

Edquist, Harald; Henrekson, Magnus

Working Paper

Product market reforms and incentives to innovate in Sweden

IFN Working Paper, No. 986

Provided in Cooperation with:

Research Institute of Industrial Economics (IFN), Stockholm

Suggested Citation: Edquist, Harald; Henrekson, Magnus (2013) : Product market reforms and incentives to innovate in Sweden, IFN Working Paper, No. 986, Research Institute of Industrial Economics (IFN), Stockholm

This Version is available at:

<https://hdl.handle.net/10419/95627>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

IFN Working Paper No. 986, 2013

Product Market Reforms and Incentives to Innovate in Sweden

Harald Edquist and Magnus Henrekson

Product Market Reforms and Incentives to Innovate in Sweden[#]

By

Harald Edquist^{*} and Magnus Henrekson^{**}

November 13, 2013

Abstract: The Swedish economy has developed rapidly since the mid-1990s relative to most comparable countries, in particular relative to almost all other EU-15 countries. We investigate two policy areas that are believed to have been important for the strong economic development in Sweden during the last two decades, namely product market reforms and incentives to innovate. The paper provides a short description of the policy changes that have taken place within these areas since the early 1990s and offers ideas for additional policy reforms that would pave the way for continued successful economic development.

Keywords: Economic reforms; Entrepreneurship; Innovation; Institutions; Product market regulations; Sweden.

JEL Codes: L53; O31; O52.

[#] This paper was written for the project “What can we learn from economic reforms in Greece and Sweden?” jointly commissioned by Forum for Greece, Forum for Reforms, Entrepreneurship and Sustainability (Fores) and European Liberal Forum. The paper is also published in Choupres, Maria, and Harald Edquist (eds) (2013), *What Can We Learn from Economic Reforms in Greece and Sweden?* Brussels: European Liberal Forum.

^{*} Forum for Reforms, Entrepreneurship and Sustainability (FORES), Bellmansgatan 10, SE-118 20, Stockholm, Sweden. Email: Harald.Edquist@fores.se

^{**} Research Institute of Industrial Economics (IFN), P.O. Box 55665, SE-102 15 Stockholm, Sweden. E-mail: Magnus.Henrekson@ifn.se

Table of contents

1. Introduction	2
2. Short theoretical and empirical background	3
2.1 Definition of product market reforms.....	3
2.2 Impact and measurement of product market reforms.....	3
2.3 OECD product market regulation indicators.....	5
3. Product market reforms in Sweden since the early 1990s	6
3.1 Taxi services.....	7
3.2 Domestic aviation.....	8
3.3 Postal Services.....	8
3.4 Telecommunication services	9
3.5 Electricity market.....	10
3.6 Railways.....	11
3.7 Pharmacies.....	12
3.8 Vehicle inspection	12
3.9 What can we learn from economic reforms in the Swedish product markets?	12
4. Incentives to innovate in Sweden	14
4.1 Entrepreneurship and innovation	14
4.2 The development of innovation and entrepreneurship in Sweden.....	15
4.3 Swedish innovation policy.....	17
4.3.1 The role of public policy actors in Sweden	18
4.3.2 Higher educational system.....	19
4.3.3 Research support	20
4.3.4 Commercialization of research.....	20
4.3.5 Publicly funded venture capital and loans	21
4.3.6 Public Procurement	22
4.3.7 Tax incentives for innovation and entrepreneurship: owners and financiers	22
4.3.8 Tax incentives for innovation and entrepreneurship: employees.....	25
4.4 How can incentives to innovate in Sweden be improved?	27
5. Conclusions	28
6. Figures	31
7. References	33

1. Introduction

Since the mid-1990s the Swedish economy has developed rapidly both relative to previous decades and relative to most OECD countries. *Figure 1* shows annual GDP growth per capita 1995–2011 for EU-15, Japan and the US. According to *Figure 1* Sweden had the third highest GDP per capita growth rate at 2.2 percent per year. Finland and Ireland were the only two economies that grew more rapidly. Moreover, compared to the average for the Eurozone countries, economic growth per capita was almost twice as high during the investigated period. Harmonized unemployment was 8.2 percent in February 2013 compared to 12 percent on average for the Eurozone (OECD 2013a). Moreover, the employment rate for persons aged 15–64 was among the highest in the EU at 73.8 percent in the fourth quarter 2012 compared to 63.6 for the Eurozone countries (OECD 2013a).

Figure 2 shows that Sweden also performed well in terms of labor productivity growth in 1995–2011. Thus, the Swedish economy has been successful in increasing its productivity in a medium-term perspective. Moreover, productivity has been particularly strong in manufacturing with an annual labor productivity growth rate of 5.8 percent compared to 1.5 percent in business services (Statistics Sweden 2012b).

There is a plethora of different explanations for the strong economic performance in Sweden since 1995. Some examples are investment in research and development (R&D), information and communication technology (ICT) and other intangibles, and deregulation and market reforms (Bergh 2013; Calmfors 2012; Edquist 2011; Edquist and Henrekson 2006).

The strong economic performance in Sweden during the last two decades makes it difficult to imagine that Sweden experienced a severe economic crisis in the early 1990s. Every country has its own institutional setting and there is no general formula to create economic growth and prosperity. Nevertheless, it can be of great value to investigate and compare policy areas, which are believed to have been important for the Swedish economic success.

The purpose of this paper is to investigate two policy areas that have been important for the economic development in Sweden during the last two decades, namely product market reforms and strengthened incentives to innovate. This paper provides a short description of the policy changes that have taken place within these areas since the early 1990s and also

suggests additional improvements needed to sustain a continued successful economic development.

2. Short theoretical and empirical background

2.1 Definition of product market reforms

There are a number of ways to define product market reforms. It is therefore important to be specific with how we define product market reforms. According to Pelkmans, Acedo and Maravalle (2008 p. 5) “product market reforms are changes in ‘market institutions’ with a view to have goods and services markets function better”. Pelkmans *et al.* (2008) argue that product market reforms could be defined either in a narrow or a wide view. According to the narrow view, product market reforms are concerned with market integration, competition policy at the national and EU level, national regulation of product markets and the degree of openness to the global economy. The wide view also includes the business environment with respect to fewer barriers to entry, entrepreneurship and the longer-run impact of R&D and innovation.

This paper will be based on the wide view to define and analyze product market reforms. First, the more narrow view will be used to describe the product market reforms related to competition and regulations that have been carried out in Sweden. Second, the wider definition will be used to investigate the incentives to innovate in the Swedish economy.

Pelkmans *et al.* (2008) also argue that product market reforms should not be examined in isolation from other reforms, notably labor and capital market reforms. We find this line of argument relevant, but analyzes of Swedish labor market reforms is beyond the scope of this study. Nor do we analyze service sector reforms in the public sector; social services such as schooling, care of elderly and health care are still to a large extent provided by the public sector.

2.2 Impact and measurement of product market reforms

Theoretically there are at least three channels through which product market reforms may impact economic performance (Nicodème and Sauner-Leroy 2004): The reallocation of resources (allocative efficiency), improvement in the utilization of factors of production by

firms (productive efficiency) and strengthened incentives for firms to innovate (dynamic efficiency).

Allocative efficiency tends to increase when the number of competitors increase, which induces firms to set prices closer to marginal costs. Thus, mark-ups decrease and the allocation of inputs and goods become more efficient. More product market competition also raises allocative efficiency by driving less productive firms to exit.

Productive efficiency is raised when new improved methods or technology is used within the firm, including organizational changes. Increased inter-firm competition forces firms to operate more efficiently.

Increased dynamic efficiency results from reforms raising the degree of competition when firms are incentivized to make and adopt product and process innovations, and thus speed up the move towards the technology frontier. Successful innovation is normally discerned in the data through its impact on total factor productivity.

From an empirical perspective, the availability of micro data has improved the empirical research on drivers of productivity. These empirical findings are summarized in Syverson (2011), who divides the factors influencing the firm's productivity growth into internal effects directly influenced by the firm and external effects not directly influenced by the firm.

According to Syverson (2011) examples of internal influences on productivity growth are managerial practice, the quality of labor and capital, information and communication technology and R&D, learning by doing, product innovation and firm structure decisions. Examples of external drivers explaining differences in productivity growth are spillovers, degree of competition, deregulation and proper regulation, and flexible input markets.

Syverson (2011) presents empirical evidence, based on a number of different sources, indicating that internal as well as external factors are important in explaining productivity differences among firms. The role of competition, deregulation and proper regulation are of special interest in this paper. According to Syverson competition drives productivity through two key mechanisms. First, competition induces an increase in the market share of the more

efficient producers. Thus, the market share of relatively inefficient firms shrinks, and may even force these firms to exit altogether.

Second, competition induces firms to make costly productivity-enhancing investments, investments they would have refrained from doing otherwise. Syverson (2004) shows that markets with denser activity in the construction industry have higher lower-bound productivity levels, higher average productivity and less productivity dispersion. Moreover, Foster, Haltiwanger and Krizan (2006) find that productivity growth in the US retail industry is driven primarily by the exit of less efficient stores and their replacement by more efficient national chain stores. Studies in a similar vein abound. Syverson (2011) also points to case studies showing that poorly regulated markets can create dysfunctional incentives that reduce productivity. The US sugar industry is a notorious example. In short, numerous case studies and broader sector analyses strongly suggest that increased competition as well as deregulation or proper regulation have positive effects on productivity growth.

2.3 OECD product market regulation indicators

Previous sections have defined product market reforms. Moreover, theoretical and empirical research suggests that the effects of product market reforms such as increased competition and deregulation have had an important impact on productivity growth. But how should one measure how far a country has proceeded in terms of implementing product market reforms?

