A Digital Single Market -

Growing the Baltic Sea Region

An Economic Impact Analysis

Pernilla Johansson
Joakim Lundblad

sustainable growth innovation competitiveness
Baltic Development Forum
Microsoft
top of digital Europe

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Europe

ICT Think Tank
for the Baltic Sea Region

Top of Digital Europe is an independent, non-profit think tank that promotes the Baltic Sea Region as a leader in the ICT sector. Top of Digital Europe facilitates cross-border dialogue and public-private initiatives with the ambition to strengthen the digital economy in the Baltic Sea Region. Top of Digital Europe is a joint initiative of Baltic Development Forum (BDF) and Microsoft. We are welcoming new partners.

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EXECUTIVE SUMMARY

Our economy is being updated. There is no exclusively "digital economy" that acts in parallel to or in isolation from the "old economy". Rather, digitization is fundamentally transforming the conditions and behaviors throughout the economy as we know it.

This report estimates the economic impact of growing a regional single digital market in the Baltic Sea Region, a potential digital forerunner in Europe. By estimating the economic impact based on a set of core digital indicators, the estimations show gains that can be reached within a number of years rather than the long-run economic impact of a digital single market.

The empirical analysis builds on two steps: (1) calculating how a digital single market may affect digital infrastructure, digital readiness, and digital goods and services in a Baltic Sea Region context, and (2) to estimate the productivity gains associated with those changes. The calculations build on the assumption that a single market creates the opportunities for each country in the Baltic Sea Region to reach the level of the best performer in the region. The analysis also considers effects on consumer surplus and e-procurement.

The results show that an integrated regional digital market is associated with substantial gains. GDP in the Baltic Sea Region could increase annually by EUR 29 billion, with an additional 4 billion in consumer surplus and 4 billion in e-procurement. This effect arises from an increased take-up rate in fixed broadband, improved e-skills and increased e-commerce. Hence, by extending the digital single market to more areas, the gains could be even greater.

It is also evident that each country has something to gain from the market integration, and that Poland adds decisively to the total economic impact of a joint market. A single market with a highlevel of digital readiness in terms of e-skills shows the highest impact, although it may take the longest time to realise.

Four policy recommendations are put forward: (1) to strengthen the cooperation and integrate Poland further in Nordic-Baltic co-operation, (2) to establish a cross-border benchmarking task force to facilitate further integration bottom-up, (3) to investigate and map the dynamics of supply and demand of digital skills over time in the region, and (4) to engage in joint efforts to expand and improve e-procurement.

FOREWORD

In 2012, Baltic Development Forum (BDF) and the Baltic Sea Chamber of Commerce Association (BCCA), supported by the Swedish Agency for Economic & Regional Growth, launched the report "Priorities Towards a Digital Single Market in the Baltic Sea Region".

The report mapped out policy issues with respect to their scope for a regional solution and their potential economic impact. Barriers and key economic drivers were discussed in relation to each other and with respect to the potential of solving them within the Baltic Sea Region. The work appears to have gathered attention from a wide range of stakeholders in the region and beyond.

The EU Commission has identified the completion of a digital single market as a political priority. In June 2015, the European Council agreed on a Digital Single Market strategy with 16 initiatives towards creating a truly connected digital single market. Given this background, it is timely to update the original report in view of the political and technological developments since then.

This report analyses key barriers and drivers of the digital economy, estimating the potential economic impact of a digital single market in the Baltic Sea Region. It proposes concrete initiatives that will support and pave the way for releasing this potential while complementing national and EU policies with tangible, joint regional action.

Rather than duplicating EU policies, this work offers a complementary regional scope that could identify shortcuts to a coherent single market. It takes into consideration recent EU policy initiatives and provides inputs to how the EU Strategy for the Baltic Sea Region can support the removal of unjustified barriers to the cross-border provision of services.

It is our hope that this report will serve as a policy tool, road map and policy list, stimulating the current debate on the implementation of a Digital Single Market in a regional as well as a European context.

We would like to thank the authors, Pernilla Johansson, Senior Economist at the Chamber of Commerce and Industry of Southern Sweden, and Joakim Lundblad, PhD Candidate at Lund University. We would also like to thank Top of Digital Europe Advisory Board for comments and ideas.

The report is launched alongside the first edition of the "State of the Digital Region" report that aims at giving an annually updated overview of the Baltic Sea Region´s digital position and achievements. The two publications complement each other.

Have a good read!

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1 INTRODUCTION

An integrated digital market in the Baltic Sea Region (BSR) would add up to a 65+ million market. It is just one step on the way to a European single digital market and a global digital market, but it is all the same a very productive step to take.

This report is part of a project aimed at exploring a regional approach to a digital single market in the BSR. It is published together with the first State of the Digital Region report, (Top of Digital Europe 2015 b), which provides a comprehensive overview and analysis of the current state of digitization in seven BSR countries (Finland, Denmark, Sweden, Estonia, Lithuania, Latvia and Poland). This report is aimed at expanding that analysis in two ways: (1) by estimating the economic impact of an increasingly integrated digital market in the region based on a set of core digital indicators, and (2) by putting those estimations into a near-future forecasting scenario. Both reports explore the same story, but from somewhat different perspectives. The two reports complement each other, and they can be read together or separately.

UPDATING THE ECONOMY

Following the dotcom bubble in the early 2000s, even though the hype of the information and communication technologies (ICT) sector was all but gone, the new digital technology continued to be adopted by and integrated into other sectors and parts of society. Instead of being ends in themselves, computers and connectivity more and more became means to leverage technology in business, public administration and society at large. This was the beginning of the digitization we are now in the middle of.

The integration of ICTs doesn't follow the pattern of a new vertical sector. Instead it goes horizontally through organizations as well as the entire economy. ICTs are increasingly proving to be a new, general-purpose technology, something that can be applied throughout the entire economy. For instance, the internet has disrupted everything from how people navigate in new cities and get in touch to how they buy books or groceries and how they work.

In a not-so-far future, 3D-printing will challenge the logistics of how we produce and transport goods, the internet of things (iot) will connect a rapidly growing number of sensors and smart devices to the net and allow us to interact with them, and blockchain technology may change they way we think of money, payment and transactions overall. Marc Andreessen, iconic internet entrepreneur and venture capitalist, coined the phrase "software is eating the world" to describe how this integration of ICTs and software is substituting old business models through a form of creative destruction. Software-based business simply outcompetes old business models by leveraging the benefits of connectivity and matching between supply and demand online.

Between the dotcom bust and now, growing efforts in the area of ICT policy have been directed towards showing that ICTs affect the entire economy beyond the footprint of the vertical computer industry, i.e. digitization is not a niche phenomenon. Accordingly, a lot of analyses have been made to showcase the theoretical potential of the digital economy - or more specifically, to translate the potential of digitization from technology to economics. For instance, the total direct and indirect value of re-use of public sector information (PSI), or open government data, was estimated to 140 billion EUR annually among 27 EU member countries in 2011 (Vickery 2011). Many of these estimates span an interval from very large numbers, and they are in most cases hard to relate to and anchor in real policy-making and even more so when it comes to business. However, these analyses filled an important function in demonstrating that policy-makers in all areas and on all levels should pay more attention to digitization, which they also have.

It is now becoming increasingly evident that there is no exclusively "digital economy" that acts in parallel to or in isolation from the "old economy". Rather, digitization is fundamentally transforming the conditions and behaviors throughout the economy as we know it - from broadband connections and smartphones to e-commerce, automation and the internet of things. Our economy is being updated. In line with this, a European digital single market (DSM) is essentially a technology-enabled market expansion combined with the emergence of new data-driven enterprises and consumer behaviors. With the use of ICTs, individual consumers and SMEs can access global markets that historically were restricted to larger enterprises with the means to establish themselves physically in each country to which they expanded.

