

**DIRECTORATE FOR SCIENCE, TECHNOLOGY AND INNOVATION
COMMITTEE ON DIGITAL ECONOMY POLICY**

Working Party on Measurement and Analysis of the Digital Economy

MEASURING THE SWEDISH DIGITAL ECONOMY

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This document, prepared by Irene Ek, Swedish Agency for Growth Policy Analysis, summarises the main findings of a study on “Measuring the Swedish Digital Economy”, prepared for the Swedish Ministry of Enterprise, Energy and Communications in 2014. The study analyses how the digital economy contributes to economic growth, how it influences the business conditions that spur entrepreneurship and how statistics and analysis can support the evidence-based policies in the Digital Economy.

Delegates are invited to discuss the presentations and share information about similar initiatives in their country.

The document is proposed for discussion under item 9 of the agenda.

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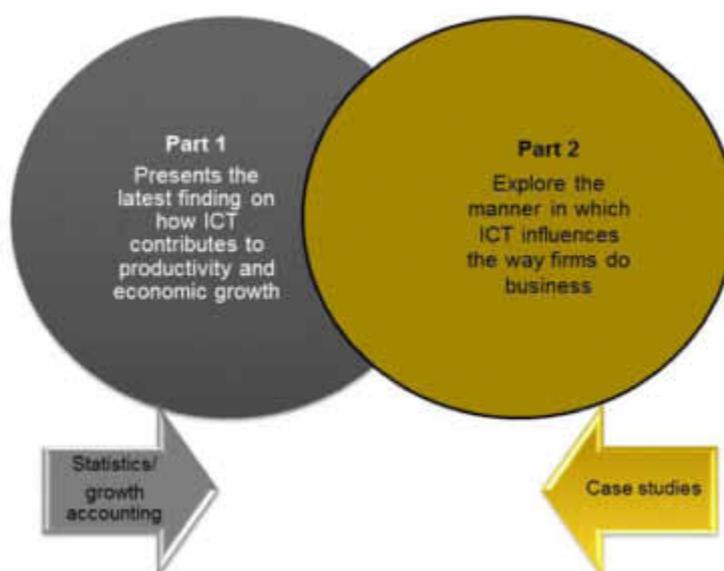
1. The background to this policy brief is that the increased importance of ICT in driving Swedish productivity growth has overturned Robert Solow’s paradox “that computers were found everywhere except the productivity statistics”. However, the growing number of studies and often seemingly contradictory results make it hard to keep track of the state of evidence (Cardona, Kretschmer et al. 2013). In order to evaluate the evidence base, Swedish policymakers requested additional analysis.

2. Measurement issues are of big importance to ICT studies. A major puzzle is why the measurement agenda is still struggling with different views about the basic assumptions. Policymakers need guidance in order to choose appropriate evidence, which holds up to scrutiny, as well as analysis of how the results can guide them in the selection and shaping of political alternatives.

The Ministry assignment

3. In 2014 the Swedish Ministry of Enterprise, Energy and Communications asked the Swedish Agency for Growth Policy Analysis (Growth Analysis) to analyse how the digital economy contributes to economic growth and how it influences the business conditions that spur entrepreneurship. The Swedish ministry requested that the results should be reported in two parts (Figure 1). Part 1 presents the latest findings on how ICT contributes to productivity and economic growth. Part 2 explores the manner in which ICT influences the way firms do business.

Figure 1. Part 1 and part 2 in the ministry assignment on the digitalisation of the Swedish economy



4. To address the questions raised by the existing evidence on ICT and productivity (Part 1), Growth Analysis used the following empirical evidence:

- A short literature review on ICT and productivity.
- New growth accounting calculations based on Swedish national accounts data from the years 1995–2013.
- OECD indicators from *Measuring the Information Economy and Society* and other OECD documents.

5. To address the questions raised by the existing evidence on how ICT influences the way firms do business (part 2) Growth Analysis used the following empirical evidence:

- A short literature review on how ICT transforms the way firms do business.
- A multi-stakeholder hearing with researchers, companies and policy makers that came together in order to discuss how to delimit the focus of the illustrative case studies.
- New case studies focusing on firms outside the ICT sector.