A serious attempt initiated by the OECD to try to measure the extent of product market reforms is the development of the Product Market Regulation indicators. Since the late 1990s the OECD has constructed a system of indicators to measure ongoing development in product market regulations across OECD-countries (Wölfl, Wanner, Kozluk and Nicoletti 2009). The basic idea of the indicators is to turn qualitative data on laws and regulations into quantitative indicators. These indicators are also characterized by a bottom-up approach, which makes it possible to trace a specific indicator score back to individual policies.

The whole system consists of 18 different low-level indicators.¹ Each indicator represents the stringency of regulatory policy on a scale from 0 to 6, where a 6 is the most restrictive

¹ The 18 low level indicators are: Scope of public enterprises, government involvement in network sectors, direct control over business enterprises, price controls, use of command and control regulation, licenses and permits system, communication and simplification of rules and procedures, administrative burdens for corporations, administrative burdens for sole proprietors, sector-specific administrative burdens, legal barriers, antitrust

towards competition. The different indicators are aggregated into the following three different categories: state control, barriers to entrepreneurship and barriers to trade and investment.²

Figure 3 shows the result for these three PMR-categories for EU-15, Japan and the US. According to *figure 3* the UK is the most deregulated and Greece the most regulated economy, considering the aggregated impact of all three categories. Sweden is in an intermediate position among the investigated countries.

One characteristic of the Swedish economy is that the category “state control” is still high compared to many other countries. Thus, the government has considerable influence on firm’s decisions through public ownership, price controls or other forms of regulation. Indicator values are particularly high for the low-level category “direct control over business enterprise”, but very low for the low-level indicator “price control”. Moreover, the PMR-indicators show that Sweden is highly deregulated in terms of “barriers to entrepreneurship”, which emanates from low administrative burdens and barriers to entry for firms. Finally, Sweden like most other countries assessed by the OECD, has very low barriers to trade and investment.

Wölfl *et al.* (2009) also find that there has been a substantial liberalization of product markets in most countries when comparing PMR statistics from earlier years. The average aggregated PMR score has moved from around 2.2 index points in 1998 to 1.3 index points in 2008. For Sweden it is primarily the category “barriers to entrepreneurship” that has improved the most. In particular, between 1998 and 2008 there were considerable improvements in licenses and permits systems, communication and simplification of rules and procedures, legal barriers, antitrust exemptions, and barriers in network sectors and services.

3. Product market reforms in Sweden since the early 1990s

This section deals with product market reforms from the more narrow perspective defined in section 2.1. This implies that product markets are viewed with respect to market integration,

exemptions, barriers to entry in network sectors, barriers to entry in services, barriers to foreign direct investment (FDI), tariffs, discriminatory procedures and regulatory barriers.

² Equal weights are used for each of the low level indicators that together form a new sub-category.

competition policy and openness to the world economy. Based on this definition a number of product market reforms have been implemented in Sweden since the early 1990s.

Throughout most of the 20th century many product markets in Sweden were public monopolies. Thus, new firms had no or very limited opportunities to enter these markets and the influence by consumers was also limited (SOU 2005:4). In the early 1990s many of these public monopolies were deregulated. Examples of markets that were opened up for competition in the 1990s include: taxi, electricity, telecommunications, railways and domestic air travel. The overall purpose of these reforms was to increase the degree of competition, notably by opening up markets for more entrants (Lundgren, Edquist and Wallgren 2007; Nicoletti and Scarpetta 2003). Another important enhancement of increased competition was the new Competition Act implemented in 1993. Its three cornerstones are prohibition of restrictive agreements, prohibition of abuse of dominance and control of concentrations (OECD 2007). This also implied that EU competition law was implemented in Sweden.

The purpose of this section is to briefly describe the most important market reforms that have taken place in Sweden since the early 1990s. We do not discuss market reforms in the public sector. The public sector can be defined as “all institutional units which are other non-market producers whose output is intended for individual and collective consumption, and mainly financed by compulsory payments made by units belonging to other sectors and/or all institutional units principally engaged in the redistribution of national income and wealth” (ESA 1995, 2§68). According to this definition, publicly owned companies are not considered to belong to the public sector. However, reforms in, for example, education and health care that have introduced contestability in the provision of tax-financed services will not be discussed.

3.1 Taxi services

The taxi market in Sweden was fully liberalized in 1990. Price setting and entry then became free, and the requirement of being connected to a booking center was abolished. To be able to conduct taxi operations a special transport license issued by the county board was required. The requirement for taxis to belong to a dispatch service was abandoned and geographically restricting operating areas and strictly regulated operating hours were abolished (OECD 2008). Moreover, regulations on meter and price information were introduced.

Following liberalization, the supply of taxis increased, resulting in shorter waiting periods for customers, particularly in metropolitan areas (Statskontoret 2005). However, prices also increased more than the consumer price index throughout the 1990s (Löfvenberg and von Sivers 2009). OECD (2008) points out that the total effect of deregulation on prices is difficult to estimate since there are no statistics on prices for government paid rides. These account for more than half of total revenue in the taxi market. Moreover, prices before and after the deregulation are not adjusted for the quality improvements emanating from shorter waiting times.

3.2 Domestic aviation

The market for domestic aviation was liberalized in 1992. Price regulations were abandoned. Permits from the government to start flying a new route were granted to any Swedish airline company fulfilling the requirements of technological knowledge and economic stability. Appeal to regional policies could, however, be used to motivate exceptions from the principle of free competition. The new rules were initially only applied to Swedish airlines, but were extended to international airlines in 1997.

Initially, it was difficult for entrants to secure attractive takeoff and landing slots. Scandinavian Airlines (SAS), jointly controlled by the Swedish, Norwegian and Danish governments, continued to have a dominant market position. However, its position gradually weakened; its market share fell from 96 percent before 1992 to 47 percent in 2008 (Transportstyrelsen 2009). Moreover, the average ticket price for a domestic flight in Sweden fell by 7 percent in real terms from 2000 to 2008 (Transportstyrelsen 2009).

3.3 Postal services

In 1993 the formal postal service monopoly for addressed letters and packages of a maximum of two kilograms was abolished. However, the Postal Services Act still ensured that comprehensive postal services to everyone would still exist. A price ceiling was also introduced on individual items up to 500 grams (SOU 2005:4). The state-owned company Posten AB was formed to ensure that the Postal Services Act was sustained.

Ten years after the reform the market share of the state-owned company Posten AB still exceeded 90 percent. According to Statskontoret (2012) it has been difficult to analyze the effects of liberalization. One problem is that prices offered to large customers are negotiated and not public. Another problem is that new technology has changed how the distribution of mail is organized. Thus, it is difficult to determine whether and to what extent increased productivity is due to market liberalization or technological change, respectively. Nevertheless, Falkenhall and Kolmodin (2005) find that productivity, measured as delivered items of addressed mail per full-time employee, increased by 32 percent in 1994–2000.

3.4 Telecommunication services

In 1993 the Telecommunications Act and the Radio Communications Act opened up the telecommunications market for competition. Market entry regulations and licensing conditions for dominant operators were introduced (Statskontoret 2005). Moreover, the National Swedish Telecommunications Administration was transformed into Telia AB, which was initially 100 percent state-owned.

In 2000, Telia AB, was introduced on the stock market. Every Swede was guaranteed to buy at least 200 shares. However, the state retained majority control of the company. After the merger of Telia with the Finnish telecommunications company Sonera, the Swedish government still (May 2013) has an ownership share of 37 percent and ascertains *de facto* control of the company.

In 1993 most phone calls were made over the fixed copper network. After the deregulation Telia continued to own this network, thus having a monopoly of fixed-link subscriptions (Statskontoret 2005). However, technological development has profoundly eroded the effects of this monopoly. Mobile communications and fixed linked internet access have made it possible for other companies to enter the market and compete despite Telia's competitive advantage of owning the copper network. In new multi-household houses copper wiring is no longer installed.

Since the deregulation in 1993 the telecommunications market has undergone rapid technological development. A plethora of innovations has made it possible for consumers to use several different means in order to communicate (Hultkrantz 2002). Thus, in legal terms

the word electronic communications services is used rather than telecommunications services. Technological development in collaboration with market forces have spurred new innovations, made entry by many different actors possible and have resulted in sharply reduced prices of electronic communication. Moreover, productivity growth has been very strong in telecommunications since the mid-1990s (Erlandsen and Lundsgaard 2007). However, it is not possible to separate the productivity effects of liberalization from technological improvements.

3.5 Electricity market

The deregulation of the electricity market was implemented in 1996. Both the production and trading of electricity were opened up for competition, while distribution remained a legal monopoly (SOU 2005:4). It was emphasized that the network should be completely separated from production and trade. Initially, it was necessary for everyone who wanted to switch electricity providers to invest in costly equipment that could measure electricity consumption per hour. This requirement was abandoned in 1999 to make it possible for everyone to change electricity providers, if desired. In 2012, approximately 450 000 households changed electricity providers, which amounts to roughly 8 percent of all households (Statistics Sweden 2013b).

Electricity production is heavily concentrated; three firms account for nearly 90 percent of total output. Thus, it has been difficult for small producers to expand and challenge the leading incumbents (Statskontoret 2005). However, competition has been favored by the expansion of the electricity market to also include neighboring countries. No producer has a market share exceeding 20 percent at the Nordic level (Fridolfsson and Tangerås 2009). The price of electricity is determined on the joint Nordic power exchange, Nord Pool. The electricity price is to a large extent affected by the supply of water in reservoirs, which makes it difficult to compare price trends over time. In the first years after the reform electricity prices fell in the Nordic countries (Bergman 2002).

Fridolfsson and Tangerås (2009) evaluate the Nordic electricity market in terms of deviations from short-term competitive pricing. They find no evidence of a systematic abuse of market power. However, there is some evidence that electricity producers from time to time are able to take advantage of capacity constraints and obtain regional market power. Moreover, they

argue that market power may materialize in other ways, notably underinvestment in new capacity, exploitation of buyer power and low capacity utilization in nuclear energy plants (Fridolfsson and Tangerås 2011).