This fundamentally changes the conditions for the relation between supply and demand at any location. Sellers can reach potential consumers all over the world, and buyers can choose from suppliers all over the world. Conversely, this also means that competition has become global, i.e. that a local supplier who chooses not to provide online sales, will still meet global competition since local customers can shop products from anywhere online. That is, any business can choose to make their business digitally available, but few if any businesses can choose not to be part of the digitally enabled competition.

At the same time, there is a growing demand for knowledge- and data-intensive services among both businesses and consumers. It spans a wide variety of examples, including buying content in virtual gaming worlds, leveraging big data to improve business, researching your next purchase or uploading a video podcast. Together, these two developments of geographic and content expansion have paved the way for entirely new types of business models and enterprises, micro-multinationals, that are born global and digital (Top of Digital Europe 2014).

However, all of this also warrants the need for new analyses and estimates, which treat this economic development in a short-term or intermediate timeframe, rather than in terms of long-run theoretical potentials. In short, there is a demand for policy foundations that account for how digitization can realistically and locally affect economic development within the next five to fifteen years. This input is essential in order to provide the necessary knowledge for policy-makers to act on now, in order to realise the full potential in the longer run. Just as technology, policy-making is going to have to evolve iteratively and become increasingly better at adapting to changes in the surroundings. That is, there is a need for short-term, sober scenarios to bridge the gap between where we are today and where we want to be in 50 years.

A BALTIC SEA REGIONAL PERSPECTIVE

The European Commission has made digitization and a digital single market a top priority, and the Digital Agenda for Europe constitutes a focal point for this development and a crucial knowledge hub with the Digital Agenda Scoreboard. Even so, the heterogeneity between member countries is significant and it is hard to imagine any set of collective policy initiatives that implemented across the board will achieve a joint market on their own.

There is a need for a complementary policy level between the national government in each country and the EU-wide Digital Agenda. This report makes a case for growing a regional single digital market in a bottom-up manner. Many, if not most, obstacles to a digital single market are not necessarily purely technical in nature, but also relate to social dimensions such as culture, language and norms.

According to the report "Priorities Towards a Digital Single Market in the Baltic Sea Region" (BDF and BCCA 2012), the single biggest challenge reported by interviewed policy-makers and business leaders was to establish trust between domestic markets and trust in the digital platforms. This means that growing a joint market between any two countries is essentially also tied to growing trust and common ground between not only large enterprises but also startups, SMEs and individual consumers in both these countries. This is no small task, and it requires holistic, EU-wide initiatives as well as regional approaches between member countries. These also tie into each other.

This approach should not be thought of as a competing policy initiative alongside the digital agenda, but rather as an iterative and adaptive development cycle within that of the Digital Agenda for Europe - a way to test, adapt and improve policy tools to promote development on a smaller geographical and temporal scale. In short, it could be thought of as a learning process. A regional digital single market approach contributes to a European digital single market primarily in three ways: (1) as an experimental living lab to collect experience and knowledge about transnational regional obstacles to digital market expansion, (2) to generate positive spillover effects to neighboring countries and thereby continue the market expansion, and finally (3) to scale up successful practices to include additional member countries or to implement in other regions within the EU.

Bearing this in mind, neither a regional nor a European market should be seen as the end of this digital market expansion. They are milestones on the way to an increasingly more global digital single market. However, if the current trend continues, many European countries may end up more connected to the rest of the world than to their neighboring countries, something that would fragment the European market and hold back its long-term potential.

There are several EU-wide initiatives that will strongly contribute to the development in this region, the foremost examples being the Digital Agenda for Europe and the Digital Single Market Strategy adopted by the European Commission.[1] For example, the Digital Single Market Strategy addresses the need to improve cross-border e-commerce and ties together initiatives to harmonize the rules for sellers as well as to improve cross-border parcel delivery and strengthen the enforcement of consumer rights. The strategy also emphasises e-skills as a key component for future work and is developing a specific e-government action plan for 2016-2020. The Digital Agenda for Europe promotes the continued improvement of digitization in each country, for instance with respect to digital infrastructure and broadband penetration.

Together, these two initiatives address all three indicators in detail in this report. These EU-wide approaches are in turn complemented by national agendas aimed at improving digitization and its positive impact on the economy. However, these initiatives can be complemented and supported by cross-border regional actions that focus on localized challenges and opportunities, for instance improving cross-border exchanges of human capital and increasing trust.

The Baltic Sea Region (BSR) is especially apt for such a regional approach. In this report, the BSR refers to Sweden, Denmark, Finland, Estonia, Latvia, Lithuania and Poland, leaving out Germany, Russia, Iceland and Norway. The Nordic countries have had a long run as digital frontrunners with high degrees of technology adoption and a strong culture of technology-driven entrepreneurship. The Baltic countries are proving to be quick learners as well as fast movers and they are well positioned to make important leaps in technology take-up and use, for instance when it comes to wireless broadband and the use of ICTs in public service. Poland may appear to be lagging behind in terms of percentages and relative measures of digitization, but in sheer size the Polish market may well prove to be a key piece in both supplying ICT skills and a growing customer demand base for new goods and services.

Together these countries make up a market of over 65 million people, some of them early adopters and avid digital citizens, but a whole lot more moving into digitization in the near future. Whether they do so together or as digital islands may make a world of difference in terms of economic impact (Top of Digital Europe 2015 b).

[1] *http://ec.europa.eu/priorities/digital-single-market/docs/dsm-communication_en.pdf* and *https://ec.europa.eu/digital-agenda/en*

FILLING TWO GAPS

This report is an attempt to fill the two gaps described above: supplying estimations between long-run potential and the current state, and providing a regional scope on the emergence of a European digital single market.

The analysis is based on a model to estimate the economic impact associated with each of the countries in the region catching up to the leader in three categories of measures: *infrastructure, digital readiness* and *digital goods and services*. For each category we use an indicator that is tangible and has a proven economic impact. This approach allows us to estimate the effect in a comprehensive framework, allowing comparable estimates of a regional digital single market. The focus of this framework is solely on effects associated with enterprise and trade. However, the results are supplemented with a related analysis of effects on consumer surplus and public service.

The primary aim of this project has been to provide a simple, accessible and transparent model, based on tangible, "hard" numbers in order to anchor the results to near-future policy measures. Accordingly, the results do not provide extraordinary predictions about future growth, but rather realistic and tangible results that are within reach in five to ten years. We also focus on specific areas of a digital single market; hence, the gains could be greater by extending the efforts to even more areas.

Data, methods and results are readily available for others to re-use or adapt, either to test new hypothesis or to update the results with new data in the future. The methods are described at length in the appendices and the data is provided from open sources online.

2 DIGITAL SINGLE MARKET AND ECONOMIC IMPACT

Digital technologies have already made a major contribution to economic growth. Between 2001 and 2011, estimations indicate that digitization accounted for 30% of GDP growth in the EU (Van Welsum, D. et al. 2013). But barriers still remain both at the EU level and in the BSR, preventing the full potential of the digital economy to be reached. A digital single market (DSM) can resolve those digital barriers and create productivity and growth. This section defines the content of a digital single market and discusses its potential economic impact.

1 DIGITAL SINGLE MARKET DEFINITION

The European Commission defines a digital single market as one "in which the free movement of goods, persons, services and capital is ensured and where citizens, individuals and businesses can seamlessly access and exercise online activities under conditions of fair competition, and a high level of consumer and personal data protection, irrespective of their nationality or place of residence" (EC 2015, p.3).

More specifically, Copenhagen Economics (2010) includes the following areas of a digital single market for Europe:

A harmonised and integrated European market without barriers between EU member states hindering the use of digital and online technologies and services

A single market which encourages cross-border online trade

A single market which encourages investments in new online services and applications

A single market with a high level of e-skills and e-readiness

A single market which encourages investment in digital infrastructure

In a BSR perspective, the digital single market makes it just as easy for a consumer or an enterprise in one country to access online information, goods and services in another country in the region. Hence, a fully functioning digital single market presents businesses in the region with a potential customer base of more than 65 million people. Excluding Poland from this effort would instead create a market of about 27 million people.