New evidence to guide policy

Part 1 - Productivity and digitalisation in Sweden

6. Sweden was an early adopter of comprehensive broadband penetration and has a large number of advanced users. This infrastructure is a good steppingstone towards growth but it is not necessarily a growth driver in its own.

7. The digitalisation process was introduced early in the Swedish private sector. The Swedish Agency for Growth Policy Analysis presents new data that shows that the contribution of the ICT-sector and the ICT-investments between 1995 and 2005 amounted to 32 per cent of the total productivity growth of the Swedish economy (Growth Analysis, 2014).

8. Despite economic development fluctuations, the impact and importance of the digitalisation process has increased in the economy. New calculations by Growth Policy Analysis indicate that between the years 2006–2013 the ICT contribution to the economy has grown larger. During the same period the ICT-sector and the ICT-investments in the entire Swedish economy contributed 42 per cent to the total productivity growth.

9. This big growth-potential is due to the fact that the whole private sector reaps the benefits of the digitalisation process. All sectors invest in new technology but, so far, the ICT-sector is showing the largest productivity gains. Our new findings show that the ICT-sector accounted for 42% of total growth in labour over 1995–2013.

10. This productivity growth, which the ICT-sector is generating, is geographically linked to Stockholm, where the ICT sector is mainly located. The new calculations, done by Growth Policy Analysis, show that between 1995 and 2005 Stockholm accounted for 50 percent of the productivity growth. A change occurs between 2006 and 2013 and the contribution for Upper Norrland and Eastern Central Sweden is now noticeable.

11. Company IT-investments are not solely responsible for growth. New studies show that new technologies need to be complemented by e.g.: organisational changes, staff education, in order for the new technologies to be implemented successfully. Because a number of factors concur to create productivity growth, it can take some time before the results become evident.

Part 2 – How ICT transforms the way firms do business

12. This section summarises the main interim findings of part 2 on how ICT transforms the way firms do business. Five illustrative case studies will be used to investigate the matter further before the final report is delivered to the Swedish ministry in January 2015.

13. The emergence and intensive utilization of ICT heavily affect the opportunities and efficiency of how firms produce and provide goods and services.

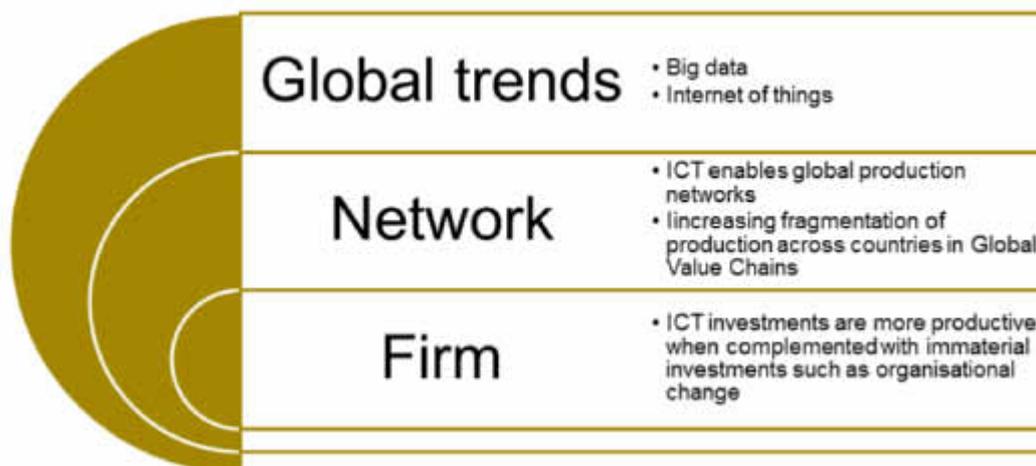
14. Previous evidence show that the relevance of ICT in the Swedish economy is not confined to the ICT-sector only. The uptake of ICT throughout the economy has the potential to enhance productivity gains in user sectors. In addition, the ongoing digital transformation can enlarge market reach and reduce operational costs of companies. Furthermore, it induces changes in business processes and provides opportunities for setting up new businesses and jobs (OECD, 2013a).