The largest electricity producer, Vattenfall, is still a government-owned company. Moreover, among all state-owned enterprises, Vattenfall has provided the largest dividend payouts to the government. This gives rise to a conflict between two competing government interests: a high return on government assets and a well-functioning competitive electricity market (Statskontoret 2005)

3.6 Railways

The deregulation of the railway industry has been carried out in different stages. In 1996 market entry for goods traffic was made free in principle, while free entry into passenger traffic was not introduced until 2010. The railway tracks have remained under government control.

In 1988 the infrastructure was separated from operations. Today, the Swedish Transport Administration is responsible for the construction and maintenance of the state-owned railroads. The state-owned company SJ continued to be responsible for railway services (Nilsson 2002). However, it was possible for private firms to compete in procurement of regional train services. Thus, in 1989 BK Tåg won a four-year contract and could conduct train services on a small scale. In the 1990s several private firms won contracts for non-commercial services (Nilsson 2002). However, SJ continued to have monopoly on the commercial railway services. Thus, competitors could only enter the market through procurement (Statskontoret 2012). In 2010 the market was deregulated and free entry was allowed. However, the effects of the deregulation have not yet been thoroughly evaluated.

In 1996 there was a complete deregulation of freight services in Sweden. In 2001 SJ was split into three separate firms: SJ for passenger services, Green Cargo for freight transport and Swedcarrier for real estate assets. In 2010 there were 15 different companies competing in the freight market (Vierth 2012). However, the market is still dominated by the state-owned company Green Cargo, with a market share exceeding 60 percent (Alexandersson and Hultén 2008).

3.7 Pharmacies

The Swedish pharmacy market was deregulated in 2009 when the state retail monopoly for pharmaceuticals was abolished. The scope for organizing provisions of pharmaceuticals to hospitals was extended, and the pharmacy retail industry was liberalized.

The state-owned company Apoteket AB was split up horizontally by letting four new entrants buy 465 pharmacies (Statskontoret 2012). Moreover, 150 pharmacies were sold to independent entrepreneurs. The remaining pharmacies (approximately 300) are still operated by the state-owned Apoteket AB.

According to Statskontoret (2012) the pharmacy deregulation is still difficult to evaluate properly because of data constraints and difficulties in isolating the effects of deregulation from the effects of other changes in the market.

3.8 Vehicle inspection

Compulsory vehicle inspections were introduced in Sweden in the early 1960s. In 2010 the inspections were deregulated. Firms accredited by the Swedish Board for Accreditation and Conformity Assessment are allowed to conduct car inspections. The state owned company AB Svensk Bilprovning is in the process of selling-off parts of its inspection facilities. It is too early in the process to evaluate the reform (Statskontoret 2012).

3.9 What can we learn from economic reforms in the Swedish product markets?

One important goal of the numerous product market reforms carried out in Sweden since the early 1990s was to create a more competitive environment in the various markets, which in turn was expected to result in positive productivity effects and more rapid economic growth.

An important conclusion is that it is often difficult to evaluate the exact impact of a specific product market reform. One reason is that it takes time from when the reform is implemented until it actually has any effects on competition, prices and efficiency. Other factors such as exogenous technological change can be driving productivity in a specific market. Thus, it is difficult to isolate the effects from a specific product market reform.

Another important conclusion to be aware of when evaluating the effects from product market reforms is that product market reforms in one sector can have large effects on productivity growth in other sectors. For example, if telecommunications have a good coverage and prices are competitive more people will use their mobile phones and mobile internet services; this is likely to positively impact on the performance of telecommunications-intensive industries. Hence, a country with many well-functioning markets has a larger potential for obtaining high productivity growth not only in specific industries, but also in the economy as a whole, as a result of spillover effects.

The Swedish reform process since the early 1990s also shows that every market experiencing deregulation has specific characteristics. For example, to provide electricity to households and firms, access to a network is necessary. By contrast, no binding constraint of a similar nature is faced by a person considering starting a taxi service. Hence, there is no blueprint for deregulation that can be applied across product markets. In order to reap the full benefits from deregulation of a specific product market, thorough knowledge of the relevant idiosyncratic factors is required and this knowledge needs to be used astutely in order for the reform to be successful.

A specific aspect of the Swedish product market reforms is that in all cases except deregulation of the taxi market, the reform process has involved the formation or restructuring of a company wholly or partly owned by the government. This is also indicated by the OECD product market regulation indicators where the category “state control” is still high for Sweden (figure 3).

A characteristic of most of the product market reforms carried out in Sweden since the early 1990s is that a state-owned company has retained a market leading position even after deregulation. The likely explanation for this state of affairs varies. In the case of Vattenfall, the government may want to make sure that strategic energy resources remain under government control. In postal services, railway transportation and telecommunications the government wants to secure that people living in remote and sparsely populated areas also have access to key services at affordable prices. A third explanation could be to make sure that the new deregulated market becomes well-functioning when it is opened up for new entry, in order to avoid the risk of having a private company that becomes too predominant.

The trend in Swedish product market reforms has been to keep at least one state-owned company in a leading position in the respective industries; the state actor has been expected to improve its performance while allowing for, and facilitating, the entry of new actors. This appears to be a successful strategy in the short run. However, as the different product markets evolve and mature, and where there is fierce competition, the rationale for retaining large state-owned companies as industry leaders gradually evaporates. Thus, the next logical step in the area of Swedish product market reform is to develop an exit strategy for state-owned companies operating in competitive markets. One example, where the Swedish state has gradually decreased its stake is the telecommunications company Telia. There is no reason for the government to continue to be involved as a controlling owner of companies in well-functioning markets.

4. Incentives to innovate in Sweden

The previous section investigated product market reforms defined narrowly and primarily examined market integration, competition policy and national regulation. This section will focus on the wide view of product market reforms, highlighting the reforms that Sweden has undertaken to promote incentives for entrepreneurship, R&D and innovation.

4.1 Entrepreneurship and innovation

In the last few decades it has become evident that entrepreneurship and innovation have grown increasingly important for explaining economic growth in industrialized countries (Baumol 2010). According to OECD (2005, p. 46): “An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations”. The two most common indicators of innovation are R&D spending and patents. It is important to be aware that spending on R&D is an input measure and does not measure technological change.

Entrepreneurship can be defined in many different ways. One of the first economists who emphasized the importance of entrepreneurship for economic development was Joseph Schumpeter (Schumpeter 1934). According to Schumpeter the entrepreneur’s role is to produce innovations by combining inputs in a novel manner to create value for the consumer. Moreover, an important characteristic for most definitions of entrepreneurship is that the

entrepreneur is seen as someone accomplishing change and promoting development (e.g., Parker 2009). Henrekson and Stenkula (2010) also note that the entrepreneur is not the only agent important for economic progress. Entrepreneurs are also dependent on complementary agents such as skilled labor, industrialists, venture capitalists and secondary markets.

In the economic debate about innovation, the system of innovation approach is often used as a framework to try to understand the role of innovation and entrepreneurship in economic development. According to Metcalfe (1995, p. 462–463) a system of innovations is “that set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process. As such it is a system of interconnected institutions to create, store and transfer the knowledge, skills and artifacts which define new technologies.” Braunerhjelm *et al.* (2012) argue that the system of innovation approach often has too narrow a focus on new technologies, while failing to emphasize incentives to innovate. Fagerberg, Srholec and Verspagen (2010) also argue in favor of a broader perspective on innovation. Thus, this paper will primarily deal with an incentives perspective on innovation within a few broad policy areas.

4.2 The development of innovation and entrepreneurship in Sweden

Sweden has been able to maintain a strong industrial base with a broad range of products and activities. During the last decades Swedish firms have also been able to integrate sophisticated service components into their products. In fact, all employment growth net since the mid-1990s consists of business services (Edquist 2010).

Swedish firms have substantially invested in intangible assets (Edquist 2011). Intangible investment can be defined as expenditures by businesses intended to increase output in the future that do not take the form of traditional physical capital (Corrado, Hulten and Sichel 2005). According to Corrado *et al.* (2005) these investments include software, R&D, mineral exploration, copyright and license cost, development cost in the financial industry, design, brand equity, vocational training and organizational structure. van Ark, Hao, Corrado and Hulten (2009) find that intangible investments account for a large share of GDP in many countries. In Sweden, intangible investment was almost 10 percent of GDP based on growth

accounting calculations and accounted for nearly 30 percent of labor productivity growth in the business sector in 1995–2006 (Edquist 2011).

An important intangible asset is R&D. *Figure 4* shows R&D spending by government and the business sector within the OECD. According to *Figure 4* total spending on R&D in Sweden was 3.4 percent of GDP in 2010. Thus, R&D spending as a share of GDP was only higher in three other countries, namely Israel, South Korea and Finland. Business spending on R&D accounted for almost 70 percent of total spending. It is evident that Swedish firms have invested considerably in R&D, although the share of R&D investments by firms has decreased since the early 2000s (OECD 2012).³ Moreover, a few large Swedish companies account for the lion's share of R&D investments. According to Statistics Sweden (2012a), the ten largest firms investing in R&D in Sweden accounted for 55 percent of total R&D investments in the business sector in 2011.

Sweden's economic development and innovation system has been based on a long-term co-operation between the state and industry. Public procurement has been a major driver of innovation and economic growth (OECD 2013c). According to OECD (2013c) Sweden has a highly favorable environment for operating a business. There is good access to bank lending, and venture capital is supplied through a combination of business angel activity and public support.

The proportion of high-growth firms [in employment], so-called gazelles, was among the highest in the Swedish service sector compared to other OECD-countries, but only about average in manufacturing in 2008 (OECD 2013c).⁴ Moreover, a survey by Henrekson and Johansson (2010) concludes that gazelles are outstanding job creators. All studies surveyed find gazelles to generate a large share of all net jobs. There is no evidence that gazelles are overrepresented in high-tech industries, but there is some indication of them being overrepresented in services. In Sweden, small and medium-sized enterprises have reasonably good access to bank loans, although somewhat less so for high growth firms compared to many other countries (OECD 2013c).