2 BUSINESS PERSPECTIVE: IMPACT ON PRODUCTIVITY

The key variable for the impact of the digital economy is size. A sizeable customer base enables companies to make full use of ICT to scale up for productivity gains, creating growth along the way. It also provides incentives to invest in the underlying digital infrastructure and digital skills. Although the digital economy might affect several areas of society, the main focus of this report is on productivity.

Productivity measures the efficiency in the production process, i.e. the efficiency in which enterprises turn inputs into outputs. Usually, productivity is measured as labour productivity. This corresponds to the total output per worker or per hours worked. Productivity is important because the higher the productivity of a country, the higher the living standards that it can afford and the more options it has to choose from to improve well-being.

A digital single market can influence productivity and thereby economic well-being by increasing the customer base and creating incentives for digital investments. Lorenzani and Varga (2014) discuss two important transmission channels:

The efficiency in the production process increases when enterprises use digital technologies and/or recourse to online sales

The intra-sectoral allocative efficiency of resources in the economy increases when digital skills improves the capacity of enterprises to react to changes in the competitive environment

Hence, productivity gains can arise from enterprises' actual use of digital technologies, but there are also several theoretical reasons to assume that they arise from the effect of organisational learning, flexibility, and adoption of innovative practices. In addition, in a rapidly developing high-tech environment, digital skills may play a role in improving the capacity to efficiently respond to changes in competitive and economic conditions.

3 CONSUMER PERSPECTIVE AND PUBLIC SECTOR

The digital single market also holds a great potential for consumers. It makes it easier to reach a greater range of suppliers, to browse products and gather information from other consumers in order to make informed decisions and to switch from one supplier to another if goods or services are not satisfactory, thereby increasing consumer welfare.

Another important area for the impact of a digital single market is the public sector. For instance, effective e-government can provide a wide variety of benefits including more efficiency and savings for governments.

3 AREAS OF FOCUS

We focus the analysis on three areas of the digital single market: digital infrastructure, digital readiness and digital goods and services. Those areas are found to be the main drivers for the economic impact of the digital economy (for example Copenhagen Economics, 2010). They also correspond to the three priority areas of the EU Commission's strategy to create a Digital Single Market for Europe. We use a specific indicator to measure the current state of each area. This approach allows us to estimate the effect in a comprehensive framework, allowing comparable estimates of a regional digital single market. This section sets out the issues and discusses the indicators.

1 DIGITAL INFRASTRUCTURE

Digital infrastructure is an important driver of the economic impact of digitization as all digital services depend on infrastructure for delivery. It includes areas like broadband, mobile connectivity and software infrastructure. In the EU Commission's strategy, digital infrastructure relates to the second pillar: creating the right conditions and a level playing field for digital networks and innovative services to flourish (EC 2015).

Recent literature shows that it is not only the existence of the infrastructure that is important but also to what extent the infrastructure is being used. The literature identifies broadband internet-enabled employees to be those most clearly related to productivity, at the firm as well as at the industry level (for example Hagsten 2014 and Grimes et al., 2012). Therefore, in this report, we use the percentage of enterprises connecting to the internet via fixed broadband to reflect digital infrastructure.

2 DIGITAL READINESS

Digital readiness, i.e. the ability to take advantage of the digitization process, is another important driver of the economic impact. From a business perspective it is of importance to have the right skills and processes to be able to reap the benefits of digitization. Readiness corresponds to the third pillar of the EU Commission's Digital Agenda Strategy: Maximising the growth potential of the digital economy.

The underlying economic rationale is supported by a long-standing literature on the role of human capital and skills in improving the allocative efficiency, and thereby the productivity, of the economic system. The recent empirical literature focuses on the role of human capital in the productivity-enhancing process of digital technology: for instance, Hagsten and Sabadash (2014) find that the proportion of ICT-intensive human capital in enterprises has a positive impact on productivity. In this report, we use the percentage of people employed with ICT specialist skills to reflect digital readiness.

3 DIGITAL GOODS AND SERVICES

Cross-border e-commerce is an important part of the digital single market as it provides increased choice and economies of scale. It allows both consumers and businesses to enjoy a wider variety of goods and services and lower prices through increased price competition. Also, it allows businesses to benefit from cross-border e-commerce by exploiting economies of scale that reduce costs, increase efficiency and promote competitiveness, thereby improving productivity. The first pillar of the EU Commission's strategy focuses on providing better access for consumers and businesses to digital goods and services across Europe.

The empirical literature on the effect of e-commerce is wide. One strand of the literature focuses on the effect on international trade. For example, Francois et al. (2014) show that e-commerce reduces distance-related trade costs. Another strand of the literature focuses on the effect from the consumer perspective, finding lower and less dispersed online prices, more price-elastic online demand, and sizeable gains in terms of consumer surplus of e-commerce (for example Duch-Brown and Martens 2014). The third strand of the literature focuses on productivity gains from e-commerce. Falk and Hagsten (2015) find that the percentage of enterprises that made electronic sales has a positive impact on labour productivity. The effect arises when enterprises that sell online reach a larger customer base and thereby exploit economies of scale, i.e. the cost of producing per unit is lowered when production is higher. Also, when more enterprises sell online competition deepens, creating incentives to increase efficiency. In our analysis, we focus on the percentage of enterprises that made electronic sales.

3.1 | E-PROCUREMENT

In relation to the public sector, we focus on e-procurement as it provides savings and efficiency gains. Copenhagen Economics (2010) identifies two economic effects of e-procurement: competitive effects and operational savings and transparency. First, cross-border e-procurement increases accessibility to the procurement process, thereby increasing competitive effects. Second, e-procurement lowers the barrier to entry for small and medium-sized enterprises, thereby promoting and spurring growth. Also, a common, cross-border platform for e-procurement could improve work efficiency by streamlining the procurement process, reducing disputes in procurement processes, and improving the enforcement of regulations. Hence, it could create operational savings both in the procurement process and in the public sector in general. Data shows that contracting authorities that have already switched to e-procurement are estimated to save between 5 and 20 per cent (EC 2012).

4 METHOD

In the empirical analysis, we estimate the potential economic impact of each area of a digital single market in a BSR context. Impact figures are provided for each country in the region. The estimations build on two steps:

1. First, we calculate to what extent the digital single market might affect identified variables within the three categories of measures: *infrastructure, digital readiness* and *digital goods and services*.
2. Second, we estimate to what extent the change in the identified variables affects productivity and thereby the economy in terms of GDP impact. In addition, we estimate the effect on consumer surplus and savings in the public sector.

The first-step calculations build on the assumption that a single market creates the opportunities for each country in the BSR to reach the level of the best performer in the region. For example, regarding enterprises connecting to the internet via fixed broadband, Finland is the best performer with a take-up rate of 100 per cent. In the empirical analysis, we thereby calculate how much each country has to improve the take-up rate to reach 100 per cent. Hence, we focus on a reachable and tangible goal for each area.

Of course, this type of calculation also faces caveats. On the one hand, it rules out the possibility of the best performer to improve, thereby underestimating the effect (although this is not possible in terms of broadband take-up rate in Finland). On the other hand, it might be the case that the implementation of the digital single market does not account for the entire improvement of the variable of interest. In this case, the estimations overestimate the effect of the digital single market. Also, we focus on specific areas of a digital single market; hence, the gains could be greater by extending the efforts to even more areas. The approach nevertheless provides a transparent approach that focuses on a reachable improvement.

Hence, the economic impact estimations show gains that can be reached within a number of years rather than the long-term economic impact of a digital single market.

The second step estimations build on the method used by Lorenzani and Varga (2014).[2] In line with their work, we use elasticities from the empirical literature to calculate the effect on productivity. For each area of interest, we apply the relevant elasticity and calculate the effect on labour productivity.[3] We also calculate the effect in terms of GDP and GDP per capita. When calculating the consumer surplus and savings in the public sector, we apply a slightly different approach, which is presented below.

