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Abstract: The ongoing structural change towards the service and knowledge societies, innovations, and the increasing integration of markets will have considerable influence on the European Union, particularly on the Eastern members of EU. In March 2010, the European Commission released the Europe-2020 strategy, which shall push the EU to be the smartest and most competitive region in the world. Among the European Union members, the Baltic Sea countries are effective in bringing up innovative cluster solutions, cooperation between science and business. Innovations are crucial for further economic development and prosperity. However, the innovation headline indicators are ambitiously defined targets of the Europe-2020 strategy. The paper at hand analyses and highlights the innovation and creative capability within the Europe 2020 strategy framework.

JEL classification: O3, R11, R12, Z1

Key words: Innovation, Baltic Sea Region, Europe 2020, creative sector

Content

1 | Introduction

In March 2010, the European Commission released the Europe-2020 strategy, which shall push the European Union to be the smartest and most competitive region in the world. The vision of the Europe 2020 strategy is that of a social market economy of the 21st century, whose economy is smart, sustainable, and inclusive.[1] Five headline targets serve as benchmarks for the EU-2020 strategy on employment, education, social inclusion, R&D, climate and energy (see Bongardt et al., 2016; Eurostat. 2016a). Complementary to the EU-2020 strategy, the Commission developed an own macro-regional strategy for the Baltic Sea Region - the first macro-regional strategy in Europe - to support the implementation of the EU-2020 strategy. Moreover, the strategy shall support the Baltic Sea Region to become the most competitive region within the European Union.

The Baltic Sea Region covers eleven countries, eight of them EU members (see European Commission, 2016). Namely, these are Denmark, Sweden, Finland, Estonia, Lithuania, Latvia, Poland, and Germany. Three European neighbor countries are touching the region, namely Belarus, Norway, and Russia. The eight member countries count for approximately 29 percent or 147 million inhabitants of the European population. The largest member state is Germany (82.2 m. inhabitants), the smallest member state is Estonia (1.3 m. inhabitants). These countries generate 29.3 percent of the GDP of the EU member states.[2] This makes the region a significant economic region in Europe whose specific structure and history offers enormous opportunities for development. The countries of the Baltic Sea Region face common challenges – demographical, societal, environmental et al. – which are preferred to be tackled by working together, achieving a balanced development and reinforce integration.

The ongoing structural change towards the service and knowledge societies, innovations, and the increasing integration of markets will have considerable influence on the region. But, how can the development of the innovation capability of the Baltic Sea Region in respect of the EU-2020 strategy be evaluated? The Baltic Sea Region countries are effective in bringing up innovative cluster solutions, cooperation between science and business, and support for the research and development (R&D) sector from the national GDP. They are supporters of green growth, based on innovation policy and a stronger turn to renewable energy sources. These are strategic aspects, they can also be found in the headline indicator results of the EU-2020 strategy (see Commission of the European communities, 2016; Stiller/Wedemeier, 2011; Hogeforster et al., 2008).

The specific importance of the Baltic Sea Region in Europe is also the subject of the EU Strategy for the Baltic Sea Region (EUSBSR). The cornerstones of this strategy are to

[1] The European Commission puts seven flagships initiatives to catalyze the priorities, there are “Innovation Union”, “Youth on the move”, “A digital agenda for Europe”, “Resource efficient Europe”, “An industrial policy for globalization era” “An agenda for new skills and jobs”, and “European platform against poverty”. European Commission, Communication from the commission, Europe 2020, A strategy for smart, sustainable, and inclusive growth, COM(2010) 2020 final, 2010.

[2] A more narrow regional definition of the Baltic Sea Region (program) is the federal states of Berlin, Brandenburg, Bremen, Hamburg, sub-region Lüneburg, and Mecklenburg-Western Pomerian, and Schleswig-Holstein for Germany, the remaining seven countries in the Baltic Sea region are treated in their entirely. The regional covering count for 85 million inhabitants in the Baltic Sea region.

make the Baltic Sea Region more save (environmentally), connected (geographically and societally) and prosperous (competitively and innovatively). The strategy includes an action plan with various flagship projects as well as actions to promote entrepreneurship, innovation and digitally driven growth (see European Commission, 2016). Ensuring its technological capability and power of innovation are important prerequisites for the Baltic Sea Region for being able to compete with other regions in the global market in the future. The extent of these factors, in turn, depends, among other things, on the availability of qualified labor, on research and development activities, and university-industry linkages.

In the first section of this paper, some statistical facts about the research and development indicator are presented, emphasizing the relevance for the economic development. Section two shows various descriptive statistics for regional R&D expenditure and further innovation indicators. In the third section, we discuss some aspects of innovation and its link to the creative economy. The paper is closed by a conclusion, whereas it considers the European regional smart specialization strategy (S3) development.

2 | Innovation in the Baltic Sea Region

The DUAL Ports project aims to decarbonize regional ports´resources through innovation port investments that helps to minimize their negative external effects, the ecological footprint. The effect of minimization has to be quantified by instruments as the CBA (see European Commission, 2016b).