³ It may be noted that in the 1990s Sweden had the highest R&D spending as a share of GDP of all countries.

⁴ High growth firms are defined as firms with average annual growth in employees exceeding 20 percent over a three-year period.

Measuring innovation output is complicated. Different indicators only partially cover the impact of innovation. Many indicators have been collected for other purposes and may therefore be influenced by factors that have very little to do with innovation. The impact of different innovations also differs widely. Nevertheless, the OECD has developed a number of indicators. Some examples are royalty and license fees, patents and trademark applications, and academic publications and citations.

According to the OECD (2013c) Sweden performed very well in terms of innovation output. Sweden is among the world leaders in terms of scientific publications and patents per capita, although scientific performance is somewhat less impressive when citations are taken into account. In terms of patent applications per million inhabitants, Sweden is among the leading EU-countries. Sweden also performs well in terms of trademarks applications. Moreover, ICT has become increasingly important for innovation. Broadband penetration among Swedish households is 82.6 percent compared to the OECD average of 62.8 percent (OECD 2013c). Standard mobile broadband subscriptions are also significantly higher than in most other OECD countries.

As pointed out by the OECD (2013c) innovation is seldom an end in itself, but rather a means towards other goals such as increased productivity, market shares, revenue, profits or aggregate growth. Thus, aggregate indicators can therefore only be used to analyze the impact on an innovation system in a partial sense. However, keeping this caveat in mind, these indicators are still one important aspect to consider in the evaluation of a national innovation system.

4.3 Swedish innovation policy

According to the OECD (2013c), innovation activity requires a medium- or long-term horizon and a stable and favorable institutional environment. So far, Sweden appears to have been successful both in terms of innovation input and output. R&D and other intangible investment spending is high, and the same is true for scientific publications and patent applications per capita. Broad aggregate indicators such as productivity growth and economic growth have also been high since the mid-1990s. What are the characteristics of Swedish innovation policy, and what can be improved?

The purpose of this section is not to provide a complete description and analysis of Swedish innovation policy. Instead the focus will be on a few key areas which are deemed especially important for the incentives to innovate: the role of public policy actors, the higher educational system, research support, commercialization of research, publicly financed venture capital and loans, public procurement and tax incentives for innovation and entrepreneurship.

4.3.1 The role of public policy actors in Sweden

A number of different public actors at all levels of government are involved with the purpose of creating propitious conditions for innovations in the Swedish economy. The Ministry of Enterprise, Energy and Communication is responsible for innovation policy including enabling organizations, while the Ministry of Education and Research is responsible for schools, universities and research policy.

VINNOVA – the Swedish Governmental Agency for Innovation Systems – is Sweden’s innovation agency. Its mission is to promote sustainable economic growth by improving the conditions for innovation and funding needs-driven research. Another important agency for promoting innovation is the Swedish Agency for Economic and Regional Growth (*Tillväxtverket*). It is primarily involved in fostering entrepreneurship and promoting regional strategies to support innovations. Included in the Swedish state support system for innovations are also a number of government-funded research foundations such as the Swedish Research Council, the Swedish Foundation for Strategic Research, the Knowledge Foundation (*KK-Stiftelsen*) and the Foundation for Strategic Environmental Research.

All these foundations and government agencies form a network with the aim of providing opportunities for researchers and innovators to develop their ideas. However, there are few, if any, high-quality quantitative evaluations of these programs and organizations. In contrast to the US, Swedish evaluations tend to be focused on qualitative aspects (OECD 2013c). Even though examples exist where government action has been instrumental for innovation, such as the deployment of the GSM infrastructure in the 1990s, it is not evident that more resources to governmental agencies and foundations directly translate into more innovation output and economic growth.

4.3.2 Higher educational system

Most of the publicly funded R&D takes place in 40 university and university colleges in Sweden. Five of these universities – Karolinska Institutet, Uppsala University, Lund University, Stockholm University and the University of Gothenburg – receive almost 60 percent of total public R&D funding (OECD 2013c). Nevertheless, there has been a regionalization trend in Sweden since the mid-1970s. New universities and university colleges have been established and there is a university branch or a college in most large and medium-sized cities. The number of students participating in university education increased from approximately 216 000 in 1993 to 342 000 in 2011, i.e. by approximately 60 percent in two decades (Statistics Sweden 2013a). Moreover, there are specific research foundations like the Knowledge Foundation that are primarily focused on financing research in new universities and university colleges.

The age of graduation in tertiary education in Sweden is among the highest in the OECD. The average graduation age is 29 years compared to 24 in the UK (Uusitalo 2011). Swedish students enter university-level education later than the youth in other comparable countries and the average duration of university education is about five years, which is higher than the OECD-average.

In terms of academic output, Sweden performs well; the indicator showing scientific articles per 1 000 persons puts Sweden in second place after Switzerland. Moreover, a similar result is found for citations relative to population. Nevertheless, the annual growth in scientific publications has recently declined relative to the EU average. According to OECD (2013c) the average annual growth rate in scientific publications was 3.5 percent in Sweden compared to 5.1 for the EU. Karlsson and Persson (2012) find that in comparison to Denmark Finland, the Netherlands, Switzerland and the UK, the mean citation rate and the production of highly cited papers have declined.

Finally, it is worth noting that the higher educational system in Sweden is highly dependent on the performance of the educational system at lower levels. There are clearly indications of problematic developments in earlier stages of the Swedish educational system. International surveys such as PISA and TIMSS indicate that educational results in Swedish schools have declined since the mid-1990s, notably in mathematics and the natural sciences (OECD 2013c). Moreover, there seems to be inflationary problems with the grading system, which is used as

the primary selection mechanism for higher education. According to Vlachos (2010) the share of pupils with the maximum grade point average increased from 0.1 percent in 1997 to 3.5 percent in 2008, while the performance of Swedish pupils deteriorated in international tests.

4.3.3 Research support

Every four years the Swedish parliament decides on a bill on how to allocate and structure public research and innovation spending. In the Research and Innovation Bill 2013–16; the distribution of funding based on quality criteria and peer review was sharply increased (OECD 2013c). The bill specifically emphasized attracting top young researchers to Sweden.

Unlike many other countries, Sweden does not offer much direct public support to stimulate R&D in the business sector. Instead, support to R&D is based on funding from foundations and funding agencies, which are often partners in consortia. It is an interesting paradox that despite the near absence of direct R&D-subsidies, business R&D investment in Sweden is among the highest in the OECD.

4.3.4 Commercialization of research

In addition to teaching and research, Swedish universities are expected to encourage and facilitate commercialization of their research. To diffuse and commercialize knowledge is the “third mission” of universities, as mandated by the law governing public universities.⁵ Many universities have established technology transfer offices, incubators and science parks. Swedish incubators provide dedicated business support services to start-up and early stage firms. There are approximately 800 companies in these incubators employing 3 500 persons (OECD 2013c). Moreover, 4 000 companies are connected to a science park, trying to stimulate the flow of technology among university research departments and firms. Thus, entrepreneurship is an important goal of the Swedish academic sector (OECD 2013c).

Sweden also supports a system of “professor privilege” which implies that persons employed at universities, technical colleges and other academic institutions have the property right to the inventions that they make during their employment (Färnstrand Damsgaard and Thursby

⁵ Effective from 1998, this is spelled out explicitly in the regulation of the universities. The universities are exhorted to be open to influences from the outside world, disseminate information about their teaching and research activities outside academia, and to facilitate society’s access to relevant information about research results.

2013). The professor privilege strengthens the incentives for individual researchers to try to commercialize their inventions. Moreover, the inventor often has the best knowledge about the commercial potential of their products. However, giving all property rights to the inventor does not automatically create the best incentives for commercialization. According to Goldfarb and Henrekson (2003) there is a risk that the organization of the university environment creates disincentives for academic inventors. Hence, they argue that the system would work better if property rights were shared between universities and inventors; in the US, the Bayh-Dole Act awards universities the property rights to research financed by federal grants. However, the US system differs in many other dimensions as well, most notably that the universities themselves are highly competitive vying for talented students, faculty and research grants; in Sweden and most other European countries, they are tax-financed government bodies.

4.3.5 Publicly funded venture capital and loans

In Sweden the state is involved in facilitating financing for enterprise through venture capital and loans. The rationale behind this involvement is that venture capital markets seldom are efficient over the entire business cycle in small countries. Moreover, large private venture capital firms seldom provide early stage seed funding (Svensson 2011).

The principal government organizations involved in providing venture capital to firms are: Almi and the Swedish Industrial Development Fund (*Industrifonden*). Until 2012 the Innovation Bridge (*Innovationsbron*) was an independent state-owned limited company. In 2013 it was merged with Almi. It provides seed financing for the commercialization of ideas from universities and businesses that are based on new and advanced technologies. Firms are assisted through different channels such as seed funding, soft loans, equity investments and incubators. Almi is a public non-profit company that offers a combination of advice, business development and supplementary financing (OECD 2013c). The Industrial Development Fund is an independent foundation formed by the Swedish government. The Fund either invests in equity or provides loans. All investments are made on a commercial basis in cooperation with entrepreneurs and other investors.

Svensson (2011) evaluates the public support for early stage firms in the form of venture capital and loans. Public support is primarily needed at early stages and for R&D-intensive

projects. However, Svensson (2011) finds that too large a share of the public support is used at later stages when many firms already have a positive cash flow and would be able to obtain financing in the regular market. Svensson (2011) claims that the Innovation Bridge (now part of Almi) is the only government organization that fulfills the role of providing financing in cases that cannot be handled by the private market. He further argues that public funding should be based on matching funds from the business sector to the greatest extent possible, and public funding should be redirected towards earlier stage development.