The empirical literature is extensive. However, only recently has the literature been able to use micro-level data at the firm level. We use these recent empirical estimations that rely on a unique panel of micro-aggregated firm-level data for 14 European countries spanning over the years 2002 to 2010 (e.g., Hagsten 2014). The data has been compiled within an EU-funded project, which involved partners from 14 European statistical offices, supported by academic advisors. The database includes information for Austria, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Slovenia, Sweden and the UK.

[2] We follow the method Lorenzani and Varga (2014) use to estimate partial-equilibrium results. In addition, they estimate a dynamic stochastic general equilibrium model in order to simulate the long run macroeconomic impacts. Due to the lack of such a model for the BSR and to a shorter time perspective, we do not apply corresponding estimates.

[3] Appendix A1 provides a detailed description and discussion of the impact elasticities.

5

ECONOMIC IMPACT ANALYSIS

The impact analysis focuses on the business sector and productivity effects (section 5.1). For each category of measures: infrastructure, readiness and goods and services, we present figures on the current state, the assumed improvement and the estimated impact. In section 5.2 we estimate the potential impact on consumer welfare and the public sector from e-commerce and e-procurement.

1 IMPACT ON PRODUCTIVITY

1.1 | DIGITAL INFRASTRUCTURE

Digital infrastructure, measured as enterprises connecting to the internet via fixed broadband, varies in the BSR from 85 per cent in Poland to 100 per cent in Finland (**table 1**). The average for the region equals a take-up rate of 94 per cent, somewhat higher than the EU average of 92 per cent. Excluding Poland, the BSR average reaches 96 per cent. Assuming that each country catches up to the leader, a digital single market has the potential to improve the take-up rate in Poland by 15 percentage points and by less in the other countries. In all countries except Sweden, the calculated change in the take-up rate falls below the perceived change over the last five years.

To calculate the effect on labour productivity, we use an elasticity from the empirical literature estimating the relationship between enterprises connecting to the internet via fixed broadband and productivity. Following Hagsten (2014), an increase by 1 percentage point in the percentage of employees with access to fast broadband is on average associated with an increase in labour productivity by 0.11 per cent.[4] See appendix A1 for a detailed discussion of the elasticities. The calculations indicate that the effect on labour productivity ranges from 0.2 per cent in Denmark to 1.6 per cent in Poland, the latter corresponding to a GDP effect of EUR 7 billion. However, calculating the more policy relevant GDP per capita variable, the effect is most important in Sweden.

TABLE 1

IMPACT OF FIXED BROADBAND

	Enterprises connecting to the internet via fixed broadband, 2014	Change since 2009 (p.p.)	Change to BSR best (p.p.)	Effect on labour productivity (%)	GDP effect (million EUR, 2014 prices)	GDP per capita effect (EUR)
Sweden	93	5	7	0.7	3223	335
Denmark	98	18	2	0.2	551	98
Finland	100	6	0	0.0	0	0
Estonia	96	10	4	0.4	84	65
Latvia	92	31	8	0.9	206	101
Lithuania	96	39	4	0.4	155	52
Poland	85	27	15	1.6	6631	173
EU28	92	10	0	0.0	0	0
BSR excl. Poland	96	18	4	0.4	4218	156
BSR incl. Poland	94	19	6	0.6	10849	166

Sources: Eurostat and own calculations

In sum, the effect of the digital single market in terms of digital readiness amounts to an annual increase of GDP by EUR 12 billion for the BSR. Excluding Poland, the impact decreases to slightly below 3 billion and the GDP per capita effect is almost halved.

1.2 | DIGITAL READINESS

Digital readiness, as measured by those employed with specialist ICT skills, ranges from 1.8 per cent of the workforce in Lithuania to 4.4 per cent in Sweden (**table 2**). As opposed to digital infrastructure, digital readiness has deteriorated in most countries in the region over the past five years. Also, at the EU level, the number of employed with specialist ICT skills has declined as a percentage of the workforce. As for the impact of the digital single market, the expected improvement reaches as much as 3 percentage points in Lithuania.

TABLE 2

IMPACT OF PROFESSIONAL E-SKILLS

	Employed with ICT Specialist Skills, 2013 (%)	Change since 2008 (p.p.)	Change to BSR best (p.p.)	Effect on labour productivity (%)	GDP effect (million EUR, 2014 prices)	GDP per capita effect (EUR)
Sweden	4.4	-0.6	0.0	0.0	0	0
Denmark	4.0	-0.3	0.4	0.3	880	156
Finland	4.4	0.0	0.0	0.0	72	13
Estonia	3.3	0.3	1.2	1.0	200	156
Latvia	1.9	-1.3	2.5	2.2	531	260
Lithuania	1.4	-0.4	3.0	2.6	961	319
Poland	1.8	-1.0	2.6	2.3	9554	250
EU28	2.4	-0.8	0.0	0.0	0	0
BSR excl. Poland	3.2	-0.4	1.2	1.0	2643	98
BSR incl. Poland	3.0	-0.5	1.4	1.2	12198	187

Sources: Eurostat and own calculations

[4] The calculations use the most conservative estimates of elasticities which correspond to the elasticity in the service sector.

The effect on labour productivity follows from the estimations in Lorenzani and Varga (2014). They find that an increase by 1 percentage point in the percentage of those employed with specialist ICT skills is associated on average with an increase in labour productivity by 0.9 per cent (see appendix A1 for details). Applying this elasticity to the assumed change in the Baltic Sea region, the impact on labour productivity ranges from close to zero in Finland to 2.6 per cent in Lithuania. Accordingly, Lithuania also faces the highest GDP per capita effect, although the effect in terms of total GDP is the highest in Poland.

In sum, the effect of a digital single market in terms of digital infrastructure amounts to an annual increase of GDP by EUR 11 billion for the BSR. Excluding Poland, the total effect amounts to 4 billion and the GDP per capita effect decreases slightly from EUR 166 to 156.

1.3 | DIGITAL GOODS AND SERVICES

Enterprises that made electronic sales in 2014 amounted on average to 16 per cent of total enterprises in the BSR, which is in line with the EU average. Ranging from 7 per cent in Latvia to 26 per cent in Denmark, the deviation was quite large (**table 3**). In all countries, the percentage of enterprises selling online has increased somewhat over the past five years. Calculating the potential impact of a digital single market, electronic sales is assumed to increase from 1 percentage point in Sweden to 19 percentage points in Latvia.

Following the estimation of the relationship between enterprises that made electronic sales and labour productivity in Falk and Hagsten (2015), an increase of 1 percentage point is on average associated with an increase in labour productivity of 0.06 per cent. Using this elasticity, the effect on labour productivity in the BSR ranges from 0.1 per cent in Sweden to 1.1 per cent in Latvia. Again, the greatest GDP effect arises in Poland, however, the GDP per capita effect is most important in Finland.

Since the elasticity estimations use enterprises that made electronic sales irrespective of national or cross-border transactions, we also use this measure in the analysis. However, since our focus is on creating a single market, it could be argued that cross-border sales are more relevant. Data on cross-border online sales show that the percentage of enterprises conducting online sales cross-border is evidently lower (**table 4**). Therefore, it is reasonable to assume that the lion's share of the expected increase in e-sales arises from increased cross-border sales.

In total, increased e-commerce is expected to raise GDP by EUR 6 billion annually in the BSR or by 2 billion if we exclude Poland.