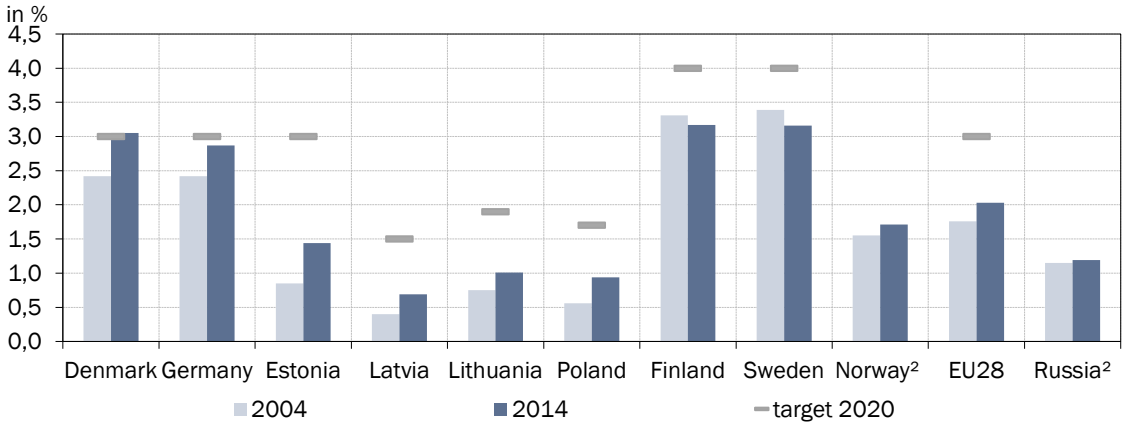
The innovation headline indicators are as well as ambitiously defined targets. Innovations are regarded as crucial for further economic development and prosperity. According to the so-called endogenous growth theory, R&D investments are essential drivers of growth. In the model of Paul Romer, for instance, R&D constantly develops new interim products which lead to a continual increase of productivity (see Romer, 1986). The level of intramural research and development expenditure therefore influences the overall GDP growth; the expenditures in R&D shall promote innovations resulting in economic growth and increasing welfare. Ensuring its technological capability and power for innovation is an important prerequisite for the Baltic Sea Region being able to compete with other regions in the European common market such as in the global market. But these innovation measures reflect more the condition for innovation than being an innovation themselves. R&D and numbers of employees in R&D are common input factors for innovation processes. These differing conditions for innovations are reflected in the indicators found in international comparative analyses of innovation as well as in the EU-2020 strategy by the European Commission. In this process, an invention emerges of an idea for a new product or process, in contrast, an innovation is the next step to bring the idea out into the market (see Fagerberg, 2004). For this process, there is a need for a knowledge society. In a knowledge-based European society, many jobs need

a relatively high level of qualification. Europe-2020 target is to increase the share of population aged 30-34 having completed tertiary education to at least 40 percent, what – with the exception of Germany – will be met by all Baltic Sea Region countries. The number of persons (aged 30-34) with tertiary education in the Scandinavian countries (more than 50 percent in Sweden), for instance, is traditionally higher than the EU average (39 percent), whereas Germany has the lowest number of persons with tertiary education (32 percent) due to its successful system of vocational training (see Stiller/Wedemeier, 2016).

The 28 EU member states achieved a value of 2.03 percent of intramural gross research and development expenditure (GERD) as a percentage of GDP in 2014 (see Eurostat, 2016). It will be a considerable challenge to meet the innovation target of at least 3 percent of GDP by 2020. The Baltic Sea Region countries mostly have a stable position among the most innovative members of the EU (see figure 2a). In 2014, the EU member states with the highest (total intramural) gross domestic expenditure on R&D (GERD) were Finland (3.2 percent GERD) and Sweden (3.2 percent GERD), followed by Denmark (3.05 percent GERD). Germany's expenditures reach approximately 2.9 percent GERD, which is still four times higher than the expenditures of Latvia, which has the lowest GDP share on R&D. However, also neighbor countries such as Norway and Russia have similar shares of GDP expenditure on research and development (1.7 percent and 1.2 percent GERD) in comparison to the EU-28 average (2.0 percent GERD) (see figure 1). The European corporate R&D efforts are partly ambitious; in 2020, Finland's and Sweden's target is to reach 4.0 percent GERD, Denmark's, Estonia's, and Germany's target is 3 percent GERD. Latvia and Lithuania aim to achieve 1.5 percent and 1.9 percent of their gross domestic product spent on R&D. With the exception of Denmark and Germany, most countries will presumably fail to meet this headline indicator.

Figure 1

Europe' 2020: Gross expenditure on R&D (GERD)[1]



[1] Data for Belarus not reported

[2] Partner countries; no target defined.

Source: Eurostat (2016).

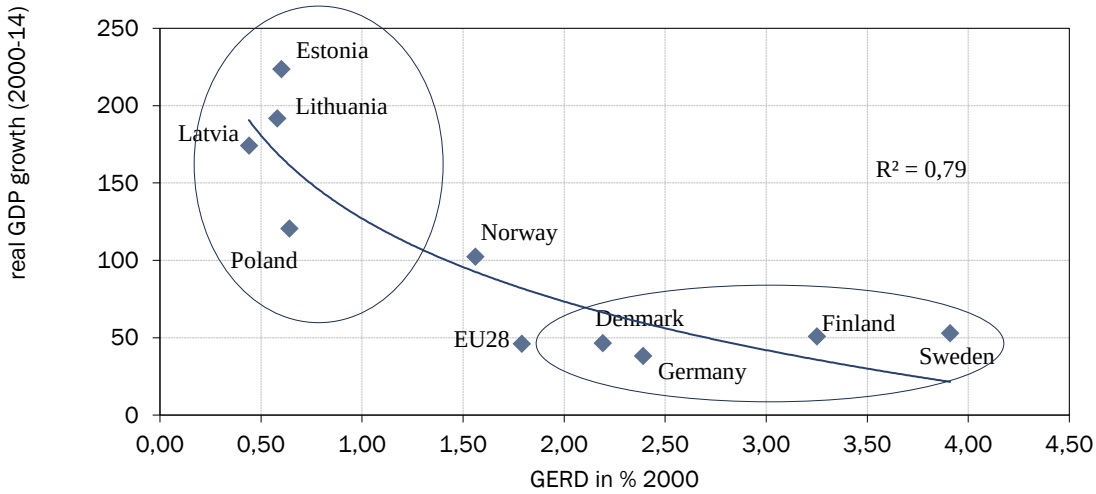
With regards to the theory of Romer that research and innovation play an outstanding role for the economic performance, it is worthwhile to have a look at the current GDP growth and the R&D performance. Also further empirical literature indicates a strong relationship between these variables. The arguments are that innovation is a fundamental driver of economic growth that benefits consume and business. Innovation can therefore lead to higher productivity and with a growing productivity, also the economy as a whole will benefit (see OECD, 2007; European Central Bank, 2018; Barro, 1996). By doing so, we use the R&D performance and analyse whether it relates to GDP growth. However, this article does not aim to control for causalities; it simply indicates the possible relationship. But what do the figures tell us? The relation is positive and relatively strong (R^2=0.79 in logarithmic regression).

