What are the specifics of the innovation system in Sweden?

Sweden is a small open economy, which is connected to global flows, both for large shares of export and import, and the economy is influenced by international events. The economy is dominated by a number of large multinational companies, and small companies, but compared to other countries relatively few medium sized companies. The majority of the large companies are also relatively old. The Confederation of Swedish Enterprise reports that only one of the 50 largest Swedish companies was formed after 1970: Tele2 in 1993. These companies have been based on a successful innovation that was exported, and then the firms have been able to renew themselves through subsequent innovations.

The firms have often carried out substantial local R&D in Sweden. For a long period of time there have been special relations between these large firms and the Swedish state, such as between Ericsson and the Swedish National Telecom operators, Bofors and SAAB Aero and the defence. Some of the firms were also previously public companies, like the previous National Telecom Operator, Telia-Sonera. However these relations have decreased due to international trade agreements, a changed view of the role of state and the relation between private and public, as well as participation in the European Union.

A distinguished feature of the Swedish Innovation System is that R&D is mainly carried out in these large companies, at the same time there are many small firms that innovate and carry out R&D, but R&D activity is dominated by the large companies.

Another distinct feature of Sweden is that the level of new form start-up is low compared to other countries, and with few entrepreneurs, lower than in Denmark and Norway as examples.

Most of innovations originate in the private sector, and there is some originating from the universities, these are however more often related to students than researchers starting firms.

Sweden is one of the countries with the highest spending on R&D, around 5% of GDP and as mentioned above the majority something like 75% is funded by the private sector and carried out in this sector as well. Then the state finances the higher education and research sector, which mainly consists of public universities and university colleges, where 20% of R&D is being carried out. In Sweden there are 36 state higher education institutions, but R&D activities are concentrated to the top tier of Universities. The main actors carrying out research here is the largest universities – Karolinska Institute, Chalmers University of Technology, Uppsala University, Lund University, Gothenborg University, the Royal Institute of Technology (KTH), Stockholm University, and Linköping University. Another distinct feature of Sweden is that the institute sector is very small. And most of the public research is being carried out in the Universities.

Most of the funding of Swedish Universities comes from the public sources (regional and national government and EU) and only a small proportion (approximately 11%) is funded by private firms and foundations, the exceptions here are the Karolinska Institute (Life Science) and the Royal Institute of Technology in Stockholm (engineering).

Direct government appropriations to higher education institutions amount to approximately SEK 12.6 billion (46% of funding). External sources are around SEK 6.6 billion comes from research councils and other public research funders. Approximately SEK 0.9 billion comes from public research foundations and another SEK 1.1 billion comes from the EU. SEK 1.1 billion comes from public actors such as county councils and municipalities. Private funders such as the business sector and foundations contribute some SEK 4.4 billion.

There are four major research-funding agencies. The largest is the Swedish Research Council, which in 2009 shared out SEK 4 billion to basic research in natural sciences, technology, medicine, the humanities and social sciences. The Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas) supports basic and needs-driven research in the fields of environment, land-based industries and spatial planning. In 2009 Formas distributed about SEK 850 million. The Swedish Council for Working Life and Social Research (FAS) distributed some SEK 400 million in 2009 and supports and initiates basic and needs-driven research in the fields of the labour market, work organisation, work and health, public health, welfare, the social services and social relations. The Swedish Governmental Agency for Innovation Systems (VINNOVA) distributed some SEK 1.4 billion in 2009, primarily to needs-driven research in the fields of technology, transport, communications and working life.

Another source is the public research foundations that invested some SEK 1.3 billion in research in 2009. The largest research foundations are the Swedish Foundation for Strategic Research (SSF), the Foundation for Strategic Environmental Research (MISTRA), the Knowledge Foundation (KK), the Foundation for Baltic and East European Studies, the Swedish Foundation for Health Care Sciences and Allergy Research (Vårdal), the Swedish Foundation for International Cooperation in Research and Higher Education (STINT) and the Bank of Sweden Tercentenary Foundation (RJ).
There are also private funders, like the Knut and Alice Wallenberg Foundation which, amongst other things, provides funding for expensive scientific equipment, and in 2008 granted over SEK 1 billion to various research projects. The Swedish Cancer Society distributed some SEK 370 million in 2008 for research in its field.

Another feature is that in Sweden the salary levels are relatively high compared to international standards for more basic levels, whereas top salaries are lower. There are less monetary differences. Similarly tax levels are relatively high, but falling, and redistributive welfare system that further decrease differences. At the same time there is a difference in top level and more basic level research institutions.