TABLE 3

IMPACT OF E-COMMERCE

	Enterprises who made electronic sales, 2014 (%)	Change since 2009 (p.p.)	Change to BSR best (p.p.)	Effect on labour productivity (%)	GDP effect (million EUR, 2014 prices)	GDP per capita effect (EUR)
Sweden	25	5	1	0	258	27
Denmark	26	7	0	0	0	0
Finland	15	1	11	1	1354	249
Estonia	12	1	14	1	164	128
Latvia	7	3	19	1	274	134
Lithuania	18	1	8	0	174	58
Poland	10	5	16	1	3966	104
EU28	15	2	0	0	0	0
BSR excl. Poland	17	3	9	1	2225	82
BSR incl. Poland	16	3	10	1	6191	95

Sources: Eurostat and own calculations

TABLE 4

ENTERPRISES (SMES) THAT MADE ELECTRONIC SALES CROSS-BORDER (PERCENTAGE), 2014

	Electronic sales (%)	Electronic sales cross-border (%)	Difference (p.p.)
Sweden	25	8	17
Denmark	26	10	16
Finland	15	5	10
Estonia	12	6	7
Latvia	7	4	3
Lithuania	18	11	7
Poland	10	3	7
EU28	15	6	9
BSR	16	7	10

Sources: Eurostat and own calculations

1.4 | TOTAL IMPACT ON PRODUCTIVITY AND GDP

The analysis indicates that a digital single market could increase GDP in the BSR annually by EUR 29 billion (in 2014 prices). This effect arises from an increased take-up rate in fixed broadband, improved e-skills and increased e-commerce. Hence, by extending the digital single market to more areas the gains could be even greater.

To a large extent the effect arises in Poland and by excluding Poland from the calculations, the effect decreases to 9 billion (**table 5**). ***In terms of GDP per capita, the effect corresponds to EUR 448 when including Poland and EUR 336 when Poland is excluded.***

TABLE ***5***

TOTAL EFFECT OF A DIGITAL SINGLE MARKET IN THE BALTIC REGION

	Digital infrastructure	Digital readiness	E-Commerce	**Total GDP effect**	Percentage of total GDP effect	GDP per capita effect
Sweden	3223	0	258	**3481**	12	361
Denmark	551	880	0	**1430**	5	254
Finland	0	72	1354	**1426**	5	262
Estonia	84	200	164	**448**	2	349
Latvia	206	531	274	**1011**	3	495
Lithuania	155	961	174	**1290**	4	429
Poland	6631	9554	3966	**20151**	69	527
Total BSR excl. Poland	4218	2643	2225	**9087**		336
Total BSR incl. Poland	10849	12198	6191	**29238**	100	448

Sources: Eurostat and own calculations

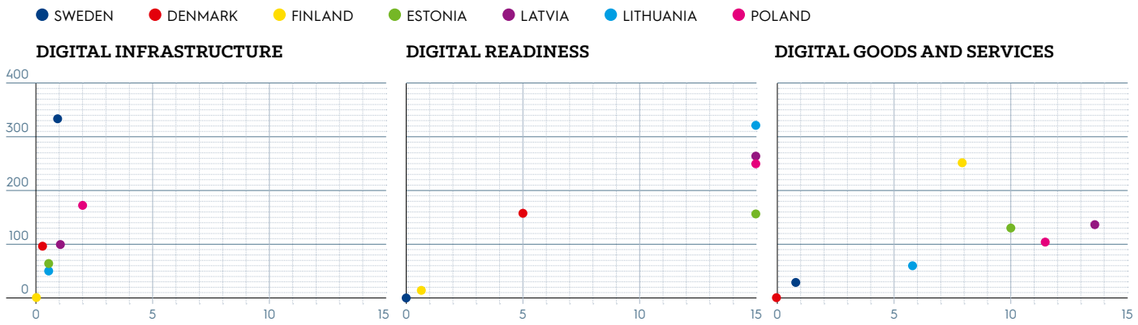
Overall, the analysis shows that all countries would gain from reaching the level of the best performer in the region. However, in terms of GDP per capita, a digital single market will have the most impact in Poland, Latvia, and Lithuania.

Figure 1 illustrates the estimated effects in terms of GDP per capita by category of measures. By assuming an improvement pace in accordance with the track record of the best performer in each category, the figure also presents a time dimension on the x-axis (number of years). When including Poland, the biggest gain comes from improving digital readiness. Excluding Poland, the biggest gain comes from improving digital infrastructure. This effect comes from a great potential in Sweden to increase the take-up rate of fixed broadband within enterprises.

The figure also illustrates that for most countries the assumed improvement of the number of employees with specialist ICT skills might take up to 15 years. In contrast, reaching the benefits of digital infrastructure could have a much shorter timeframe, and even for this category the impact is sizeable. Moving towards a digital single market might, however, speed up the improvement pace. Nevertheless, digital readiness probably takes the longest time to realise.

FIGURE ***1***

GDP PER CAPITA EFFECT BY CATEGORY AND COUNTRY



Horizontals: GDP per capita ***EFFECT*** *(0-400)* *Verticals: number of* ***YEARS*** *(0-15* *Source: own calculations*

1.5 | ROBUSTNESS CHECKS

To analyse the robustness of the calculated impact, we estimate (1) what the effect would be if the countries falling below reach the region average and (2) how the effect changes if we use country specific elasticities.

1 Improvement in line with BSR average

Applying an even shorter time perspective, the impact of a digital single market could be calculated as the improvement to the BSR average for those countries falling below it. The total effect then reduces to EUR 12 billion annually compared to the base estimations that total EUR 29 billion (see **table 6** for details). Excluding Poland from the calculations, the effect reduces from EUR 9 billion to 3 billion.

Hence, about 30 to 40 per cent of the effect is reachable by improving to the BSR average. Note that the only country in the region that does not fall below the region average in any of the three dimensions is Denmark.

GDP effect (million EUR, 2014 years prices)

TABLE ***6***

THE IMPACT OF A DIGITAL SINGLE MARKET USING BSR AVERAGE AS THE BEST PERFORMER

	Digital infrastructure		Digital readiness		Digital goods and services		Total effect	
	Base estimates	Sensitivity analysis	Base estimates	Sensitivity analysis	Base estimates	Sensitivity analysis	Base estimates	Sensitivity analysis
Sweden	3223	592	0	0	258	0	3481	592
Denmark	551	0	880	0	0	0	1430	0
Finland	0	0	72	0	1354	141	1426	141
Estonia	84	0	200	0	164	49	448	49
Latvia	206	59	531	237	274	132	1011	427
Lithuania	155	0	961	516	174	0	1290	516
Poland	6631	4105	9554	4498	3966	1523	20151	10125
Total BSR excl. Poland	4218	1403	2643	862	2225	474	9087	2739
Total BSR incl. Poland	10849	4756	12198	5251	6191	1844	29238	11850

Sources: Eurostat and own calculations

2 Different impact across countries

The effect of digitization might differ across countries due to country specific effects. For example, the effect on productivity of an increase in broadband usage could depend on the level of usage at the outset. Hagsten (2014) shows that the relationship between broadband internet-enabled employees and labour productivity differs across industries and European countries. The strength of the significance ranges from -0.146 (Slovenia) to 0.507 (Poland) for the manufacturers and between 0.028 (Finland) and 0.222 (Germany) for the service enterprises.

By applying those country specific elasticities to the countries in the BSR, the effect of broadband usage mainly depends on whether we include Poland or not.[5] As the effect increases in Poland when using country specific elasticities, while decreasing in countries such as Sweden, the total effect becomes larger in total only if we include Poland. Compared to the base estimates of EUR 11 billion, the sensitivity analysis amounts to 14 billion (see **table 7**). However, excluding Poland, the effect in principle diminishes.

GDP effect (million EUR, 2014 prices)

TABLE ***7***

IMPACT OF DIGITAL INFRASTRUCTURE, BASE ESTIMATES AND SENSITIVITY ANALYSIS

	Base estimates	Sensitivity analysis
Sweden	3223	-151
Denmark	551	-10
Finland	0	0
Estonia	84	170
Latvia	206	420
Lithuania	155	317
Poland	6631	13509
BSR excl. Poland	4218	746
BSR incl. Poland	10849	14255

Sources: Eurostat and own calculations

2 CONSUMER SURPLUS AND PUBLIC SECTOR

The estimated impact of a digital single market in the previous section focuses on the business sector and the effect on productivity and GDP. Now, the analysis includes the consumer perspective and the public sector.

