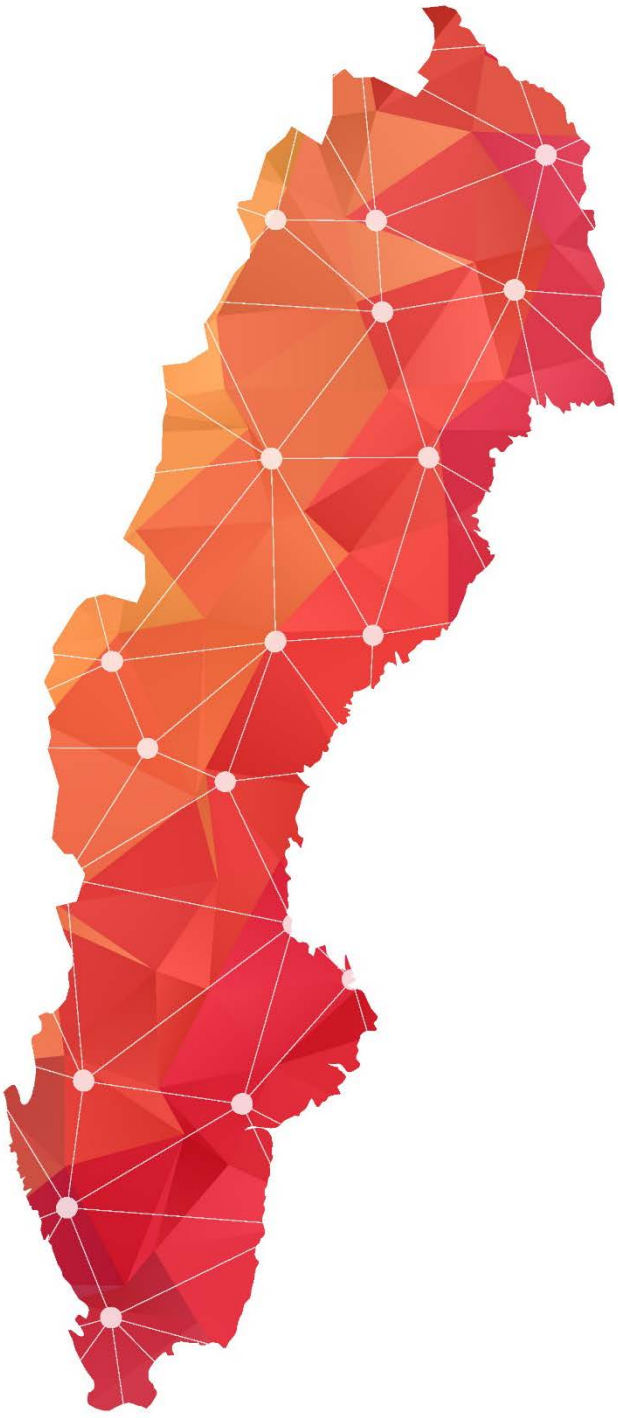

Cambridge Industrial Innovation Policy

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Introduction

An initial point of departure for assessing Swedish industrial innovation policy is to have a look at Sweden's innovation performance. This could be captured in several innovation-related indexes as summarized in Box 1. As can be seen in the table, the Swedish economy appears to be among the innovation leaders and performs very well in terms of competitiveness but with mixed results for entrepreneurial activity. [1]

Box 1. Innovation Related Indexes Comparison

Index Innovation	Ranking	Description	Comment on China's Position
EIS - European Innovation Scoreboard	1 (of 27) (EU) 2 (of 38) (Europe)	Index of 32 indicators grouped into 12 innovation dimensions in four groups: Framework conditions, investments, innovation activities, and impacts.	Sweden ranked as an innovation leader, and performs very well in most dimensions – but less so regarding impact.
GII - Global Innovation Index	2 of 132	81 indicators grouped into 21 sub-pillars, 7 pillars (Institutions, Human capital and research, infrastructure, market sophistication, business sophistication, knowledge and technology output, and creative outputs)	Sweden is one of the leaders: in particular for Human capital and research, infrastructure and business sophistication but less so for market sophistication.
Bloomberg Innovation Index	5 (of 60)	Less compressive and transparent (open) than EIS and GII "analyses dozens of criteria using seven equally weighted metrics, including research and development spending, manufacturing capability and concentration of high-tech public companies."	Sweden ranks high for R&D intensity, high-tech density, tertiary efficiency and researcher concentration, and less high for manufacturing value-added and patent activity.