The investment in R&D has the character of diminishing marginal products, i.e. the additional unit in R&D investment, as an input in the production process, will contribute less to the production, here real GDP, while the amount of other inputs is held constant. This seems reasonable as not any investment in R&D will increase its effect on the GDP. For instance, Schumpeter (1950) discussed that innovation and technological change come from the entrepreneurship or *Unternehmergeist* (Mark I) while large firms and investments do not necessarily contribute disruptively to the innovation processes. Large firms are more interested in maximizing the profit under the regime of incremental product and process improvements (Mark II).

The countries can be divided into two groups. Firstly, those EU members with an already high GDP in the Baltic Sea region (Sweden, Finland, and Germany) present relatively low GDP growth. Secondly, those countries with low GDP growth show a relatively high level of GERD, vice versa. Obviously, figure 2 indicates a growth and investment in R&D gap between the less developed countries of the Baltic Sea Region and the more developed EU member countries of the Baltic Sea Region. In many cases, there are considerable time lags between an innovation and its influence on economic growth. Moreover, this gap is larger for investments in research and development such as GDP growth. For the more developed Baltic Sea countries, it can be assumed that it is a fortiori essential to have high levels of expenditures in R&D to remain globally competitive. For instance, Pelle (2015) who shows a positive relation between R&D expenditures and the GCI score of EU member states as an indicator for competitiveness, validates this assumption. Moreover, Frietsch et al. (2015) summarize that the low R&D level in Eastern European countries, hereunder Poland, Latvia, and Lithuania, are less the outcome of underinvestment in research and development, rather than a political response to a relatively low transfer rate of research investments into research output. In other words, there are no considerable research capabilities to catalyze higher expenditures in R&D. Moreover, it is obvious that Norway's GDP development is driven by other factors, for instance the petroleum industry, rather than R&D expenditures. The (current) GDP growth of Russia is 429 percent between 2000-14 while its level of GERD is 1.05 percent. This extreme value (outlier) lies outside the range of the rest of the observations (and is not included in the simple regression).

Figure 2

Current GDP growth (2000-14) to GERD 2000 in %[1]



[1] Current Gross Domestic Product (GDP) to Gross domestic expenditure on R&D (GERD); Data for Belarus not reported.

Sources: Eurostat (2016a).

3 | Regional Innovation Development

Comparing regional data on R&D at NUTS level 2, in 2013 the Copenhagen area (Hovedstaden) had the highest percentage in R&D, followed by Trøndelag in Norway, and Nordjylland in Denmark (all more than 4.6 percent GERD). The Polish voivodship Lubuskie, and Opolskie are at the bottom-up of the Baltic-Sea regions (around 2.6 percent GERD). There are considerable regional disparities in R&D. The largest regional disparities were observed in those Baltic Sea Regions, which had particular specialization and clusters, for instance, the Danish region of Hovedstaden (health and food), the Norwegian region of Trøndelag (education and knowledge creation), the German regions of Bremen (transportation and logistics) and Hamburg (transportation, logistics, and distribution) (cf. figure 3) (see Eurostat, 2016b; European Cluster Observatory, 2015). Another typical pattern is that the capital city regions recorded the highest level of intramural R&D expenditures (see Eurostat, 2016b). In Germany, Berlin has the highest level of R&D (3.55 percent GERD). Outside of the German parts of the Baltic Sea, several regions are outperforming the regional level of R&D, for instance, Braunschweig (7.33 percent GERD) und Stuttgart (6 percent GERD). Especially for small countries, it is important to focus on particular strengths and to profile themselves accordingly. Specialization means finding a niche. It is vital to the success of initiatives that the necessary critical mass of specialists and human resources in general are reached so that specialties