2.1 | CONSUMER SURPLUS FROM E-COMMERCE

The consumer perspective is especially important for e-commerce as the effect on consumers due to lower prices, more choice, and better quality of goods and services can be quite large (e.g., Duch-Brown and Martens 2014). In economics, the concept of consumer surplus is used to calculate the effect due to lower prices. Consumer surplus is a measure of the welfare people gain from consuming goods and services and it is defined as the difference between the price that people pay in the market and the value they place on the product.

In line with Lorenzani and Varga (2014) we estimate the consumer surplus of an increase in e-commerce. To do this, we need information about consumer spending on e-commerce, the price difference of online and offline sales, and the price elasticity of demand (see appendix A2 for a detailed description of the calculations).

Since the focus is on the consumer side, we use data on turnover of e-commerce in the retail sector. Regarding price differences, we follow the estimations in Civic Consulting (2011). Based on a database of online-offline price differences in 17 EU Member States for seven categories of final goods, they find online prices to be, on average, 2.6 per cent lower than offline ones. Based on the same data, they also estimate that achieving full integration of the EU

5 The estimations in Hagsten (2014) does not include Estonia, Latvia or Lithuania so in our calculations we assume the same elasticity for these countries as in Poland.

internal market for e-commerce would decrease average online prices by 21 per cent EU-wide. The price difference arises due to the possibility of consumers to freely resort to cross-border online purchases, rationally, at the lowest available online price EU-wide. Since estimations for the BSR are not available we use the EU-wide price differences in our estimations. The price elasticity of online and offline demand follows from estimations in Lorenzani and Varga (2014).

E-commerce amounts on average to 6 per cent of the total turnover in the BSR retail sector, ranging from 2 per cent in Estonia to almost 12 per cent in Latvia (**table 8**). As with the productivity calculations, we assume that each country in the BSR reaches the level of the best performer in the region.

The estimated consumer surplus from increased e-commerce amounts to EUR 4 billion for the BSR. The effect corresponds to 0.3 per cent of GDP, irrespective of Poland being included. In terms of the percentage of GDP, the effect is most important in Estonia and Lithuania.

This impact is, however, a lower-bound estimation, as it focuses on the direct price effect only. Hence, it does not account for the potential price pressure exerted on offline prices by (lower) online prices, nor the increase in the variety of available final goods. Estimations by Civic consulting (2011) shows that the consumer surplus from increased variation could be quite large.

TABLE **8**

ESTIMATION OF CONSUMER SURPLUS FROM E-COMMERCE

	Turnover of e-commerce in retailing, 2012 (%)	Change to BSR best (p.p.)	Change to BSR best (EUR millions)	Consumer surplus (EUR millions)	Consumer surplus (% of GDP)
Sweden	4.3	7.5	5393	1332	0.3
Denmark	5.0	6.7	2791	690	0.3
Finland	7.9	3.8	1482	366	0.2
Estonia	2.1	9.7	536	132	0.7
Latvia	11.7	0.0	0	0	0.0
Lithuania	4.3	7.4	655	162	0.5
Poland	6.8	5.0	5014	1239	0.3
EU	6.9	0.0	0	0	0
BSR excl. Poland	5.9	5.8	10857	2682	0.3
BSR incl. Poland	6.0	5.7	15871	3921	0.3

Sources: Eurostat, Lorenzani and Varga (2014) and own calculations

2.2 | IMPACT OF E-PROCUREMENT

The take-up level of e-procurement varies quite significantly across the region, ranging from close to zero in Poland and Latvia to 55 per cent in Lithuania (**table 9**). Hence, by assuming that each country reaches the level of the best performer in the region, the expected improvement is quite large.

Previous studies show that contracting authorities that have already switched to e-procurement have saved between 5 and 20 per cent (EC 2012). In the calculations, we use the most conservative estimate of 5 per cent.

The estimations show that annual operational savings could amount to EUR 4 billion in the BSR. In terms of percentage of GDP the savings corresponds to 0.3 per cent. According to the estimates, the effect is most important in Finland where the take-up rate is assumed to increase by 50 percentage points.

TABLE **9**

ESTIMATION OF OPERATIONAL SAVINGS IN PUBLIC SECTOR FROM E-PROCUREMENT

	E-procurement take-up level, 2013 (%)	Change to BSR best (p.p.)	Change to BSR best (EUR millions)	Operational savings (EUR millions)	Operational savings (% of GDP)
Sweden	34	21	14698	735	0.2
Denmark	6	49	16697	835	0.3
Finland	5	50	17368	868	0.4
Estonia	2	53	1296	65	0.3
Latvia	0	55	1460	73	0.3
Lithuania	55	0	0	0	0.0
Poland	0	55	25646	1282	0.3
EU	11	0	0	0	0
BSR excl. Poland	20	35	51519	2576	0.3
BSR incl. Poland	17	38	77165	3858	0.3

Sources: Eurostat, IDC (2013), Public procurement indicators 2013 and own calculations

6

BARRIERS TO REMOVE IN ORDER TO REAP THE ESTIMATED IMPACT

In the process leading to the report "*Priorities Towards a Digital Single Market in the Baltic Sea Region*" (BDF and BCCA 2012), business leaders and policy-makers came together to identify drivers of the digital market and the barriers holding them back. A key component to the analysis was to weigh the regional scope for solutions to each barrier. Although a lot has happened since 2012, the list of barriers still provides a good starting point to provide an overview of what lies ahead, between the estimates provided in this report and their realisation. The list contained the following barriers:

Trust

Privacy and data protection

Cybercrime and security

Digital content and copyright

Interoperability and standards

e-payments

electronic contracts, tenders and invoices

e-government

Digital Infrastructure

e-procurement

Public Sector Information (PSI) / open data

Roaming

Online intermediaries

Only one of the barriers can be said to have become (almost) outdated: roaming charges are set to vanish in the summer of 2017 after a compromise between the European Commission, the Parliament and the Council. Apart from this, the barriers remain, although to different extents. Going into each barrier in detail is beyond the scope of this report, especially since most of these subject areas have advanced significantly into specialist areas of their own which are well covered by others. However, some of the subjects warrant comment in relation to the estimations presented in this report and to the scope of regional solutions between the countries in the region.

The highest priority among the interviewees in 2012 was to establish trust in the cross-border digital market. This is still an issue, as proved for instance in "Searching for the micromultinationals" (Top of Digital Europe 2014). Lack of trust is not something that can be directly remedied by policy. Rather, trust is the result of successful policy implementation to counter other barriers, such as those related to privacy, contracts and security. Moreover, trust is not a technical barrier, but a social one. Being able to connect with and sell to or buy from enterprises and individuals in another country with a single click is in no way a guarantee that people will do it.

Data also show a big difference between national online sales and cross-border trade. How people perceive the transaction – from the quality of the product to the enforceability of the contract and final delivery – is in many ways more important than what rules actually apply. That is to say, even if there are checks and balances to ensure consumer safety, if these differ from the rules and regulations with which the consumers are familiar they may be significantly less motivated to fully engage the market.

Barriers related to privacy and data protection have become increasingly important as more and more people supply and store personal data online. This also ties into security and cybercrime issues. On a government level, issues related to mass-surveillance are being balanced against security policies, and individual privacy is often at risk of being underestimated in the trade-off between the two. In 2014, the Data Retention Directive (Directive 2006/24/EC) was found invalid by the European Court of Justice, meaning that the regulations originally set to store information on individual data traffic is void.

This type of surveillance is potentially damaging to the efforts to create trust in the digital marketplace if people fear violations against the privacy of their online interactions. In addition to this, there is also a balance to be struck between user privacy and businesses providing online services in exchange for personal data. The way in which this data is being treated and re-used or sold on to others is not always transparent to the user, meaning that the level of privacy is uncertain. On the other hand, attempts to regulate data privacy nationally in individual countries may very well increase or create new barriers to cross-border data flow, making it harder, or even impossible, to provide data-driven services on a single digital market.