[1] Sources: EIS: See https://ec.europa.eu/info/research-and-innovation/statistics/performance-indicators/european-innovation-scoreboard_en#european-innovation-scoreboard-2021, GII: https://www.globalinnovationindex.org/Home ; Bloomberg: https://www.bloomberg.com/news/articles/2021-02-03/south-korea-leads-world-in-innovation-u-s-drops-out-of-top-10 and https://worldpopulationreview.com/country-rankings/most-innovative-countries; IMD: https://www.imd.org/centers/world-competitiveness-center/rankings/world-competitiveness/ , GCI 4.0: https://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf; GEI: http://thegedi.org/tool/ ; GEM: https://www.gemconsortium.org/reports/latest-global-report

OECD STI Scoreboard	-	OECD STI (Science, Technology & Innovation) Scoreboard includes 1000+ indicators on R&D, science, business innovation, patents, education and the economy, but no ranked index.	Needs to be studied per indicator, not done here.
Competitiveness			
CGI (2019)	8 (of 141)	Global Competitiveness Index 4.0 measures national competitiveness—defined as the set of institutions, policies and factors that determine the level of productivity. The overall GCI 4.0 score is the average of the scores of the 12 pillars. In total, there are 103 indicators distributed across these 12 pillars. CGI 4.0 does not seem to have been updated since 2019.	Sweden performs particularly well along the pillars of ICT adoption, macroeconomic stability and innovation capability, but relatively less well regarding market size, labour market and product market.
IMD World competitiveness index	4 (63)	Based on statistics and survey the capacity of countries to create and maintain an environment which sustains the competitiveness of enterprises is ranked based on 255 criteria and categorized into 20 sub-factors and in four main factors: Economic Performance, Government Efficiency, Business Efficiency and Infrastructure	Sweden does extremely well in Business efficiency and infrastructure but less well in economic performance and a mixed picture for Government efficiency (mainly due to tax policy)
Entrepreneurship			
GEI (2019)	8 (137)	The Global Entrepreneurship Index GEI is an annual index that measures the performance of entrepreneurship ecosystems in 137 countries with measurements grouped in 14 pillars.	Sweden performs better (than expected from the ranking) in the dimensions of entrepreneurial ability, and worse in entrepreneurial aspiration.

GEM	31/47 (TEA)	Survey and expert interview-based research on entrepreneurship and entrepreneurship ecosystems around the world. Among the indicators is TEA - Total early-stage Entrepreneurial Activity	Sweden's entrepreneurial activity is modest according to this survey.

The view of a largely successful innovation system in Sweden was essentially confirmed by OECD (2013), which pointed at strengths such as successful socio-economic development, specialization at the high end of global value chains, good framework conditions for innovation, a strong human resource base, high investment in R&D, knowledge-based capital and ICTs, a strong science base, excellent industrial innovation performance, good positioning in international networks, high-quality institutions and wide public acceptance for the role of innovation for sustainable growth. Some weaknesses were also identified, including some aspects of the framework conditions for innovation, e.g., the area of financing, declining educational performance (PISA results), a suboptimal system of academic IP and University centres of competence/excellence being relatively small which can reduce their impact, and insufficient links between traditional universities and SMEs.[2]

Needless to say, it is highly questionable to make a causal link between the recent Swedish Industrial Innovation policy and Sweden's innovative performance. Explanatory factors may be found far back in time, e.g., in the early internationalization and relative success of large Swedish companies, high levels of education and long-standing high high-level of investments, public procurement and collaboration between industry and the state in key areas such as electricity and telecommunications.

This also makes it difficult to analyse the organisations, processes and content of Swedish Industrial Innovation and its strengths and weaknesses and gap analysis with respect to some generic ideal system, which does not exist, neither in theory nor in practice and which would in addition be context dependent. In the following, we still try to assess, analyse, and synthesise observations made at a Swedish level. The conclusions are still preliminary and tentative.