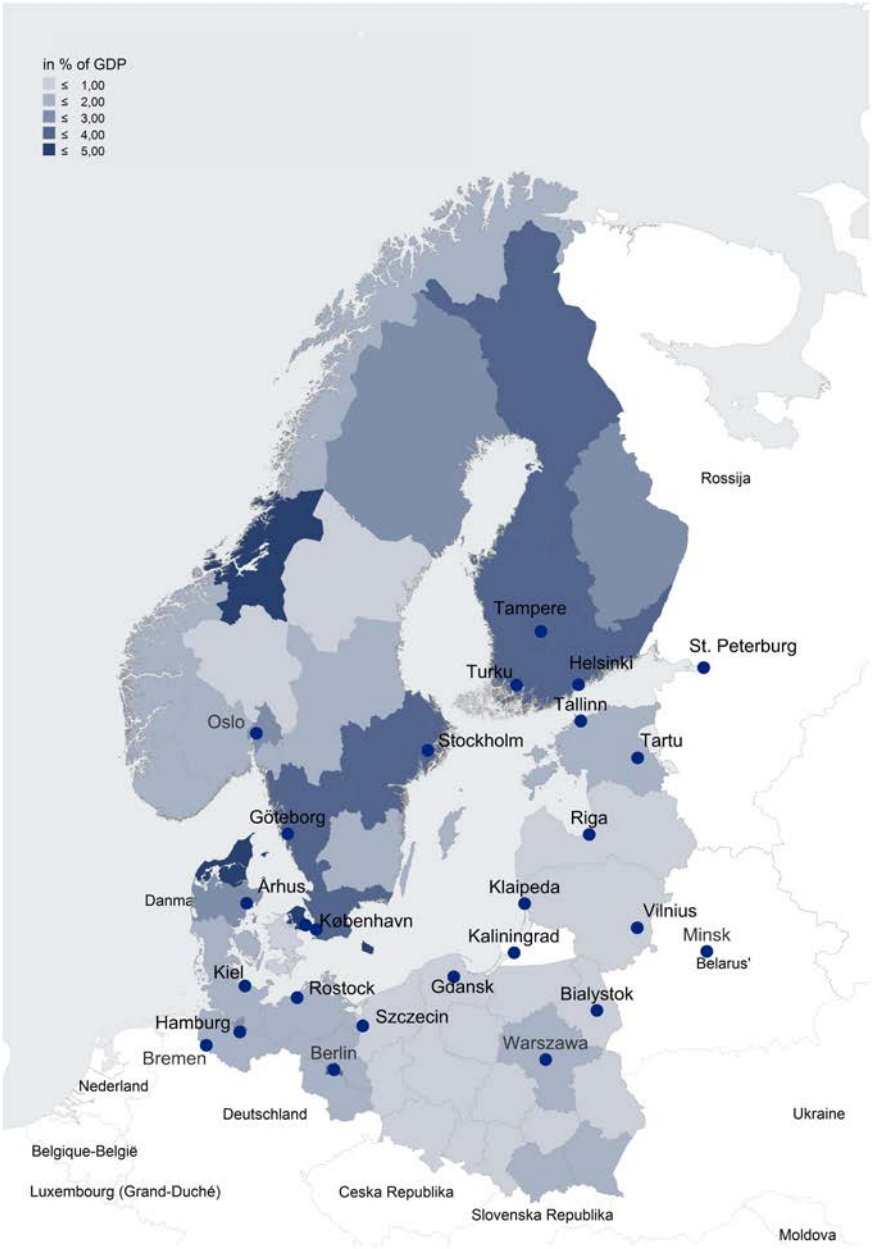
can develop (see Blech et al., 2009). For small countries, cooperation is a key to success in forming clusters and minimizing disadvantages of scale. This helps to explain why, for instance, Denmark and Finland are relatively open and liberalized countries (see Maskell et al., 1998).

Patents and trademarks give their inventor the intellectual property right to use a specific invention – based on a new solution or technical problem – in a particular field. Patents are limited for a number of years,[3] and represent, from the micro-economic perspective, a governmentally-granted monopoly or legal market power. It gives the inventors the incentive to invest in patents, trademarks or generally, inventions. But intellectual property refers broadly to inventions, and is not to be compared with innovations in a narrow sense (inventions brought to the market). With a patent, the government grants an enterprise the right to produce, sell a good or service, notwithstanding hereof if the granted patent holder uses it to supply market goods or services or not (see Schumpeter, 1950). Exclusivity laws give a significant benefit for the innovator-turned monopolist.

[3] Another limitation is that the regional statistics on patents are based on the address of the inventor; the place of invention is not always the place of the inventor. The discrepancy is even higher in the case of smaller geographical units.

Figure 3

Gross expenditure on R&D (GERD) by NUTS 2 regions (2013)



Source: Eurostat (2016a).

Sweden, Finland, Denmark and Germany are among the leading "inventors" in Europe and file more patents than the EU average. In contrast, in Russia and the more recent EU countries, such as Estonia, patents play a subordinate role for the development of these countries as areas of innovation (see Stiller/Wedemeier, 2016). Underlining this observation, Estonia witnessed a significant decline of over 50 percent in absolute patent applications in the period between 2008-12. Apart from Lubelskie in Poland (minus 70.9

percent) that is the largest decline of all single regions in the study area. While capital regions generally rank above the national average, for instance in terms of patent applications, the case of Berlin breaks the trend. The growth in patent applications was in average negative among the European Union 28 member states. This trend can also be observed for the Baltic Sea region (see Eurostat, 2016c).

Trademarks reflect the non-technological innovation in every sector including services. Trade marks support brand recognition, and are seen as important in marketing and communication. The European Union trademark (EUTM) gives protection for trade and service marks and is valid across the EU. According to findings of a study, almost 21 percent of all economic job activities – these are approx. 45.5 million jobs – in the EU during the period 2008 to 2010 were created by trade mark-intensive industries (see OHIM/EPO, 2013). Sweden, however, has the highest level of registered trademarks (208.0 EUTM registrations per m. inhabitants) within the Baltic Sea Region. In contrast, the level of EUTM registrations is the lowest in Poland (49.6 EUTM registrations per m. inhabitants). This is also below the EU-28 average of 150.4 EUTM registrations per m. inhabitants. Moreover, the regional levels of EUTM registrations are relatively heterogeneously distributed among the Baltic Sea Region with Stockholm (412.6), Hamburg (375.0), and Copenhagen (303.7) presenting the highest level of trade marks per m. inhabitants and therefore belonging to the top regions for EU trade marks in the European Union. Thereby, the Polish NUTS level 2 presents a level (Warminsko-Mazurskie 18.3 or Zachodniopomorskie 52.4 EUTM registrations per m. inhabitants) which is below the EU-28 average.