There is a need for transparency on privacy issues from both government surveillance and enterprise data processing. If anything, these barriers risk becoming steeper in the near future. Since the Data retention Directive has become invalid, there may be an increased scope and need for harmonisation and joint approaches to data protection standardisation between countries on a regional level. For instance, joint standards and harmonisation in data retention and protection could aid cross-border law enforcement initiatives significantly. However, many of the procedures built on the directive still remain in operation.

Digital infrastructure is overall fairly evenly advanced in all of the countries in the region. However, there lies a great potential in continuing and completing the expansion of internet connectivity. It appears that this barrier is increasingly bundled with that of digital content and intellectual property rights. Content seems to drive demand for connectivity, or rather

they go hand in hand, and currently the market for European content is all but single. There is a severe US-EU gap in content accessibility, and in most cases it is, for instance, easier to get access to American films than European ones, even if they are from a neighboring country.

The lack of unified content market and availability inhibits online demand, but it also damages the spread, preservation and future growth of European cultural content. Although there might not be much of a scope for copyright reforms within the region, there is a need to start tackling these issues both locally and across the EU in order to realise the full potential of uniquely European content. A regional approach to these issues would be to find better ways to promote the emergence of European intermediaries and digital platforms that can leverage and spread uniquely European content, for instance by simplifying regulations and procedures. The European Parliament backed a report on recommendations for copyright reform in the summer of 2015. A proposal for legislation is expected at the end of the year.

A barrier that has emerged and grown to a focal point of debate in the last years is the increasing demand for e-skills and special skills in ICT-related areas (Top of Digital Europe 2015 a). It is not only a growing demand for engineers and computer scientists who can write code, but also for programmers with a business mindset or complementary skills in, for instance, marketing, economics or design. This barrier is highly correlated to the integration of ICTs into the economy through digitization. The average internet user or customer is no longer necessarily very tech savvy or even interested in the technology per se. Accordingly, usability, design and interfaces are becoming all the more important to businesses looking to attract and retain customers. In turn, it is crucial that businesses can access the necessary skill set in order to stay globally competitive.

However, it is not simply a matter of adding "e-skills" as a new subject in the school curriculum to solve this issue. Compared to the industrial transformation of the economy, where educational programmes were shaped to provide interchangeable workers, digitization is increasingly promoting the division of labour and expertise. In addition to this, demands are shifting faster with technological development. It is a wider issue of adapting to transforming conditions in the labour market as well as in the educational system. First of all, there is a need to better understand how the demand for and use of digital skills has evolved over time, in order to better predict how it may change in the future.

When it comes to e-commerce, there are evidently still barriers to remove. Only a small share of businesses in each country provided online sales (from 26 per cent in Denmark to just 7 per cent in Latvia) in 2014 according to the Digital Agenda Scoreboard (see also Top of Digital Europe, 2015 b). This is a two-way barrier, to consumers who cannot connect to these enterprises digitally and to enterprises that are still exposed to competition from other enterprises offering online sales. In the BSR countries, 16 per cent of SMEs made electronic sales, while only 7 per cent made electronic sales cross-border. These barriers to e-commerce are perhaps associated to software infrastructure for economic transactions, but this is unlikely to be the sole cause of the current state. Several solutions to digital and online payments have emerged the last couple of years. However, what may be lacking are shared and open standards for electronic identification and payment frameworks associated to these.

E-procurement holds great promise for more competitive and innovative procurements procedures that stretch across borders, but it has yet to attract a majority of firms in most countries in the region. Lithuania has a 55 per cent e-procurement take-up and in Sweden the corresponding share is 34 per cent, while the number sinks to 6 per cent in Denmark, 5 per cent in Finland and 2 per cent in Estonia. It is not enough that e-procurement is digital, it must also be simple and accessible to small and medium-sized enterprises. Done right, it provides a valuable learning tool with low thresholds for both businesses and procurers.

The access to and re-use of open government data provides important resources for creating new digital goods and services, as well as for improving democratic transparency. However, according to the Google World Map of Open Government Data, all of the Nordic countries have government-led open data initiatives while the Baltic countries and Poland do not. And the Nordics still have a way to go to fully leverage the use of open government data. Providing data to fuel transparency, re-use and innovation is not a national matter, and the entire region could benefit greatly from joint standards and procedures to provide data that can be easily be combined between countries. This is especially relevant from a digital single market point of view, where new data-driven services should not only leverage data from different countries, but also be available across borders.

All in all, many of the borders mapped out in 2012 remain, but the approach to lowering them is shifting in a slight but significant way. Increasingly, more focus is put on the demand side of the equation, on getting enterprises, consumers, citizens and policy-makers to actually leverage the potential that digital technology holds for them, not just to get the technology "out there". The growing focus on e-skills also goes to show that non-digital barriers to a digital single market are growing in importance. The market has adopted the new technologies, but it has yet to adapt to them in a way that fully realises their potential impact.

7

SUMMARY

KEY OBSERVATIONS

A DIGITAL SINGLE MARKET IN THE BSR YIELDS SUBSTANTIAL GAINS

A regional digital single market makes it just as easy for consumers and enterprisers in one country in the BSR to access online information, goods and services as in another country in the region. This report indicates that moving towards such a single market could increase GDP in the region annually by EUR 29 billion.[6] The effect arises from an increased take-up rate in fixed broadband, improved e-skills and increased e-commerce. Hence, by extending the digital single market to more areas the gains could be even greater.

To a large extent the effect arises in Poland and by excluding Poland from the calculations, the effect decreases to 9 billion. In addition, there are gains on the consumer side and in the public sector amounting to about EUR 4 billion, respectively.

ALL COUNTRIES BENEFIT

The analysis shows that all countries benefit at least in one category by moving towards a digital single market. In terms of GDP per capita, the total effect mainly arises in Poland, Latvia, and Lithuania. However, for digital infrastructure the estimated GDP per capita effect is highest in Sweden, while for digital goods and services it is most profound in Finland. To confirm the findings in each country, future work needs to look into country specific factors as indicated by the robustness analysis. This is also further explored in the State of the Digital Region report (Top of Digital Europe 2015 b).

DIGITAL READINESS SHOWS THE HIGHEST IMPACT

The analysis indicates that the biggest impact comes from improving digital readiness. This finding is not surprising as the role of human capital and skills in improving the allocative efficiency, and thereby productivity and growth, is confirmed by long-standing research. Increasing the number of employees with specialist ICT skills enables businesses to reap the benefits from digitization. Especially in Poland, the effect is estimated to be important. Although the country has a large number of ICT specialists, they still represent a small fraction of all those employed, thereby creating a huge potential.

... BUT IT TAKES TIME TO REALISE

Considering the time perspective, however, digital readiness may take the longest time to realise. By assuming an improved pace, in accordance with the track record of the best performer in each category, the assumed improvement of the number of employees with specialist ICT skills might take up to 15 years. Although moving towards a digital single market might speed up the improvement pace, a lot of work remains and a positive trend is missing in most countries. In contrast, reaching the benefits of digital infrastructure could have a much shorter time perspective, and even for this category the impact is sizeable.

E-COMMERCE BENEFITS BUSINESSES AND CONSUMERS

Increasing online trade benefits both businesses and consumers in the BSR. The effect on productivity from economies of scale and improved efficiency is estimated to increase GDP annually by EUR 6 billion in the region. In addition, the effect from lower online prices on consumer surplus is estimated to EUR 4 billion. Following the track record of the best performer, the estimated impact is possible to reach within 5-15 years. However, as discussed in relation to barriers, improved cross-border trust is one important element in order to reach the estimated benefits.