[2] OECD (2013) as summarized in OECD (2016)

Organisations

As elaborated in the Stage 3 report, innovation is supported at all levels of governance in Sweden, with relatively strong national and relatively weak regional competencies. Relatively small ministries design overall policy, administer mid-term budgets, and monitor progress. It is primarily the Ministry of Enterprise and Innovation and the Ministry of Education and Research that are responsible for innovation policy, but several other ministries are also involved. Around 20 major agencies support research and innovation – quite a large number for a small country with Vinnova as the key public actor for innovation. Vinnova is Sweden's national innovation agency, work under the Ministry of Enterprise and Innovation and is governed by its Instruction, Appropriation Directions, and Government Assignments. It has three major roles: (1) Innovation financing role - to support research and innovation projects in competitive calls; (2) expert role – strategy and analysis for innovation policy internally and externally (3) and mobilisation role for all parts of society to support system innovation and transformation. A handful of research councils, public and semi-public foundations and a large number of non-profit organisations and foundations (notably the Wallenberg Foundations) play a significant role in financing research and innovation. In addition, a multitude of other public actors support and finance innovation at different levels, including support structures around universities (innovation offices, university holding companies, incubators, science parks, institutes, and general support for university-industry collaboration.)[3]

A major share of innovation is performed by the business sector (as indicated by their R&D efforts), in particular large companies, notably Ericsson, Saab, Volvo Cars, the Volvo Group, and Scania, but also by SMEs and start-ups, HEIs and a relatively small but growing public research institute sector largely consolidated as RISE. Intermediary organisations representing the interests of specific groups and including industry associations, trade unions and professional organisations, also influence policymaking. Policies are in turn evaluated regularly. There is an agency assigned to analysis and evaluation (Growth Policy Analysis) and in addition, several other agencies (including Vinnova) have substantial analytical functions and influence policymaking. Innovation programmes are evaluated on regular basis, often by independent consultants or researchers. [4]
In assessing how well the models work, we may first note that Sweden is a highly innovative economy. The Swedish model seems to be working rather well at least from an administrative point of view, that is with clear roles and processes, with many relevant stakeholders involved in influencing, executing, and evaluating innovation policy. Sweden also has, for more than two decades, a dedicated innovation agency (Vinnova) at the national level, which could be considered a strength, although complementary organisations are needed.

However, innovation policy is weak relative to other policy areas. There is a lack of a holistic approach to innovation. The system is also somewhat fragmented with several (relatively small) ministries, and many agencies which make the innovation policy system difficult to orchestrate. The relatively small size of Sweden also means that programmes may lack critical mass and coverage.

Perhaps it is a bit of a Swedish trait to be fairly well-organized and consensus-building but not so much risk takers. Some stakeholders may find administrative rules a bit bureaucratic, maybe not taking care of initiatives in a good way. There may also be a risk that civil servants become the actual policymakers.

[3] See for a more comprehensive overview including sources, see the Stage 3 Country Study Sweden, Chapter 1.
[4] *Ibid.*

Still, several "good" examples come out of this organisation, including high technology level programmes with collaboration between university and industry and quite visionary initiatives although sometimes not followed through, at least not domestically.

Processes

The distributed organisation of Innovation and Industrial Policy across different ministries and agencies and at different levels make it difficult to describe one policy framework. For instance, the most recent innovation strategy is from 2012, while industrial strategies are launched on a more regular basis (the latest one is in 2022). One constant since several decades are the Research and Innovation Bills decided on every four years which allocate and structure public research and innovation spending and set priorities in a mid-term perspective. This sets a planning rhythm for the involved parties and with planning exercises shaping or influencing long-term views and attitudes. The bill is preceded and influenced by written inputs from some 300 stakeholders, some of which are mandated to provide this input. It is important to note that these bills do not cover all aspects of innovation policy, but rather those parts that are most closely linked to R&D. [5]

Similar cycles can be seen at lower levels, for agencies such as Vinnova and specific programmes such as The Strategic Vehicle Research and Innovation Initiative (FFI) and the Strategic Innovation Programmes – SIPs. Vinnova is implementing a core process in all their ten prioritized areas, consisting of the following steps: See system(s) and context(s); Develop strategy and implementation plan, Mobilize actors; Implement measures; Handle portfolio and Evaluation and learning.[6]

Here it is important to note that processes in which innovation policies are developed are not set in a fixed framework. Although more comprehensive innovation policies and strategies are developed now and then, project- and programme-based policies are initiated, established, and developed in an ongoing process of continuous improvement of innovation policy development. The history and learning process behind the Strategic Innovations Programmes (SIPs) can be seen as a case in point (see further below). This continuous improvement process is also aided by a relative openness to the involvement of many stakeholders and can be adapted when political issues arise.