On the other side, German regions such as Bremen (170.7 EUTM per m. inhabitants) also show relatively high levels of registered European Union trademarks (see table 1). Looking at the regional shares of trademarks, the highest concentration can be found in Helsinki (59 percent of Finnish registered EUTM), in Copenhagen (48 percent of Danish registered EUTM), in Berlin (38 percent of Northern German registered EUTM), and Pomorskie (52 percent of Northern Polish registered EUTM).4 Moreover, the concentration of EUTM registrations per m. inhabitants reaches its highest values in Stockholm (412.64 registrations), Helsinki (317.45) and Copenhagen Hovedstaden (303.71), reflecting the previously stated observation of above-average concentrations in capital regions and an enhanced importance of Scandinavian regions in matter of trademarks. In opposite to the registered patent applications to the European Patent Office (EPO), with exception of Germany, the level of registered trademarks increases between the years 2008-15 (see table 1). The highest percental increases can be found in Polish regions as a reflection of their still existing backlog. The noticeable low values of Russia in terms of EUTM regis-

[4] Respective data shares refer for German and Polish NUTS 2 regions to Northern Germany (Berlin, Brandenburg, Bremen, Hamburg, Mecklenburg-Vorpommern, Lüneburg, Schleswig-Holstein) or to Northern Poland (Warminsko-Mazurskie, Podlaskie, Pomorskie, Zachodniopomorskie).

trations can be traced back to the fact that the EUTM registrations only reflect registrations of trademarks within the European Union and therefore neglect foreign activities. The same statistical inaccuracy holds for patent applications to the EPO (see table 1).

Statistics on high-tech industry and knowledge-intensive services (KIS) refer to economic, employment, science, technology, and innovation (STI) data describing the technological intensity of sectors. These sectors are regarded as highly competitive and innovative on a global scale. In the following, the focus lies on the knowledge-intensive services, since they are more generally distributed between the smaller economies of the Baltic Sea Region than the industry shares. The share of employment in knowledge-intensive services is especially high in the Scandinavian countries (between 53 and 45 percent). Germany presents a share close to the average of the EU-28 member states (40 percent). The three Baltic States and Poland deliver shares below the EU-28 average with around 31 percent (Poland), and 36 percent (Latvia). A geographical fragmentation between the Nordic states on the one hand side, Eastern Europe on the other and Germany in between can be derived from the statistical data. However, the three Baltic states faced a growth rate above the EU-28 average, whereas especially Estonia stands out with the highest percentage increase of all single countries. Among the states in Northern Germany, only Bremen witnessed a decline in 2008-12. The only other region with a negative growth in that period is Åland in Finland, whereby Warminsko-Mazurskie realized the highest growth rate marking a considerable catching-up process from the Polish region with the lowest employment in KIS to a region close to the national average (see Eurostat, 2016c) (see table 2).

Additional to data on knowledge-intensive services, statistics on high-technology sectors allow for some interesting conclusions. Defined as an aggregate of high-technology manufacturing and knowledge-intensive high-technology services, the included sectors are quantitatively smaller in comparison to KIS. The geographical fragmentation is less noticeable but still existent in this case, with Norway (4.0 percent) and Germany (4.1 percent) ranking in the region of the EU-28 average (4.0 percent) and Sweden (4.9 percent), Denmark (5.6 percent) and Finland (5.9 percent) in the upper range. While Poland (3.0 percent), Latvia (3.3 percent) and Lithuania (2.3 percent) remain weak also in terms of high-tech industries, Estonia appears to be more of a Northern country than part of Eastern Europe with 5.1 percent high-tech sectors. That is not only the third highest value within the study area, behind Finland and Denmark, but Estonia also witnessed the largest growth in the period of 2008-12. Again, the Eastern European countries face a higher growth rate than the EU-28 average which can be attributed to their still emerging high-tech industry. The highest share on the regional level can be found in Helsinki with 10 percent of total employment being located in high-technology sectors. Copenhagen Hovedstaden (9.7 percent), Oslo (8.1 percent) and Stockholm (7.1 percent) complement the list of high-technology regions, whereby among these regions only Stockholm faced a decline since 2008 (see Eurostat, 2016c).

A similar pattern in terms of a geographic fragmentation in human resources in science and technology (HRST), measured in percentage points of the active population, can be observed. The HRST measure is an additional definition for qualified labor. HRST is defined as persons who have completed a tertiary level of education and, respectively or, are employed in science or technology related sectors (see Eurostat, 2016c). Again, the Nordic countries, such as Sweden, Finland and Denmark rank above the EU average (45 percent), this time accompanied by Norway with the highest share among the Baltic Sea countries. Germany, on the other hand, although slightly above the EU-28 average, is surpassed by Estonia and Lithuania, emphasizing the successful structural change in the aftermath of the collapse of the USSR. The below-average growth rate in Germany (4.2 percent) and Denmark (4.9 percent) is, however, not necessarily critical as their human resources in science and technology already reflect the European average. Moreover, Norway, Sweden and Finland not only have the highest share of HRST in relation to the active population but also their growth rates exceed the other countries in the study area. Again, Estonia ranks above the Eastern Europe average, both in terms of the level of HRST and its growth rate. Lithuania is also well positioned while the country performs below-average in most of the other indicators. Among all observed Baltic Sea regions only Lüneburg experienced a decline. The other German regions, apart from Hamburg, were growing less powerful than the European average. The highest concentration of fast-growing regions is observed in Norway, with an average regional growth of over 9 percent, Moreover, Norway is the only country among the study area with all its regions being placed above the EU-28 average in terms of HRST. The development in Poland is noticeable on another level as only one of 16 examined regions, namely Mazowieckie, is ranked above the EU-28 average in HRST percentage, although the Polish regions realized substantial growth rates in 2008-15 (see table 1).