4.3.6 Public Procurement

Demand-oriented policies have recently received increased attention. These policies are driven by the belief that, if appropriately designed, governments can shape innovation directly or indirectly. Public technology procurement occurs when a public agent places an order for a product or system that does not yet exist, requiring technological innovation for the order to be met (Edquist and Hommen 2000).

By being a lead user the government can also influence the diffusion of innovation. Moreover, demand directly created by government outlays can be a way to give small firms access to capital. Promotion of such outlays could also be attractive in a context of fiscal constraints.

Historically, public procurement has been important for the development of some of Sweden's largest companies. One example is the public procurement of AXE switches and the development of the GSM standard that helped Ericsson to thrive. Another is public procurement in electricity transmission, which benefited ASEA/ABB.

The OECD finds that Sweden, unlike the US, does not have a program that integrates SMEs into R&D procurement. The US has a small business innovation research (SBIR) program, which implies that a specified percentage of federal R&D funds are reserved for small businesses. SBIR funds the critical startup and development phases and it encourages the commercialization of the technology, product or service.

4.3.7 Tax incentives for innovation and entrepreneurship: owners and financiers

Tax policy affects returns on innovation and hence the incentive to innovate (OECD 2013c; Rosen 2005). The tax system is therefore a key public policy tool in setting the level of rewards for innovative entrepreneurship. The extent and design of the tax system affects the

net return on entrepreneurship, both directly and indirectly. It determines a potential entrepreneur's risk–reward profile and consequently his/her incentives for undertaking entrepreneurial activities. Extensive research has analyzed theoretical and empirical effects of the tax system; its effects are, however, often complex and sometimes counter-intuitive.⁶

An absolute increase of taxation of entrepreneurs lowers the (expected) after tax reward. It also makes expansion financed by retained earnings more difficult and negatively affects the liquidity position of an entrepreneur. A lower after tax return or higher expansion costs discourages entrepreneurial activities and impedes new start-ups and the expansion of firms. Taxation also alters the relative return of different activities if it favors one form of employment over another. As a result, a higher tax rate may encourage income shifting and thus positively influence (some form of) entrepreneurship in the economy.

It may be easier for self-employed to underreport income by avoiding registration of cash sales, to overstate costs by recording private expenses as business costs, or to frequently use more informal agreements that are hard for the tax authority to verify or disclose.⁷ When a business expands beyond a certain level, it becomes more difficult to exploit such tax avoidance opportunities.

Given that entrepreneurial incomes are more variable than salaried income, the average tax will be higher for entrepreneurs in a progressive tax system. A highly progressive tax system with imperfect loss offset therefore deters entrepreneurial business entry, and high marginal tax on entrepreneurial income (for high incomes) penalizes gazelles, or high-growth entrepreneurial ventures (Gentry and Hubbard 2000).

In sum, theory argues for both a positive and a negative relationship between taxation and entrepreneurship. The positive effects seem mainly to encourage unproductive (or destructive) entrepreneurship and non-entrepreneurial self-employment.

In order to calculate the total effect of taxation, one must consider corporate taxation's specific rules for depreciation and valuation and the taxation of interest income, dividends,

⁶ See Henrekson and Stenkula (2010) and Sanandaji (2011) for a more detailed discussion of the effects of taxes on entrepreneurship.

⁷ Engström and Holmlund (2009) estimate that the Swedish self-employed underreport their income by 30 per cent.

capital gains, and wealth. The effective total tax rates also depend on ownership category.⁸ In many developed countries, business ownership positions held directly by individuals and families have been taxed much more heavily than other ownership categories. The wave of tax reforms that swept the OECD in the 1980s leveled many of these differences (Jorgenson and Landau 1993). Those that still persist, however, spur an endogenous response in the ownership structure of the business sector towards the tax-favored owner categories (Rydqvist *et al.* 2011). If individual stock holdings are disfavored relative to institutional holdings and institutions are less willing to invest in small and new entrepreneurial projects, entrepreneurial activity could be hampered.

Most of the economic return from successful high-impact entrepreneurial firms comes as steeply increased stock market value rather than as dividends or large interest payments to the owners. As a result, the taxation of capital gains on stock holdings greatly affects the incentives for potential high-impact entrepreneurs, and high corporate and capital gains taxation may also discourage the venture capital industry (Da Rin *et al.* 2006). Successful entrepreneurs are also highly sensitive to wealth, property, and inheritance taxes.⁹ Certain assets are exempted from taxation in many countries, such as corporate wealth or pension savings, and the imputed value used as the basis for assessments is often based on arbitrary calculation rules. These rules may spur (like corporate wealth exemption) or discourage (like pension savings exemption) investments in entrepreneurial activities.

Until 1991 the Swedish tax system severely penalized new, small and less capital-intensive firms, while large firms and institutional ownership (pension funds, insurance companies etc.) were favored. For a long time there was large difference depending on the type of owner and the source of finance. Debt financing was most favored, while financing through newly issued equity was taxed most heavily. Households/individuals were taxed far more heavily than other owner categories; from the mid 1960s until 1991, the real rate of taxation for a household owning a successful firm continuously exceeded 100 percent (Davis and Henrekson 1997).

⁸ These kinds of highly complicated estimates have been made for a number of countries using the methodology developed by King and Fullerton (1984).

⁹ See Rosen (2005) for an overview.

The 1991 tax reform and some subsequent minor reforms leveled the playing field considerably for different combinations of owners and sources of finance. The abolition of the wealth tax on unlisted stock in 1992, and then for all assets in 2008, has strengthened this tendency even further.

The Swedish small business tax rules are complicated. The main reason for this is that the policy makers want to prevent that income from labor, which is normally subject to higher tax rates, is converted into capital income which is taxed at lower rates. For closely held firms there are particular restrictions on the payment of dividends, the so-called 3:12 rules. These rules were introduced in 1991 to prevent owners of profitable small businesses from saving on taxes by paying themselves dividends taxed at 30 per cent rather than wages taxed at the marginal tax rate for labor income. The scope for dividend payments was therefore restricted to a relatively small percentage of the equity capital paid by owners. The 3:12 rules also raised the capital gains tax on small businesses.

However, since 2006 a number of measures have been implemented that enable entrepreneurs' to have a larger share of their income taxed as capital income. In addition, the tax rate on such income was also lowered from 30 to 20 per cent (Edmark and Gordon 2013).

The main conclusion regarding the incentive effects of the tax system on innovative entrepreneurship is that the tax system is far more encouraging for individuals to start, develop and be controlling owners of firms compared to the situation in the 1970 and 1980s. But as we will see in the next subsection, the tax system is still very unfavorable for firms that would like to reward the entrepreneurial effort of their employees by granting them stock options, i.e. future ownership stakes in the firm at attractive rates when this is tied to continued employment in the firm.

4.3.8 Tax incentives for innovation and entrepreneurship: employees

A large part of the entrepreneurial function in a firm is carried out by employees who do not have any ownership stake in their firm; they will be remunerated through wage income, and the income they receive will be taxed according to the labor income tax schedule. Throughout the postwar period income taxes have been very high in Sweden, with marginal taxes reaching a high of 85 percent in the late 1970s.

One potentially useful instrument to stimulate employees to behave more entrepreneurially and to supply more entrepreneurial effort is stock options. In particular, stock options can be used to encourage and reward individuals who supply key competencies to a firm. In ideal circumstances, this would provide incentives that closely mimic direct ownership (Gilson and Schizer 2003). This is most important for entrepreneurs in certain industries where options serve as an effective response to agency problems.

The efficiency of stock options greatly depends on the tax code. If gains on stock options are taxed as wage income, some of the incentive effect is lost. This becomes particularly true if the gains are subject to (uncapped) social security contributions and if the marginal tax rate on wage income is high.

The situation changes dramatically if an employee with stock options can defer the tax liability until the stocks are eventually sold. The effectiveness is reinforced further if the employee suffers no tax consequences upon the granting or the exercise of the option and if the employee is taxed at a low capital gains rate when the acquired stock is sold. The US changed the tax code in the early 1980s along these lines, paving the way for a wave of entrepreneurial ventures in Silicon Valley and elsewhere (Lerner 2009; Bengtsson *et al.* 2013).

In Sweden, by contrast, the use of stock options to encourage entrepreneurial behavior among employees is highly penalized by the tax system; gains on options are taxed as wage income when the stock options are tied to employment in the firm. Thus, they are subjected both to mandatory social security (31.4 percent) and the marginal tax rate. Since the marginal tax rate is roughly 57 percent (even for moderate annual incomes) this entails a total tax rate of almost 67 percent. The firm that issues the stock options does not pay the social security tax until the stock options are exercised, and hence the firm cannot calculate the cost of its stock option plan. As a result, the Swedish tax code effectively renders impossible the use of stock options tied to employment. This is also a major impediment for the development of a venture capital industry like that of Silicon Valley. Instead, Swedish private equity firms are heavily concentrated in the buyout market, where it is far easier to construct tax-efficient remuneration contracts (SVCA 2012; Lerner and Tåg 2013).

4.4 How can incentives to innovate in Sweden be improved?

Although Sweden has been successful in terms of innovation input and output, our analysis shows that there are additional improvements in innovation policy that can be made in order to strengthen incentives for innovation, entrepreneurship and economic growth.

Our analysis shows that there is an important network of government agencies with the aim of providing opportunities for researchers and innovators to develop their ideas. Nevertheless, it does not appear obvious that more government resources directly translate into more innovation output and economic growth. In terms of aggregate R&D spending relative to GDP, Sweden already belongs to the top five countries in the world. These resources could be used more efficiently; redirecting government support to early stage funding in the form of seed capital and loans would be beneficial.