There exist cross-sectional analysis fora (sometimes temporary) established for the exchange of perspectives between stakeholders, for example between political organisations and key agencies and other organizations, as well as between them and industry, financial institutions, academic institutions, political parties, and other interest groups. For instance, an Innovation Policy Council has been in place twice since the millennium shift (the latest one 2015-2021) and a Swedish National Digitalisation Council (2017-2021). The Royal Swedish Academy of Engineering Sciences (IVA – Kungliga Ingenjörsvetenskapsakademien) may serve as an example actor promoting cross-fertilisation among industry, academia, public administration, and various interest groups, providing analysis and reports and foresight and inputs for innovation policy with an international outreach.

An often-mentioned historical strength in the Swedish system is a close collaboration between policymakers and industry, for example resulting in public procurement of R&D and technological development. It is questionable, however, if this is still the case.

Sweden has a strong record in evaluating programmes and other initiatives. Swedish agencies and councils regularly evaluate their programmes. These evaluations have focused on management, learning and procedures and have usually been qualitative. Incremental learning at both program

[5] See the Stage 3 Country Study Sweden, Chapter 3.2
[6] *Ibid*

funding entity levels can be observed, where these evaluations support such learning processes. Examples of evaluations include numerous evaluations of Competence Centres and more recent evaluations of the SIPs and there are a few evaluations of public organisations. [7] The Stage 3 report on Sweden provides a case study of the evaluation of the Strategic Vehicle Research and Innovation Initiative (FFI). However, evaluations have been criticized by some, for lacking a systems perspective and being too qualitative, claiming that Sweden could experiment with more quantitative approaches.[8]

[7] OECD (2013, pp. 237-238)
[8] *Ibid*

Content

As mentioned, Sweden does not have a spelt-out national industrial innovation policy. When it comes to objectives, different policy statements seem to converge around strengthening the Swedish innovation climate and innovation capacity, to (1) increase competitiveness and create more jobs; (2) meet global societal challenges; and (3) deliver improved public services. The national policies relate to EU policies and regional policies.[9]

In the Stage 3 report, the content of circa 20 major IIP-initiatives (incl. five Research and Innovation Bills) was described starting with the major restructuring of the Swedish R&D and innovation financing and support system in 2001.[10] It also includes an overview of the current IIP content in terms of implemented initiatives. [11]

One initial observation in this respect is the increased emphasis over the years on stimulating stakeholder collaboration and more emphasis on addressing global challenges. Possibly, it could be claimed that Swedish innovation policy has been relatively early at responding to such changes in policy thinking (Innovations systems perspectives, need for collaboration between different types of stakeholders, addressing societal challenges).

However, sometimes it seems that Swedish innovation policy has been late (R&D tax reductions) or resisted international development. An example is the debated teachers´ exemption, i.e., academic staff at Swedish universities and HEIs are given the right to their research results, allowing them to exploit ideas and become entrepreneurs, for better or worse.

Regarding the approach to industrial and national competence and capabilities, they can be said to be well aligned with what can be seen as national technological strengths. High-technology processes can draw on and exploit Swedish strengths in R&D concurrently with a highly educated workforce. On the other hand, Sweden doesn't have an intense interchange of qualified individuals between public organisations, universities, and industry, and this may hamper collaborative efforts between those.

The current (very rapid and increasingly complex) technological development has made foresight both regarding technologies, time horizons and other planning activities increasingly difficult and uncertain. This has influenced both policy development and the initiation, creation, and launching of programs and projects in the agencies.