Table 1

Further innovation indicators by (selected) NUTS 2 regions 1

	European Union trademark (EUTM) registrations (per m. inhabitants)		Employment in knowledge-intensive service sectors (in % of total employment)		Human Resources in Science and Technology (HRST) (in % of active population)		Regional innovation performance (scoreboard) [2]	
	2015	growth 2008-15	2015	change in percent points 2008-15	2015	change in percent points 2008-15	2016	performance change 2016-2012
Denmark	199,8	5,2	48,3	2,5	48,4	4,9	leader	-
Hovedstaden	303,7	3,3	57,3	2,1	59,1	4,5	leader	-
Estonia	161,4	148,4	35,7	4,5	47.7	5,3	moderate	decrease
Finland	156,4	8,7	45,4	3,9	51.3	6,0	leader	-
Helsinki-Uusimaa	87,9	53,4	51,6	2,5	61.5	5,6	leader	-
Germany	156,1	-11,9	40,0	1,3	45.8	4,2	leader	-
Berlin	251,6	36,0	51,6	0,2	54,0	4,5	leader	-
Brandenburg	46,8	14,1	41,1	1,0	44.8	4,0	strong	-
Bremen	170,7	-16,8	38,8	-1,0	43.9	3,2	strong	-
Hamburg	375,0	-4,1	47,1	2,5	55,0	6,5	leader	
Lüneburg	78,7	-16,9	38,8	2,0	43.3	-5,6	strong	-
Mecklenburg-Vorpommern	36,3	-17,7	39,4	2,4	42,0	5,6	strong	-
Schleswig-Holstein	116,6	-3,3	42,6	0,7	44.3	3,7	strong	-
Latvia	53,9	146,0	35,9	3,8	41.6	3,3	moderate	increase
Lithuania	61,6	157,1	33,8	3,3	47.1	5,5	moderate	-
Poland	49,6	111,2	31,2	2,9	40.1	8,2	moderate	-
Podlaskie	23,2	295,8	27,7	0,6	37.1	7,8	moderate	increase
Pomorskie	52,4	110,6	32,7	0,6	40.3	5,7	moderate	-
Warminsko-Mazurskie	18,3	335,7	30,9	29,7	35.7	7,5	modest	-
Zachodniopomorskie	33,2	367,7	33,9	0,4	37.8	3,5	moderate	increase
Sweden	208,0	12,3	52,8	2,3	52,0	7,2	leader	-
Stockholm	412,6	12,4	61,0	2,5	62,7	7,2	leader	-
EU-28	150,4	33,8	39,9	2,9	45,2	5,6	strong	-
Norway	43,3	4,4	51,0	3,5	54.3	9,2	moderate	decrease
Oslo og Akershus	93,3	-8,5	58,5	2,4	65.3	5,9	strong	-
Russia	0,6	1,6	:	:	:	:	:	:

[1] Performance groups: innovation leaders, strong innovators, moderate innovators, modest innovators.

Sources: Eurostat (2016); Hollanders et al. (2016).

The same pattern becomes visible in the recent Regional Innovation Scoreboard (RIS) measuring and clustering the innovation performance among 214 European regions (see Hollanders et al., 2016). The RIS 2016 includes various indicators from the European Innovation Scoreboard (EIS), thereunder regional data from the Community Innovation Survey (CIS). The RIS indicators range from "Percentage population aged 30-34 having completed tertiary education", to "Non-R&D innovation expenditures in SMEs as percentage of turnover" to "Innovative SMEs collaborating with others as percentage of

SMEs". In total, 18 indicators are sed in the RIS. The RIS measures the innovation performance and classifies them either as "innovation leaders", "strong innovators", "moderate innovators", or "modest innovators". Generally, Danish, Finish, German such as Swedish regions are classified as "innovation leaders" or "strong innovators". The Baltic States and Poland are typically moderate innovators.

Denmark's regions are almost all listed as "innovation leaders", apart from Syddanmark which is a "strong innovator", the second-highest classification. In Sweden, more than half of the regions can be found in the highest classification. Interestingly, the capital region of Stockholm is not among them while Helsinki is the only region in Finland to reach the highest grading with all other regions being only "strong innovators". Norway, in contrast, breaks the positive trend of the Nordic countries, with its regions mainly being classified as "moderate innovators". Germany partly remains in the middle with innovation leading regions such as Hamburg and Berlin and various strong innovative regions. Within the study area, Poland is the only country with a number of regions being "modest innovators", representing the lowest classification. The regions bordering the Baltic Sea, however, are among the more innovative areas within the country. The capital region is not an outstanding innovation hotspot. All regions of the study area have been relatively stable between 2012 and 2016 (see table 1).

4 | Innovation and the creative economy

A sophisticated and excellent skill structure is regarded as a major condition for regional employment growth and economic welfare (see above). In particular, creative and culture professionals are supposed to be attracted to the places that are the most beneficial to creative and innovative activities (see Wedemeier, 2012; Florida, 2002).5

The most successful places seem to be particularly concentrated in idea-producing industries, among these are the Scandinavian respectively Nordic countries.6 The creative and culture economy becomes increasingly important for economic development. More than in other states, the cities and regions of Denmark and Sweden have specialized in the creative economy and pursue cluster strategies to promote the creative economy, and in Denmark the experience economy in particular (see Danish Government, 2015). The experience economy stretches beyond the cultural and creative economy to include the areas, for instance, of sports, tourism, and edutainment. Strengthening these industries is one of the strategic aims of the Nordic Innovation Council. As part of this initiative, the Nordic countries and the Baltic States collaborate supra-nationally to develop strategies to promote the economic activities of the experience economy. The Nordic

[5] Florida (2002) developed the main hypothesis of the so-called creative class. By creativity he means the ability to create new knowledge and to deploy existing knowledge successfully. Florida's central hypothesis argues that creative cities develop out of the interplay and mutual positive reinforcement of the three locational conditions 'technology, talent and tolerance'.