POLICY RECOMMENDATIONS

THE 65 MILLION MARKET

Poland makes an important contribution to the Nordic-Baltic combination and should be fully integrated into future cooperation in the region. Although Poland may appear to be lagging behind when measured relative to its population, it is still a huge market in terms of internet connections, mobile subscriptions, internet users, engineers and PhDs in computer science, thanks to its sheer size. Although the Nordics are forerunners, and the Baltics are fast movers, it is together with Poland that they make up a joint market of over 65 million people. As the results in this report demonstrate, all of the countries can benefit by learning from each other, and adding Poland to the mix may very well make the difference between good and great for the region.

Perhaps the greatest challenge in achieving this 65 million market lies in establishing trust between people and firms across borders. The best way to do this is by interacting with each other, for instance through trade. Thus, improving the conditions for regional cross-border e-commerce, for example by developing shared and open standards for electronic identification, would go a long way towards building trust needed to integrate the market further.

BENCHMARKING TASK FORCE

This report is a basic tool for benchmarking between countries. The results presented here rest on the assumption that each country catches up to the leader in the region in each of the three categories digital infrastructure, digital readiness and digital goods and services. The model is built to be tangible, transparent and achievable in means of policy measures, but in order to realise the potential it points to that countries must actually move to catch up. The report and its findings should be considered the beginning of a process rather than the end of one.

6 In 2014 years prices.

A cross-border benchmarking task force with policy-makers, business leaders and other relevant stakeholders from each country, including both national and local leadership, should be formed to further probe the specific strengths and challenges of each country, benchmark developments and learn from each other. This is especially relevant for digital readiness and educational factors, which would make an excellent first focus for the task force.

MAPPING THE DYNAMICS OF DIGITAL SKILLS

With growing concern for the future supply of e-skills and digital specialists and the negative trend in many countries in the BSR, there is a need to understand how the supply and demand of such skills have evolved until today. Are there significant differences in how these skills have been employed in different sectors, between the private and public sector, or over time? A better understanding of the development leading up to the current situation also provides a means to making better forecasts about future human capital needs and how they relate to schools, universities, vocational training and labour market transformation.

Against this background, more data and better understanding of the dynamics of digital skills across time and space are important. A first step would be to collect data and investigate the emergence of ICT-related skills and their integration into the economy in the region. Such knowledge is crucial for identifying areas of action in a second step.

FOCUS ON E-PROCUREMENT

Governments should focus on expanding e-procurement, and they should do so through cross-border cooperation, by learning from each other and through the harmonisation of procedures. One or several pilot projects could be the start. It is an excellent way to enable and promote more businesses, especially SMEs, to expand their business to other countries. For small, innovative enterprises specifically, it is a way to get credible references and cases that they can use to further grow their business. By procuring digital services and goods, public actors can also vastly improve their own digitization processes.

In addition to all this, improved e-procurement would also create operational savings both in the procurement process and in the public sector in general. In a BSR perspective, increasing the e-procurement take-up rate is estimated to generate savings up to EUR 4 billion – savings that improve the public budget balance correspondingly.

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APPENDIX

1 DETAILS ON THE IMPACT ELASTICITIES

To calculate the effect on labour productivity, we use impact elasticities from the empirical literature (see table A1). In line with Lorenzani and Varga (2014), we use conservative estimates of up-to-date research. From the elasticities it follows that a one percentage increase in persons employed with ICT skills has a much higher impact on labour productivity than an equivalent increase in enterprises connecting to the internet via fixed broadband or enterprises who made electronic sales.

TABLE **A1**

SUMMARY OF IMPACT ELASTICITES ON LABOUR PRODUCTIVITY

	Elasticity
Enterprises connecting to the internet via fixed broadband	0.11[1]
Persons Employed with specialist ICT skills	0.88[2]
Enterprises who made electronic sales	0.06[3]

[1] Hagsten (2014)
[2] Lorenzani and Varga (2014)
[3] Falk and Hagsten (2015)

1 Digital infrastructure

The effect on labour productivity of digital readiness follows from the estimations in Hagsten (2014). Based on a pooled panel of firms between 2001-2010 in 14 European countries, Hagsten finds a positive relationship between labour productivity and broadband penetration among employees. The average estimate for the manufacturers is 0.149 and for the services firms 0.107. We use the most conservative of these estimates implying that an increase by 1 percentage point in the percentage of employees with access to fast broadband is associated on average with an increase in labour productivity of 0.11 per cent.

2 Digital readiness

The effect on labour productivity of digital readiness follows from the estimations in Lorenzani and Varga (2014). They analyse the relationship between sectoral shares of e-skilled workforce and of allocative efficiency, covering four broad sectors for the time period 2000-2010 and almost all EU countries. Their findings indicate that the percentage share of ICT-skilled workers in total employment has a statistically significant positive effect on allocative efficiency: an increase by 1 percentage point in such share is associated with an increase in allocative efficiency by between 1.2 and 1.3 percentage points. By using a semi-elasticity for the relationship between allocative efficiency and labour productivity of 0.73[7], their findings indicate that an increase by 1 percentage point in the percentage of employed with ICT specialist skills is associated on average with an increase in labour productivity by 0.88 per cent (1.2*0.73).

3 Digital goods and services

The impact of digital goods and services comes from the recent study by Falk and Hagsten (2015). By using a panel of micro-aggregated firm-level data for 14 European countries spanning over the years 2002 to 2010, Falk and Hagsten show that the change in e-sales activities and labour productivity growth are significantly positively related. Based on a robust regression method their most conservative estimate of the e-sales elasticity arrives at 0.12. As their estimate corresponds to a two-year period, in terms of annual impact, an increase of 1 percentage point is on average associated with an increase in labour productivity by 0.06 percentage points. In our calculation we apply the elasticity to labour productivity in levels rather than growth, making the calculations comparable across areas.

2 DETAILS ON CONSUMER SURPLUS CALCULATIONS

Consumer surplus is a measure of the welfare that consumers gain from the consumption of goods and services, or a measure of the benefits they derive from the exchange of goods. Consumer surplus is the difference between the total amount that consumers are willing and able to pay for a good or service (indicated by the demand curve) and the total amount that they actually do pay (the market price for the product). Consumers can realise consumer surplus gains by having access to the lower prices in e-commerce compared with offline commerce.

The methodology in Civit Consulting (2011) follows Brynjolfsson, Hu, and Smith (2003) who show that the change in consumer surplus resulting from lower online prices in a product market can be calculated using the following formula:

$$CV = -\frac{p_1 x_1 - p_0 x_0}{1+\alpha} = -\frac{p_1 x_1 - (1+\phi)p_1(1+\phi\alpha)x_1}{1+\alpha}$$

CV is the change in consumer surplus due the lower price in the product's online market than in the product's offline market, $\boldsymbol{\alpha}$ is the price elasticity for the product's online market, (p1, x1) are the current price and quantity for the product's online market, and (p0, x0) are the price and quantity for the product's offline market, $\boldsymbol{\Phi}$ is the difference between the product's online price and the product's offline price in percentage.

[7] See footnote 48 on p. 36 in Lorenzani and Varga (2014) for details.

AUTHORS

Pernilla Johansson
works as a senior economist at the Chamber of Commerce and Industry of Southern Sweden. She holds a PhD in economics from Lund University and has worked with economic impact analysis at the Ministry of Finance in Sweden and at the Swedish Riksbank.

pernilla.johansson@handelskammaren.com

Joakim Lundblad
is a PhD student in Economic Geography and Innovation Studies at CIRCLE, Lund University, and a senior policy analyst (on a leave of absence) at the Chamber of Industry and Commerce in Southern Sweden. His main research interests are urban economics, complex adaptive systems and technological development.

joakim.lundblad@circle.lu.se

Year:	2015
Published by:	Baltic Development Forum (BDF) and Microsoft
Contact:	Torben Aaberg, Head of Public Affairs, BDF *ta@bdforum.org*
Designer:	Jānis Dripe, *www.dripe.lv*

ISBN: 978-87-996254-9-9
EAN: 9788799625499