15. A growing research literature addresses the rise of digital business. Three categories of change become visible in the literature (Figure 2). First, there is a growing body of literature that analyse *global trends*, such as big data analytics and the internet of things (Brynjolfsson, Hammerbacher et al. 2011; Brynjolfsson and McAfee 2014). Beyond internet firms, the rest of the ICT sector recognise smart and interconnected devices forming the Internet of Things as well as big data as a new business opportunity. Some estimates suggest that the global market for “big data technology and services” will grow from USD 3 billion in 2010 to USD 17 billion in 2015 (OECD, 2013b).

16. Second, ICT enabled global production *networks* or so called global value chains (GVC) has been greatly facilitated by rapid advances in ICT (Ivarsson and Alvstam 2009; Ivarsson and Alvstam 2011). The international dispersion of activities requires coordination of their locations. Cheaper and more reliable ICT-enabled communication has decreased the cost of co-ordinating complex activities over long distances both within and between companies.

17. Finally, in a short amount of time, the use of ICT has gone from concerning a few specialists to permeating entire *firms* (Arh, Blažič et al. 2012; Tambe, Hitt et al. 2012; Kowalkowski, Kindström et al. 2013). However, organizational complements are considered crucial to ICT’s influence on productivity, which are presently proven even hard to pin down with statistical evidence (Part 1). An illustrative case of how ICT drives business performance can be essential when governments improve their identification of policy priorities in order to drive growth.

Figure 2. The rise of digital business



18. It could be argued that success in the digital economy where competitors from all over the world can emerge seemingly overnight will require policymakers and business leaders to go back to the drawing board to identify and build capabilities in their spheres of influence.

Evidence-based policy analysis

Map existing policies

19. Everyone recognises that Sweden needs a strong digital economy. This has led to a profusion of somewhat competing government initiatives. The e-Government Delegation was launched to enhance the development of digitalised public services. The Committee for Digitalisation was established in 2012, to monitor the progress in terms of fulfilment of the policy goals of the Swedish Digital Agenda.

20. What aspects of the digital economy is it possible to measure and monitor today? What does the latest evidence say that can be used to develop a policy rationale for interventions that support a digital economy? There could be serious consequences if these questions remain unanswered.

Government initiatives – The Swedish delegation for e-Government

In 2009 the Swedish government launched the e-Government delegation to enhance the development of digitalised public services and create good opportunities for inter-agency coordination in the area.

The delegation has now been working for four years and recently delivered recommendations on a renewed governance model for future e-Government. The delegations official report state that the Swedish public administration should be built on a 'life events-perspective' where the citizen's needs and demands are in focus. In order to move in this direction, it is argued that a critical success factor is increased interaction between the central and local government sectors.

The current governance model consists of independent agencies and local self-government. As the current governance model is firmly established, and almost impossible to change, the e-Government delegation proposes a new body of cooperation based on a membership structure. The new organization should re-enforce the collaboration between the central and local government.

21. This section presents a short policy mapping with the key features of Swedish policies used to support the digital economy. The focus is on how Swedish policy makers go about putting the digital economy on the agenda. New evidence, built on a qualitative content analysis of the selected policy reports, is presented here. An in-depth analysis of the policy reports listed in Table 1 shows a number of initiatives which all give somewhat similar recommendations and highlights infrastructure and matters that are close to the state such as e-government and public e-services and improved IT-competence especially in the education system.

22. Economic growth and the digital way of doing business are areas that are, to a large extent, absent in the policy documents. This was surprising, as the evidence presented in this policy brief, supports the view ICT reaches far beyond matters close to the state and is a strong driver of economic growth. Furthermore, the evidence also points to a need to accommodate ICT in other policies such as industrial policy, entrepreneurial policy, trade policy and innovation policy. This is a serious challenge.