Despite the lack of direct R&D subsidies, business R&D investments in Sweden are among the highest in the OECD. As such, there is no need for general R&D subsidies in Sweden. However, our analysis shows that a few large Swedish companies account for the lion's share of private sector R&D. Moreover, high-growth firms, often called gazelles, generate a large share of all net jobs in Sweden and many other OECD countries.¹⁰ Thus, government policy should encourage R&D investments in SMEs to a greater extent. One way of doing so could be through public procurement. Swedish policy makers could look to the United States, where the Small Business Innovation Research (SBIR) program requires that a specified percentage of federal R&D funds is channeled to small businesses.

During the last two decades the higher educational system in Sweden has expanded considerably. The number of students enrolled in university education has increased by approximately 60 percent since the early 1990s. However, Swedish students enter university late (average age at graduation is close to 30) and the average duration is about five years. Whether it is wise that many students remain within the system for such a long time should be evaluated. The average length of many Swedish university programs could be shortened, allowing government resources to be used to encourage firms to invest in vocational training for employees. Since firms are likely to have better information than the government about the competencies they need, firm-driven vocational training would provide better employer–employee matching in the labor market.

¹⁰ See Heyman, Norbäck and Persson (2013) for a new detailed study on job creation in Sweden.

Sweden has a long tradition of supporting a system of “professor privilege” that gives the property rights of inventions to persons employed at the university, even if their research is funded by government grants. While this system provides strong incentives to innovate, it may not provide the best incentives for commercialization; sharing property rights between universities and faculty inventors could create better incentives for commercialization. However, it would also require new ways of organizing research and commercialization within universities. Moreover, state-owned universities should not be majority owners of companies based on a new innovation.

Tax policy affects the returns on innovation and thus, the incentives to innovate. Research shows that a large part of the entrepreneurial function in a firm is carried out by employees who do not have any ownership stake in their company. One way to stimulate employees to behave more entrepreneurially and increase their entrepreneurial effort is stock options. However, unlike many other countries, the use of stock options to encourage entrepreneurial behavior is penalized by the tax system in Sweden. Thus, we deem that lowering taxes on options to employees in firms would increase the incentives for innovation.

5. Conclusions

The Swedish economy has developed strongly since the mid-1990s, both relative to previous decades and relative to most OECD countries. One characteristic of Swedish economic development is the rapid labor and total factor productivity growth. Labor productivity growth has been particularly strong in manufacturing, with an annual growth rate of 6 percent. Considering the performance of the Swedish economy in recent years, it may be difficult to grasp that in the early 1990s Sweden experienced a severe economic crisis with negative economic growth for three years in a row, a loss of 13 percent of all jobs, a budget deficit peaking at 15 percent of GDP in 1993 and a short-term interest rate as high as 500 percent.

We have investigated two different policy areas that are believed to have been important for the economic development in Sweden during the last two decades, namely product market reforms and strengthened incentives to innovate. Product market reforms are defined as “changes in ‘market institutions’ with a view to have goods and services markets function better” (Pelkmans *et al.* 2008).

The first part of this paper investigated product market reforms concerned with market integration, competition policy, national regulation of product markets and the degree of openness to the global economy. The second part had a wider view on product market reforms and examined strengthened incentives to innovate and thus primarily focused on the business environment, entrepreneurship and the impact of R&D on innovation and growth.

Since the early 1990s a number of major product market reforms have been implemented in Sweden. We discuss reforms in the following markets: taxi services, domestic aviation, postal services, telecommunication services, electricity market, railways, pharmacies and vehicle inspection. A key finding is that it takes time from when measures are implemented until sizable effects on competition, prices and productivity materialize. Hence, it is often difficult to evaluate the exact impact of a specific product market reform. Moreover, product market reform in one sector or industry can have large spillover effects on productivity growth in other sectors.

An important characteristic of most of the product market reforms in Sweden in the early 1990s is that even after deregulation a state-owned company retained a market-leading position. Thus, there is a clear tendency that Swedish product market reforms have been carried out with the intention of having a state-owned company in a leading position, but putting pressure on them to improve by allowing for new entries to the market.

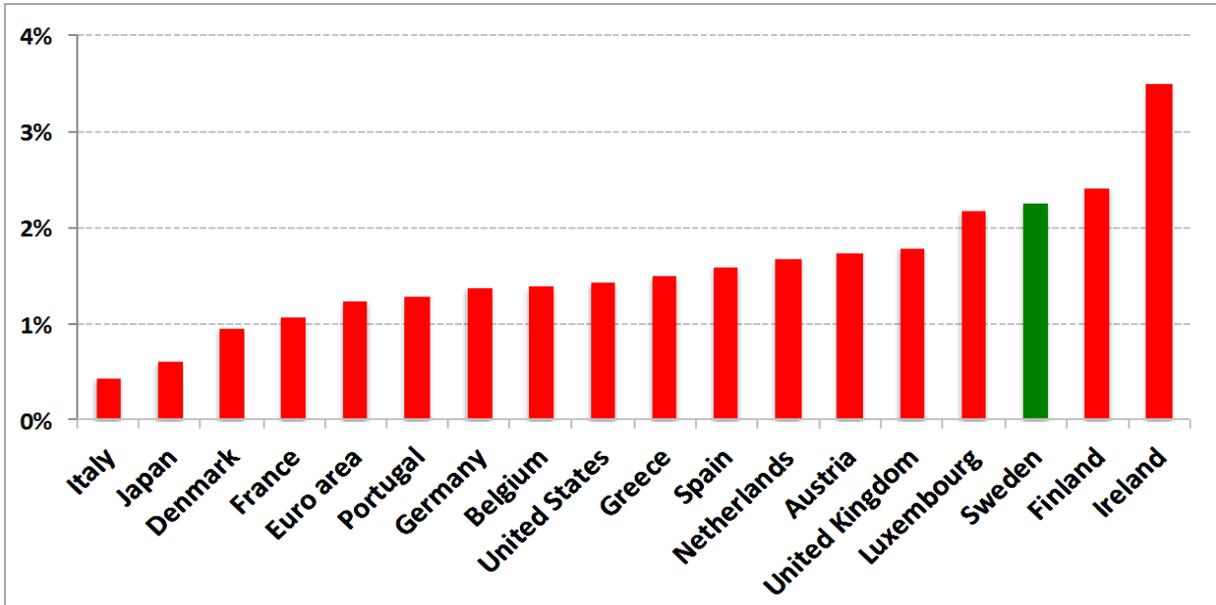
It is difficult to provide any sharp tests showing exactly how important product market reforms have been for economic development in Sweden since the early 1990s. Nevertheless, a strong case can be made that many of these reforms were *one* crucial factor behind the strong growth in Sweden since the mid-1990s. We believe there are still product markets that are overly regulated and would benefit from being liberalized. One example is the Swedish rental housing market, which is still heavily regulated. However, exactly how this liberalization would be carried out is beyond the scope of this paper. Moreover, in our judgment, the next logical step in the area of Swedish product market reform is the development of an exit strategy for state-owned companies operating in competitive markets. There is no reason for the government to continue to be involved as a controlling owner of companies in well-functioning markets.

Since the early 1990s Sweden has been successful in terms of innovation. Both Swedish firms and the government have invested substantially in R&D and other intangibles and Sweden belongs to the top five countries in terms of R&D investment per capita. Furthermore, innovation output in terms of scientific publications, citations and patent applications per capita is very high. However, the growth rate of scientific publications has declined relative to the EU average. R&D investment is also highly dominated by a small number of large multinational corporations. In 2011, the ten largest firms accounted for 55 percent of total R&D investments in the business sector.

Finally, we argue that there are a number of measures that could be taken in order to further strengthen the incentives to innovate. These include increased government support in terms of venture capital and loans in early-stage funding, increased R&D resources for SMEs, increased support for firms to invest in vocational training, lower taxes on stock options to employees and shared property rights between universities and faculty inventors.

6. Figures

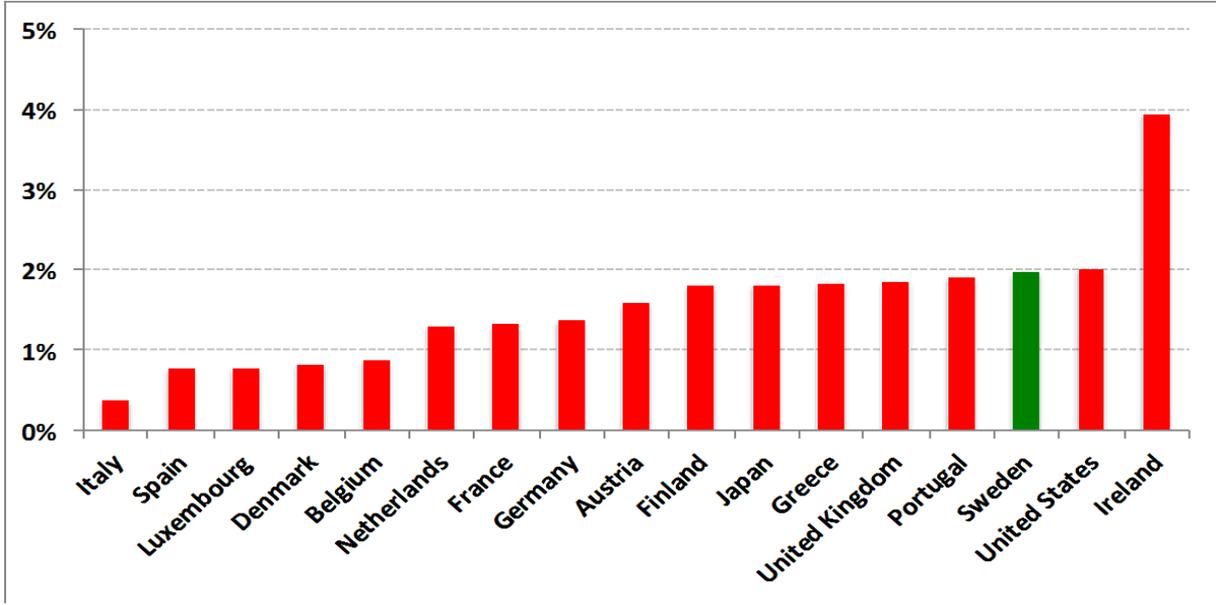
Figure 1 Annual GDP per capita growth in EU-15, Japan and the US in 1995–2011.