[6] The Nordic countries are Denmark, Finland, Iceland, Norway, and Sweden; the Scandinavian countries refer to Denmark, Norway, and Sweden, sometimes also Finland.

countries have become a growing market for the creative and culture economy. Moreover, the Baltic States, especially Estonia, are being increasingly integrated into this strategy of the Nordic countries, for example, through the joint development of a model region for the creative economy. Hamburg also has strong partnerships in the Baltic Sea Region in the sector of the cultural and creative economy (see Stiller/Wedemeier, 2016).

The indicator of employment is built on a specific distinction of the creative and culture sector including the NACE Rev.2 economic activities of film, television and music production, programming and broadcasting, creative, arts and entertainment activities, libraries, archives and museums as well as related technical activities. As in terms of innovation, the Nordic countries also rank above the EU-28 average of 2.8 percent when it comes to the employment in the creative sector in relation to the total employment. While Germany and Poland lie under the European average, especially the Baltic States rank higher compared to their innovation rankings. Nevertheless, Latvia and Lithuania are the only countries that befall a negative growth rate in 2008-14, while the majority of countries realized a growth in double-digits. As in terms of employment, Sweden tops the list with almost 5 percent of all enterprises being related to the cultural sector.7 Apart from Finland, the Nordic States again represent the upper range in contrast to Eastern European countries. In Germany, the low share of creative and culture employment is relativized by its above-average number of creative enterprises. However, in none of the observed countries has a negative growth taken place in 2008-13, whereas Estonia, Latvia and Germany realized significant increases between 23.3 and 35.4 percent (see table 2).

The same distinction as for the number of enterprises is used for data on the turnover of enterprises. Although the available data fails to draw a complete picture, particularly Poland is worth a look. Despite having the lowest percentage of creative and culture employment among all countries in the study area and being last but two in terms of the number of cultural enterprises, surprisingly, the Polish creative and culture industry has the highest percental turnover, before Germany and Sweden (see table 2).

Figure 4 presents the regional distribution of the shares of the creative economy and its growth from 2010-15. Among the regions with the highest shares are the German metropolitan cities Berlin (13.9 percent) and Hamburg (10.6 percent), such as the capital cities of the Nordic countries Copenhagen (13.7 percent), Helsinki (14.5 percent), Oslo (14.2 percent) and Stockholm (13.7 percent). The growth rates are relatively high in these cities. With some exceptions, for instance Bremen (-14.8 percent) or Nordjylland (-6 percent), the remaining regions experience relatively high growth rates, but coming from lower levels of shares of the creative economy (see figure 3).

[7] In contrast, the definition of the creative sector related to the number of enterprises differs significantly. The sector definition is an aggregate of publishing of books, journals, magazines, newspapers and computer games, film, television and music production, programming and broadcasting, news agency and architectural activities as well as specialized design activities.

Table 2

Creative economy[1]

	employment			no. of enterprises			turnover of enterprises		
	in thousands 2014	in % of total employment 2014	Change in % 2008-14	total number 2013	in % of total number of enterprises 2013[3]	Change in % 2008-13	in million EUR 2013	in % of total turnover of enterprises 2013	Change in % 2008-13
Denmark	104,1	3,8	24,4	8.459,0	4,0	17,1	5.846,7	4,5	-13,8
Estonia	21,5	3,6	11,4	1.672,0	2,7	35,4	:	:	:
Finland	95,5	3,8	6,5	6.092,0	2,6	4,6	:	:	:
Germany	1.183,0	2,8	17,1	72.873,0	3,3	23,3	62.648,3	5,8	12,5
Latvia	28,6	3,3	-8,9	1.918,0	2,0	26,6	:	:	:
Lithuania	42,4	3,2	-3,6	1.705,0	1,1	5,8	325,3	2,3	-41,9
Poland	402,1	2,6	26,4	35.071,0	2,3	8,1	7.893,4	6,2	-18,6
Sweden	194,0	4,1	29,3	31.920,0	4,8	21,2	12.050,4	5,4	19,5
EU-28	6.273,1	2,8	17,4	:	:	:	300.476,4	5,3	:
Norway	88,4	3,2	27,2	10.435,0	3,7	5,7	7.233,3	4,8	24[3]

[1] Data for Belarus and Russia not reported.