There are also support systems to potential entrepreneurs, with funding for a start-up period, different kind of funds for testing business plans, and coaching activities. There are also tax financed education and reskilling programmes, and in general the education levels are quite high.

How does the legislation regulate the innovation process?
In Sweden the most unique feature is possible the teacher's exemption (lärarundantaget), which means that ownership of inventions from university teachers is awarded to the individual who comes up with it, and not to the university. There have been discussions to alter this. This has been done in Denmark, but not necessarily with an improvement, as the universities have not had the capacity to handle the IP-rights properly.

There is also a debate about making donations to R&D tax exempted. With the idea that this would lead to more research funding. And there are discussions around a previous tax for property that has led many Swedes to keep their fortunes abroad, which decreased the availability of venture capital in Sweden. This has been removed by the present government, but the opposition has talked about reinserting the tax, which some claim scare people from returning their funds to Sweden.

What are the major participants in the innovation process?
As mentioned large Swedish Multinationals (like Volvo, IKEA, ABB, SKF, Sandvik, Ericsson, Astra Zeneca), National Ministries (Finance, Industry, Education); National agencies for innovation, and regional growth; Regional development agencies; Universities; University colleges; Funding Agencies and foundations; Business Associations; Trade Unions; EU (Regional Funds, Structural funds, Framework programmes).

How important is the government role compared to that of the market forces?
Both are very important but they are carrying out different types of activities. At the same time in Sweden there has been a large involvement of the state as carrying out services and running companies. The state has to an increasing degree pulled out of carrying out activities, and now it’s rather funding activities, regulating and providing infrastructure, trying to affect incentives systems; also facilitating by providing education and research to raise human capital. It carries out a number of activities to support new firm start-up, such as loans for proof of concept, incubators, venture capital. Due to quite substantial public pension funds, the public sector is also large owner of publicly listed companies. However these funds are not used in an outspoken strategic way. The state still owns shares and it’s a relatively active owner in some large firms, like Telia-Sonera (Telecom), Vattenfall, (Energy production) and SBAB (loans for housing).

The private sector’s role is increasing and it is the main actor for innovation. At the same time a number of sectors where services and goods were previously provided by the public have been privatised. In some areas the funding is still provided by the public, like in Health and education.

There are also in some areas of innovation policy an increase set-up of cluster initiatives, and similar forms of public private partnerships aiming at stimulating growth in strategically important sectors, in different regions in Sweden.

What are the latest trends in innovation policy?
There are a number of trends. One can say that there has been a move away in Sweden from stimulating a number of large companies and sectors, and then tax these firms and redistribute incomes from these firms to welfare projects, towards trying to stimulate growth in many parts of the country and trying to stimulate SMEs to grow. In this process a number of new regional universities have been launched around the country. Connected to these are also a number of different regional growth projects, with the intent to connect academia and industry, in projects like cluster initiatives, regional innovation systems and public private partnerships. Often with an emphasis on, so called, Triple Helix initiatives, where the public, private sector and academia collaborate.

There has also been a move away from much centralised national policies, for industry and enterprise support, and research and education policy, towards more decentralisation, where a number of regions have got more autonomy; also the universities have been given more autonomy. There is also EU-funding available for regional efforts and in EU strategies for the next 7 years there is also an increased focus on the regional level as the executive level for innovation policies.

There have been discussions about, so called, Swedish or European Paradox, that nominally there seem to be going a lot of investments in higher education and R&D, but not so much growth is coming out of it. People are arguing for more control over university action and that more efforts should be geared directly towards innovation and commercialisation of university results.

More funding is being provided through competitive measures, and the bigger universities have been more successful in attracting external funding. So there is a trend of increasing specialisation, and where the larger universities are also growing, and it is in these places that the main research is being carried out.

Furthermore some have also argued that the research output and provision of educated students is working fine. The bigger problem in Sweden with regard to innovation lies more in the side of commercialisation, new firm start-up and growth of SMEs beyond subsistence firms. There are arguments that in Sweden there are too large disincentives for starting firms and employing labour.

A number of new universities and university colleges have been started, where the original intent was that these should connect to local specialities. To some extent this has succeeded. At the same time many of these have lived from attracting foreign students with no admission courses, as the admission has been paid for by the Swedish government. Many of these institutions tended to offer similar courses, and not connect much locally. However it is likely that since Sweden has begun to charge foreign students, these regional universities and colleges will specialise more and possibly also connect more to the regional economy.

There are also a number of trendy concepts being
discussed in innovation policy circles, such as Centres of Excellence, Smart Specialisation Strategies, Service Innovation, Knowledge Triangle, Grand Challenges, System Innovation, Related Varieties, White Fields.