Table 1 Policy mapping - Sweden

| Policy report | Ministry responsible | Description |
|--|--|--|
| ICT for everyone – A digital agenda for Sweden (2011) | Ministry of Enterprise, Energy and Communication | To enhance Sweden's role as a prominent ICT nation but as ICT spans many policy areas the aim is to highlight ICT as enabler in to attain various policy goals (e.g. regional growth, green growth). |
| Organise the future e-government, by the e-Government Delegation | Ministry of Enterprise, Energy and Communication | To propose an e-gov. strategy and coordinate the selected innovation support in the area. Finally to coordinate standardisation issues. |
| A digital agenda to serve the citizens'; a bright future can be ours, by The Committee for Digitization (2014) | Ministry of Enterprise, Energy and Communication | To monitor progress in terms of meeting the policy goal of the Swedish Digital Agenda; that Sweden should become the best in world at exploiting the opportunities of digitization. |
| The Swedish Budget Bill for 2015 - A Sweden that keeps together | The Swedish Government / Ministry of Finance | This bill highlight that a good physical and IT infrastructure is needed throughout the country. |

A new framework for policy analysis

23. It is evident that fully reaping the benefits of ICT poses tremendous challenges for policy makers and entrepreneurs alike. The evidence previously presented exemplifies areas that are important to the development of the Swedish digital economy. From a policy point of view, the aim of the evidence presented above is to highlight areas where Swedish policy makers need to focus their attention.

24. This paper argues that it is important to take full advantage of insights offered by empirical studies. The policy making process can benefit from taking explicit accounts of features from the real world that are often neglected in a more theoretically informed policy discussion.

25. The current policy brief suggests that statistics (part 1) in combination with case descriptions (part 2) can be used to illustrate how existing ICT policy could be extended to better support the Swedish digital economy. The evidence previously presented demonstrates potential policy-level challenges that have not yet been addressed.

26. The current policy brief extends the spring-up of literature that focus on the evidence-based policy-making process (Monaghan, 2010). The guiding principle, when developing a framework for an evidence-based policy-making process, grew from an understanding that if policies are designed to promote the digital economy, companies cannot be perceived as black boxes. Figure 1 below illustrates how the policy analysis is based on a combination of both statistical evidence (part 1) as well as company cases (part 2) in a bottom-up process.

27. The use of a multi-method approach to analyse policy has been neglected in the evidence-based policy literature (Kay 2011; Heikkila and Gerlak 2013). There are serious consequences if this neglect continues; efforts to develop evidence-based policy-making in the field of ICT will suffer if the nature of digital business remains unexplored. Currently little efforts have been made to provide a basis in the form of a multi method policy analysis framework. The current framework allows for an injection of case studies that show how ICT transforms the way firms throughout the economy do business.