Source: OECD (2013b).

Note: The Euro-area includes all 17 Euro-member countries.

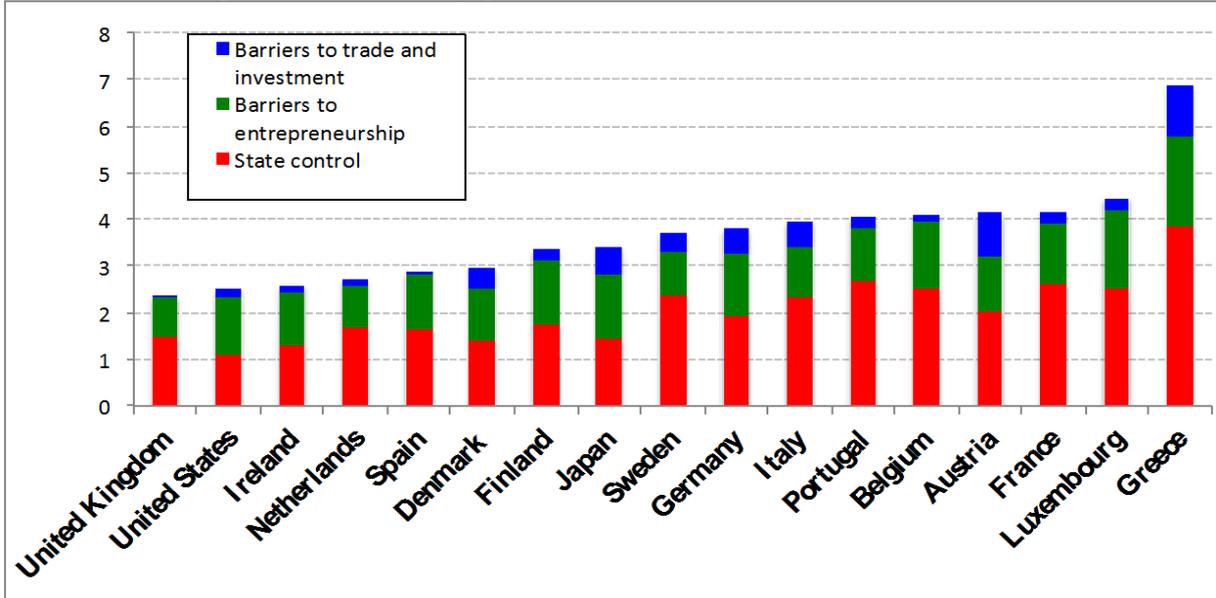
Figure 2 Annual labor productivity growth in EU-15, Japan and the US in 1995–2011.



Source: OECD (2013b).

Note: Labor productivity is defined as GDP per hour worked.

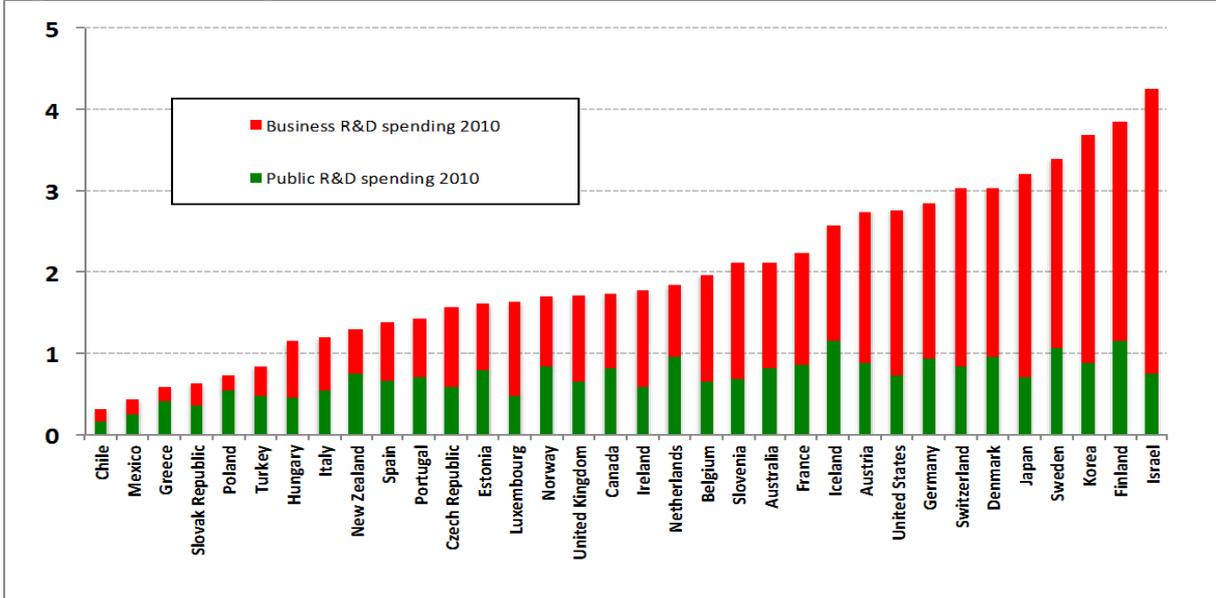
Figure 3 OECD product market regulation (PMR) indicators for three different categories in EU-15, Japan and the US in 2008.



Source: Wölfl et al. (2009).

Note: Countries are ranked on a scale from 0 to 6 for each of the three different PMR-categories.

Figure 4 R&D expenditures in OECD countries 2010.



Source: OECD (2012).

7. References

- Alexandersson, Gunnar, and Hultén, Staffan (2008), “The Swedish Railway Deregulation Path”, *Review of Network Economics*, Vol. 7, No. 1, pp. 18–36.
- Baumol, William J. (2010), *The Microtheory of Innovative Entrepreneurship*, Princeton University Press, Princeton, NJ.
- Bengtsson, Ola, Henrekson, Magnus, and Sanandaji, Tino (2013), “Entrepreneurship and Stock Option Taxation”, mimeo, Research Institute of Industrial Economics, Stockholm.
- Bergman, Lars (2002), “The Nordic Electricity Market – Continued Success or Emerging Problems?”, *Swedish Economic Policy Review*, Vol. 9, No. 2, pp. 51–88.
- Bergh, Andreas (2013), “The Rise, Fall and Revival of a Capitalist Welfare State: What are the Policy Lessons from Sweden”, *New Political Economy*, in press.
- Braunerhjelm, Pontus, Eklund, Klas, and Henrekson, Magnus (2012), *Ett ramverk för innovationspolitiken – Hur göra Sverige mer entreprenöriellt?* Samhällsförlaget, Stockholm.
- Calmfors, Lars (2012), “Sweden – From Macroeconomic Failure to Macroeconomic Success”, CESifo Working Paper Series, No. 3790, Munich.
- Corrado, Carol, Hulten, Charles, and Sichel, Daniel (2005), “Measuring Capital and Technology: An Expanded Framework”, in Corrado, Carol, Haltiwanger, John, and Sichel, Daniel (eds), *Measuring Capital in the New Economy*, University of Chicago Press, Chicago.
- Da Rin, Marco, Nicodano, Giovanna, and Sembenelli, Alessandro (2006). “Public Policy and the Creation of Active Venture Capital Markets”, *Journal of Public Economics*, Vol. 90, No. 8–9, pp. 1699–1723.
- Davis, Steven J., and Henrekson, Magnus (1997), “Industrial Policy, Employer Size and Economic Performance in Sweden”, in Freeman, Richard B., Topel, Robert, and Swedenborg, Birgitta (eds), *The Welfare State in Transition*, University of Chicago Press, Chicago.
- Edmark, Karin, and Gordon, Roger (2013), “Taxes and the Choice of Organizational Form by Entrepreneurs in Sweden”, *Industrial and Corporate Change*, Vol. 22, No. 1, pp. 219–243.
- Edquist, Harald (2010), “The Swedish Manufacturing and Service Sector Paradox”, IFN Working Paper No. 863, Research Institute of Industrial Economics, Stockholm.
- Edquist, Harald (2011), “Can Investment in Intangibles Explain the Swedish Productivity Boom in the 1990s?”, *Review of Income and Wealth*, Vol. 57, No. 4, pp. 658–682.
- Edquist, Harald, and Henrekson, Magnus (2006), “Technological Breakthroughs and Productivity Growth”, *Research in Economic History*, Vol. 24, pp. 1–53.
- Edquist, Charles, and Hommen, Leif (2000), “Public Technology Procurement and Innovation Theory”, in Edquist, Charles, Hommen, Leif, and Tsipouri, Lena (eds), *Public Technology Procurement*, Kluwer Academic Publishers, Norwell, MA.
- Engström, Per, and Holmlund, Bertil (2009), “Tax Evasion and Self-Employment in a High-Tax Country: Evidence from Sweden”, *Applied Economics*, Vol. 41, No. 19, pp. 2419–2430.
- Erlandsson, Espen, and Lundsgaard, Jens (2007), “How Regulatory Reforms in Sweden Have Boosted Productivity”, OECD Economics Department Working Papers, No. 577, Paris.
- ESA (1995), *European System of Accounts*, Eurostat, Brussels and Luxembourg.
- Fagerberg, Jan, Srholec, Martin, and Verspagen, Bart (2010), “The Role of Innovation in Development”, *Review of Economics and Institutions*, Vol. 1, No. 1, pp. 1–29.
- Falkenhall, Björn, and Kolmodin, Anne (2005), “A Broad Economic Analysis of the Effects of Liberalising the Postal Market – Documentation and Considerations for the Swedish Postal and Cashier Service Commission”, Swedish Institute for Growth Policy Studies, Östersund.