What may be achieved through these changes?
There are likely to be more market based and decentralised approaches, where policies become less planned, and less connected to different kinds of preset goals that are hard to fulfill, and where better knowledge about different markets are incorporated in policy development, as well as incorporating better equipped actors in implementation of policies. As innovation is depending on systemic factors, it is also possible to make systemic analysis and address these through these new initiatives.

What helps and what hinders the development of innovation system in Sweden?
For me the term innovation system is an analytical metaphor. I prefer to answer the question what helps and hinders innovation in Sweden.

In Sweden there is a highly skilled labour force, good infrastructure, functioning political and economic system, with relatively stable and non-corrupt institutions. There is also quite high levels of trust between actors, and relatively easy to initiate projects and collaborate between actors, sectors and different kind of institutions. There is a long tradition of people learning engineering skills and successful engineering firms and there are historic popular icons of great innovators that created many of the big firms. In the last few years it has also become fashionable to become entrepreneur and innovator, which is hopeful for the future, as it is individual creativity that in the end drives innovation, even though it is greatly beneficial with a supportive system.

There are some dangers for the future, and one is troubling results in basic education where Swedish students for a number of years have had falling results in international tests.

With regard to innovation support, there is still very much emphasis on producing patents and finding ways of commercialising patents. Within innovation support structure there is less knowledge about commercialisation processes and often underestimation of the efforts and costs involved in commercialising products. There is also a bit too much focus on specific business plans and to follow these, while entrepreneurial process requires possibilities to alter business ideas and business models as the company moves along.

With regard to universities, there is much talk about the 3rd mission according to which university employees should work actively with diffusing results to the surrounding society. Still there are often no resources for it. There is no internal appreciation, and this is not much rewarded, because the most important activity for our career is to publish articles.

The Swedish industrial structure with a number of large companies that dominate business research, and with fewer small and medium sized firms, may prevent positive spillover effects, as there are relatively fewer new firms started up, or other firms to which new knowledge is spilled over to.

In which areas the results of innovation have been most impressive?
There are these large firms mentioned, like Volvo (Automotive), ABB (engineering), Tetra Pak (packaging), SKF (ball bearings), Astra Zeneca (pharmaceuticals), etc. Then in later years another number of interesting firms came in and developed more service oriented offerings, and who have worked with business models, like IKEA, HM, and Tele2 group.

Furthermore there are a number of sectors where Sweden has been successful, like forestry/paper, mining/metallurgic, life science, ICT, mechanical industry/engineering.

How do you explain it?
Swedish companies have been good at innovating, raising knowledge content of products, raising productivity and developing new business models. Rather than trying to protect the country behind customs and tariffs it has faced global competition by improving products and services.

In the 1970s and 1980s the government tried to protect and run companies in the textile and marine technology industries, with great failures. It was presumed that set-backs were only temporary and that through temporary subsidies or by running them through public companies they would succeed in the long run. Also there were public plans on building large metallurgic complexes in ruraly backward areas to stimulate growth, which were also fiascos.

Nowadays the marine technology industry is actually quite substantive, but more from small and medium sized firms. However they are not very well known, as most people believe all of the marine industry was knocked out in the 1980s. Likewise in textile industries, it was severely hit, but in later years there have been quite a number of firms successful in new areas, with more of innovative concepts like H&M, and companies with high technology and speciality textiles, and new fashion brands, focusing on design.

How important are technological (innovation) parks?
I believe that a certain percentage of the population are natural entrepreneurs that need no support, and then there is a certain percentage that can run firms with the right type of support. These parks can be good places in coaching presumptive entrepreneurs, and providing them with access to resources to succeed in developing their business.

What is your forecast for the development of innovation system in Sweden?
More decentralisation, more specialisation, and collaboration for all types of actors. More broken up processes, with more different types of suppliers in increasingly complex value networks. The larger universities will become even more specialised in research and possibly cater to global networks, where smaller universities will find niches in regional context but possibly leverage that to international links.

Large firms will continue specialise, and interact with smaller firms that develop risky projects that they can choose to commercialise. Likewise smaller firms will continue to specialise. In the Swedish context I also think that the previous industry structure of many small firms, almost no medium sized ones and relatively many huge multinationals will alter, and Sweden will get relatively more medium sized firms. At the same time it is important with collaboration to develop industry standards. Policy will be more carried out at regional level, but in coordination with national and international levels. At the same time international and global connections will continue to be important and most likely increase, also in areas such as China, India and Brazil.