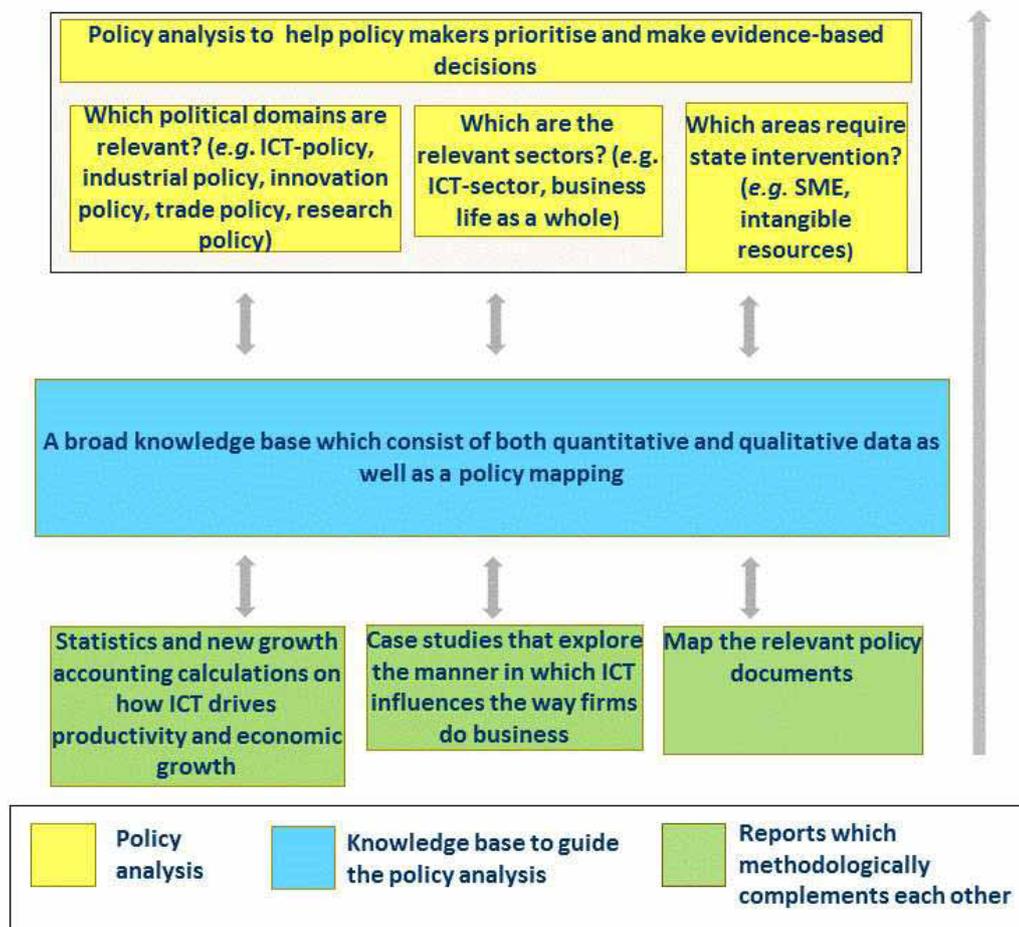
28. The new framework (Figure 1 below) builds on a multi-method approach. Initially the Swedish ministry articulated their need in a ministry assignment. The bottom-up process proceeds as three aggregate themes, specific to the Swedish digital economy, are defined. The first theme is how ICT drives productivity and growth (part 1). Second, to explore the manner in which ICT changes the way firms do business (part 2). Finally, to facilitate policy learning, the most important policy documents are identified and analysed to understand the existing policy rationale (part 3). Evidence gathered from the three themes makes up a broad knowledge base, which serves as a base from which to conduct the policy analysis.

29. This analysis suggests that the following issues are important to promote the Swedish digital economy:

- i. Which political domains are relevant, e.g. ICT-policy, industrial policy, innovation policy, trade policy or research policy?
- ii. Which are the relevant sectors, e.g. ICT-sector or the economy as a whole?
- iii. Which areas require state intervention, (e.g. SME, intangible resources)?

30. The answers to these questions are summarised below to identify the most relevant policy implications.

Figure 3. Framework for evidence-based policy based on multiple methods



31. Digitalisation transforms the economy and the primary beneficiaries will be those who adapt their capabilities and assets and fully exploit the potential of new technologies. The new evidence presented here suggests that Swedish policymakers, who, for years, have focused on ensuring infrastructure and matters close to the state, now need to adopt a broader perspective that highlight the use of ICT throughout the economy.

32. The evidence presented in this paper supports the view that ICT reaches far beyond matters close to the state such as infrastructure and the public sector. There is a need to accommodate ICT in other relevant policies e.g. industrial policy, innovation policy, trade policy and research policy.

33. A good case can also be made that the policy-making process needs to take on board both a strong ICT sector as well as the big growth potential that arise when the all of the private sector reaps the benefits of the digitalisation process.

34. Finally the evidence has shown that the existing policy rationale, which focuses on infrastructure and the public sector, should be extended. There is presently an underutilisation of evidence that point out to market failures in the private sector.

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