[9] See the Stage 3 Country Study Sweden, Ch. 2.1
[10] See *ibid*, Ch. 2.2
[11] See *ibid*, Ch. 2.3

Good Practices

We bring forward the Strategic Innovation Programmes (SIPs), as described in the Stage 3 report chapter 4, as a good example of a continuously improved innovation policies programme, with a summary of their development.[12] The SIPs were launched in 2012 partly as a replacement to, and more open to new participants than, the earlier Sectoral Research Programmes. Also, partly as a response to perceived drawbacks of preceding SRAs (Strategic Research Areas) programmes, learning from and improving earlier programmes. In addition, there was a perceived need to increase interaction between universities and industry (and society at large) alongside a need to further fund innovation rather than fundamental research, and to further address societal challenges.

The SIP programme proper was preceded by the formation of Strategic Innovation Agendas (SIAs) using a bottom-up approach. From 2013 to 2017, in total 17 strategic innovation programmes were given up to 12 years of funding. Within the programmes, companies, HEIs and other organisations are jointly responsible for formulating challenges, setting common long-term goals, and prioritising investment in R&D and innovation. The SIPs then fund projects, mostly through open calls but also strategic projects. Several of the early SIPs drew to a large extent on earlier Sectoral Programmes, while later SIPs (such as IoT Sweden, SIO Grafen, Smart Built, and Medtech4Health) less so, hence taken together providing a mix of continuity and more radical change.

The SIPs have been evaluated on regular basis, both separately and together. The second round of evaluations concluded e.g. that the contribution to make Sweden attractive for investment was significant while their contribution to sustainable growth was more modest. For achieving more radical, system-changing purposes and to meet societal challenges, it was deemed that would need to prioritise the needs of societal stakeholders more, have clearer and more specific visions, and focus on fewer and bigger changes.[13] The latter conclusions are also reflected in the joint input from Vinnova, Stem, Formas, Forte, SNSB and VR to the Research and innovation bill 2020 which suggested that the next-generation SIPs should to higher extent address areas of broad societal relevance to realize system transitions, and have fewer programmes with larger budgets. [14]

These suggestions were largely adopted in the bill under the heading Strategiska Innovationsprogram 2.0 (SIP 2.0) 15 and the Government tasked Formas, Vinnova and STEM to further develop the SIPs, to further contribute to and accelerate a sustainable transformation to increase societal gains and competitiveness of Swedish industry. In 2022, Stem, Formas and Vinnova started the launch of this new generation programmes, now labelled “Impact Innovation”. In autumn of 2022, a mobilization and preparation process started, giving actors the opportunity to prepare together and describe the system

[12] For a more comprehensive account of the description of SIP and sources, see the Stage 3 Country Study Sweden, Chapter 4.2
[13] Since the first version of this report was written, a third round of evaluations has been initiated, so far including a 9-year evaluation of 5 of the SIPs (Fredholm and Hallström Hjort, 2022a). This evaluation was conducted by Sweco and built on the earlier ones, focusing more than before on early results and effects of the programmes. (For an overview of the methodology used, see Fredholm and Hallström Hjort, 2022b). System effects, effects among participants, added value and contributions to the SIP overall objectives were assessed. It is difficult to comprehensively summarize the results of the evaluation here. However, in brief, the report concludes that the programmes had largely been successful thus far, largely thanks to the set-up of the programmes (with detached programmes offices, projects that can be initiated by programme management etc.) allowing them to take a long-term and strategic perspective. Among the challenges have been a difficulty to manage project portfolios. One main critique from the evaluators is that the transformative power of the programmes has so far been limited. (Fredholm and Hallström Hjort, 2022a)
[14] VR et al. (2019)
[15] Prop. 2020/21:60, pp. 164-165

changes they want to achieve within the programs. This process will culminate in a full programme launch in 2024.16

To conclude, we see the evolution of the SIPs, as a relatively successful example of continuous innovation policy development, with numerous iterations among different stakeholders, allowing adjustments regarding the type of measures, their content, and priorities, building on previous programmes, adapting to evaluations, global trends, insights from innovation policy research, and changing policy priorities.

[16] https://www.vinnova.se/en/news/2022/06/sweden-is-developing-the-innovation-program-of-the-future/

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Cambridge Industrial Innovation Policy (CIIP) is a global, not-for-profit policy group based at the Institute for Manufacturing (IfM), University of Cambridge. CIIP works with governments and global organisations to promote industrial competitiveness and technological innovation. We offer new evidence, insights and tools based on the latest academic thinking and international best practices.

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