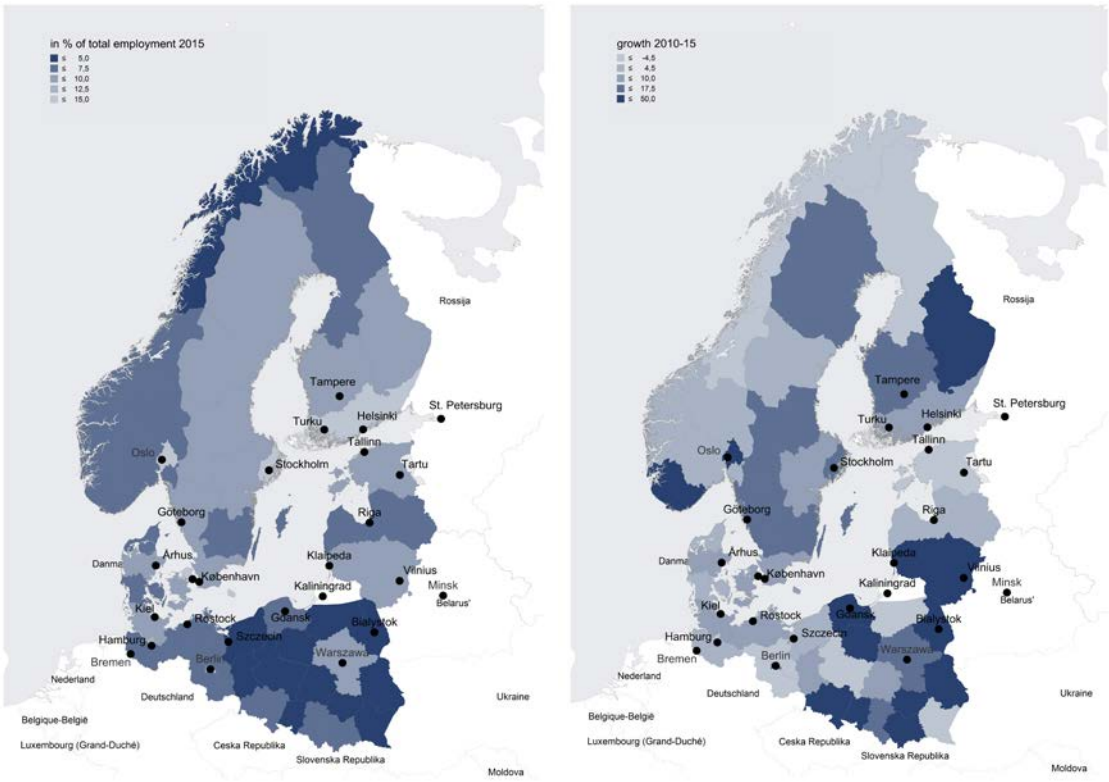
[2] 2009

[3] Number of enterprises in the non-financial business economy

Source: Eurostat (2016).

Figure 4

Creative economy



Source: Eurostat (2016).

5 | Conclusion

As empirical literature suggests, the innovation capability is an important driver in achieving growth and welfare in the European Union, whereby the Baltic Sea countries already contribute to a high extent to this development. Programs such as the flagship program Innovation Union and Horizon 2020 are an integrated contribution to this development. The Baltic Sea Region innovation system is a heterogeneous one. The resource endowment is very different between the Baltic Sea countries, but the same holds for its efficiency in producing innovative outputs.

Europe's corporate R&D goals are challenging and presumably too ambitious. In a global perspective, however, the development of R&D has been relatively stable in the last ten years, in the United States and Japan it remained at almost the same level (see European Commission, 2010; Pochet, 2010). The European Union, therefore, is far from

being totally outperformed by these countries. Moreover, the member states of the European Union upgraded the R&D intensity in the last decade, especially by national efforts. The main drivers of the European innovation improvements were the Scandinavian members and Germany. They increased the public and private spending since 2000 between 2.19 percent of GDP (minimum) (Denmark) and 3.91 percent of GDP (maximum) (Sweden) to 2.87 percent of GDP (minimum) (Germany) and 3.17 percent of GDP (maximum) (Sweden) in 2014. Thanks to the countries of the Baltic Sea Region, Europe is not only the largest transnational science and research system but it is still ahead of other international innovation systems (see Frietsch et al., 2015). Still, in various indicators, the three Baltic States rank below the EU-28 average (for instance in terms of employment in technology-intensive sectors or patent applications to the EPO), while Estonia outperforms its neighbors and the EU-28 average in terms of employment in high-technology sectors. Looking at human resources in science and technology (HRST), the above-average position of Estonia is shared by Lithuania, breaking the substandard trend for the latter. Obviously, the economic transformation has not yet raised the Baltic States to the Western European level, but the efforts already made are reflected in specific indicators. Most capital cities tend to have higher innovation scores than the rest of the countries. This is not a surprise since companies' headquarters are mainly located in capital cities/regions. Despite of the highest growth rates for several headline targets being recorded in the eastern Baltic Sea countries, most regions within these countries are still catching up to the Western part of the Baltic Sea region.

The regional disparities presented in this paper indicate a need for action since one aim of the European Commission's Innovation Union – as part of the EU-2020 strategy - is to foster the dissemination and realization of European wide economies of scale (and scope, i.e. knowledge spillovers) in innovation and knowledge intensive sectors (see McCann/Ortega-Argilés, 2015). A core objective is to enforce interregional cooperation of regional smart specialization strategies (S3). The key concept of S3 is that innovation leader regions (in a specialization) mostly invest in the invention of a general purpose technology (GPT), while the moderate/modest innovator regions (in a specialization) follow the co-invention aspect of a technology with their investment. Smart specialization is therefore not about being specialized in a certain sector. For moderate innovation regions, it is more relevant to focus on what is the potential of GPT for the target economic domain by the aspect of co-invention of applications (see David et al., 2015), e.g. augmented reality (GPT) for construction or tourism activities.

This is also an argument for organizing more cross-cluster approaches and innovation projects with the character of transnational cooperation. Many regions in Europe are characterized by a weak relation between R&D and the economic activities (see McCann/Ortega-Argilés, 2015). This can also be assumed for many regions of the Baltic Sea. Projects such as GoSmart BSR[8] or Smart-Up BSR can contribute to a strengthening

8 GoSmart aims to boost transnational cooperation among industry, the research & development sector, and authorities in employing smart specialization strategies in regions in the eastern parts of the Baltic Sea Region. It promotes mutual learning, sharing best practices and translating smart specialization strategies into practical joint actions of small and medium sized enterprises.

of smart specialization and a catch-up process of regions in the Baltic Sea Region (see Interreg BSR, 2018a; Interreg BSR, 2018b)

Moreover, policy should consider the technology and market trends as relevant, since changes in the focus of the economic sector are still possible and could influence the future of the region's smart specialization strategies, especially relevant for the upcoming update of the S3 for the period 2021+. One important factor for the transfer of knowledge – and this precisely because of the upcoming trend of digitalization – is face-to-face contact and the cross-border mobility of the labor force under the regime of the four freedoms of the European Union. For the process it is important to encourage entrepreneurs and other organizations to become involved in the discovery of the future's regional specializations.

However, the east-west disparities among the Baltic Sea countries are expected to decrease in future, whereas this decease will apparently take decades. As part of the catch-up process of the three Baltic States and Poland, the research and development capacities in these countries will expand and create potential growth.

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