- Färnstrand Damsgaard, Erika, and Thursby, Marie C. (2013), “University Entrepreneurship and Professor Privilege”, *Industrial and Corporate Change*, Vol. 22, No. 1, pp. 183–218.
- Foster, Lucia, Haltiwanger, John, and Krizan, C. J. (2006), “Market Selection, Reallocation and Restructuring in the U.S. Retail Trade Sector in the 1990s”, *Review of Economics and Statistics*, Vol. 88, No. 4, pp. 748–758.
- Fridolfsson, Sven-Olof, and Tangerås, Thomas (2009), “Market Power in the Nordic Wholesale Electricity Market: A Survey of the Empirical Evidence”, *Energy Policy*, Vol. 37, No. 9, pp. 3681–3692.
- Fridolfsson, Sven-Olof, and Tangerås, Thomas (2009), “Nuclear Capacity Auctions”, IFN Working Paper nr 892, Research Institute of Industrial Economics, Stockholm.
- Gilson, Ronald J., and Schizer, David M. (2003), “Understanding Venture Capital Structure: A Tax Explanation for Convertible Preferred Stock”, *Harvard Law Review*, Vol. 116, No. 3, pp. 874–916.
- Goldfarb, Brent, and Henrekson, Magnus (2003), “Bottom-up versus Top-down Policies towards the Commercialization of University Intellectual Property”, *Research Policy*, Vol. 32, No 4, pp. 639–658.
- Gentry, William M., and Hubbard, R. Glenn (2000). “Tax Policy and Entrepreneurial Entry”, *American Economic Review*, Vol. 90, No. 2, pp. 283–287.
- Henrekson, Magnus, and Johansson, Dan (2010), “Gazelles as Job Creators: A Survey and Interpretation of the Evidence”, *Small Business Economics*, Vol. 35, No. 2, pp. 227–244.
- Henrekson, Magnus, and Stenkula, Mikael (2010), “Entrepreneurship and Public Policy”, in Acs, Zoltan J. and Audretsch, David B. (eds), *Handbook of Entrepreneurship Research*, Springer, New York.
- Heyman, Fredrik, Norbäck, Pehr-Johan, and Persson, Lars (2013), *Jobbdynamiken i svenskt näringsliv 1990 till 2009*. Expert Group for Public Economics (ESO), Ministry of Finance, Stockholm.
- Hultkrantz, Lars (2002), “Telecommunications Liberalisation in Sweden: Is “Intermediate” Regulation Viable?”, *Swedish Economic Policy Review*, Vol. 9, No. 2, pp. 133–161.
- Jorgenson, Dale W., and Landau, Ralph (eds) (1993), *Tax Reform and the Cost of Capital: An International Comparison*, Brookings, Washington, D.C.
- Karlsson, Staffan, and Persson, Olle (2012), “The Swedish Production of Highly Cited Papers”, Swedish Research Council, Stockholm.
- King, Mervyn A., and Fullerton, Don (eds) (1984), *The Taxation of Income from Capital. A Comparative Study of the United States, the United Kingdom, Sweden and West Germany*, University of Chicago Press, Chicago.
- Lerner, Josh (2009), *Boulevard of Broken Dreams: Why Public Efforts to Boost Entrepreneurship and Venture Capital Have Failed – and What to Do about It*. Princeton University Press, Princeton, NJ.
- Lerner, Josh, and Tåg, Joacim (2013), “Institutions and Venture Capital”, *Industrial and Corporate Change*, Vol. 22, No. 1, pp. 153–182.
- Lundgren, Stefan, Edquist, Harald, and Wallgren, Arvid (2007), *Tillväxt i otakt*, Konjunkturrådets rapport, Center for Business and Policy Studies, SNS Förlag, Stockholm.
- Löfvenberg, Natasha, and von Sivers, Therese (2009), “Prissättningen på den svenska taximarknaden”, Masters’ Thesis, Stockholm School of Economics, Stockholm.
- Metcalfe, J. Stanley (1995), “The Economic Foundations of Technology Policy: Equilibrium and Evolutionary Perspectives”, in Stoneman, Paul (ed.), *Handbook of Economics of Innovation and Technological Change*, Blackwell, Oxford and Cambridge, MA.

- Nicodème, Gaëtan, and Sauner-Leroy, Jacques-Bernard (2004), “Product Market Reforms and Productivity: A Review of the Theoretical and Empirical Literature on the Transmission Channels”, Economic Papers No. 218, European Commission, Brussels.
- Nicoletti, Giuseppe, and Scarpetta, Stefano (2003), “Regulation, Productivity, and Growth: OECD Evidence”, World Bank Policy Research Paper No. 2944, Washington D.C.
- Nilsson, Jan-Eric (2002), “Restructuring Swedish Railways: The Unintentional Deregulation”, *Swedish Economic Policy Review*, Vol. 9, No. 2, pp. 229–254.
- OECD (2005), *Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data – Third Edition*, OECD, Paris.
- OECD (2007), *OECD Reviews of Regulatory Reforms Sweden: Achieving Results for Sustained Growth*, OECD, Paris.
- OECD (2008), *Taxi Services Regulation and Competition*, Directorate for Financial and Enterprise Affairs Competition Committee, OECD, Paris.
- OECD (2012), *OECD Science, Technology and Industry Outlook 2012*, OECD, Paris.
- OECD (2013a), *OECD Labor Force Statistics Database*, OECD, Paris.
- OECD (2013b), *OECD National Accounts Database*, OECD, Paris.
- OECD (2013c), *OECD Reviews of Innovation Policy: Sweden 2012*, OECD, Paris.
- Parker, Simon C. (2009), *The Economics of Entrepreneurship*, Cambridge University Press, Cambridge.
- Pelkmans, Jacques, Acedo, Lourdes, and Maravalle, Alessandro (2008), “How Product Market Reforms Lubricate Shock Adjustment in the Euro Area”, Economic Papers No. 341, European Commission, Brussels.
- Rosen, Harvey S. (2005), “Entrepreneurship and Taxation: Empirical Evidence”, in Kannianen, Vesa and Keuschnigg, Christian (eds), *Venture Capital, Entrepreneurship, and Public Policy*, MIT Press, Cambridge, MA.
- Rydqvist, Kristian, Spizman, Joshua, and Strebulaev, Ilya (2011). “Government Policy and Ownership of Financial Assets”, NBER Working Paper No. 17522, National Bureau of Economic Research, Cambridge, MA.
- Sanandaji, Tino (2011), *Essays in Entrepreneurship Policy*, Doctoral Dissertation in Public Policy, Irving B. Harris Graduate School of Public Policy Studies, University of Chicago, Chicago.
- Schumpeter, Joseph (1934), *The Theory of Economic Development*, Harvard University Press, Cambridge, MA.
- SOU 2005:4, *Liberalisering, regler och marknader*, Final report from the Regulatory Reform Commission, Fritzes, Stockholm.
- Statskontoret (2005), *Six Deregulations: Liberalisation of the Markets for Electricity, Postal Services, Telecommunications, Domestic Air Traffic, Rail and Taxi Services in Sweden*, Report 2005:8, Swedish Agency for Public Management, Stockholm.
- Statskontoret (2012), *Utvärdering av om- och avregleringar – en kartläggning*, Report 2012:10, Swedish Agency for Public Management, Stockholm.
- Statistics Sweden (2012a), “Forskning och utveckling inom företagssektorn”, Statistiska meddelanden, UF 14 SM 1201, Stockholm.
- Statistics Sweden (2012b), *Nationalräkenskaper, detaljerade årsberäkningar 1950–2010*, vissa data 1950–2012, www.scb.se.
- Statistics Sweden (2013a), *Befolkningens studiedeltagande 1993–2011*, www.scb.se.
- Statistics Sweden (2013b), *Prisutvecklingen på el- och naturgas samt leverantörsbyten, fjärde kvartalet 2012*, Statistics Meddelanden EN 24, Stockholm.

- SVCA (2012), *Swedish Venture Capital Association: Annual Report 2011*, available online (June 1, 2013): http://www.svca.se/PageFiles/807/SVCA_arsrapport_2012.pdf
- Svensson, Roger (2011), "När är statligt stöd till innovativa företag och entreprenörer effektivt?", Confederation of Swedish Enterprise, Stockholm.
- Syverson, Chad (2004), "Market Structure and Productivity: A Concrete Example", *Journal of Political Economy*, Vol. 112, No. 6, pp. 1181–1222.
- Syverson, Chad (2011), "What Determines Productivity?", *Journal of Economic Literature*, Vol. 49, No. 2, pp. 326–365.
- Transportstyrelsen (2009), *Inrikesflygets förändringar: trender och behov*, Swedish Transport Agency, Norrköping.
- Uusitalo, Roope (2011), *Vad förklarar svenska universitetsstudenters höga examensålder*, Expert Report No. 2 to the Medium-Term Survey, Department of Finance, Stockholm.
- Van Ark, Bart, Hao, Janet, Corrado, Carol, and Hulten, Charles (2009), "Measuring Intangible Capital and its Contribution to Economic Growth in Europe", *EIB Papers*, Vol. 14, No. 1, pp. 62–93.
- Vierth, Inge (2012), "Uppföljning av avregleringen av godstrafiken på järnväg", VTI Report No. 741, Swedish National Road and Transport Research Institute, Linköping.
- Vlachos, Jonas (2010), *Betygens värde – En analys av hur konkurrens påverkar betygssättningen vid svenska högskolor*, Swedish Competition Authority, Stockholm.
- Wölfl, Anita, Wanner, Isabelle, Kozluk, Tomasz, and Nicoletti, Giuseppe (2009), "Ten Years of Product Market Reforms in OECD Countries – Insight From a Revised PMR Indicator", Economics Department Working Papers No. 695, OECD, Paris.