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Explaining regional economic performance: the role of competitiveness, specialization and capabilities

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Keywords: Capabilities, Specialization, Regions, Related Variety, Smart Specialization

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By

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1. Introduction[1]

How should differences in regional economic performance be explained? This paper examines the different approaches to this question, including their empirical underpinnings, which have developed in the scholarly literature with particular emphasis on identifying issues that continue to be of central importance for scholars in the field today. It may be noted, however, that as far as theories and perspectives are concerned, the research area under scrutiny here is a highly porous one. In fact, the theoretical perspectives guiding researchers in this area do in most cases apply to other spatial levels as well. For this reason, a very sharp distinction between the bodies of knowledge on for instance national and regional economic performance may not be very fruitful. Section 2 presents an overview of how theoretical and applied work of relevance for the analysis of regional economic performance has evolved to its present stance. This leads to the identification of two central factors for regional economic performance, that is, capability building and specialization. Section 3 is concerned with the availability of relevant data for exploring the relationships between these factors and economic development. The analysis shows that regional economic performance and capability building does indeed go hand in hand, while the evidence regarding the impact of specialization is more mixed. Finally, Section 4 considers lessons and implications for policy and future research.

2. An evolving agenda

In this section we outline central themes and approaches in the scholarly literature on how differences in economic performance may be explained. We start by a discussion of the term "competitiveness" and attempt to map its development in order to better understand the economic performance of countries and/or regions. Then the relevant theories and approaches are presented

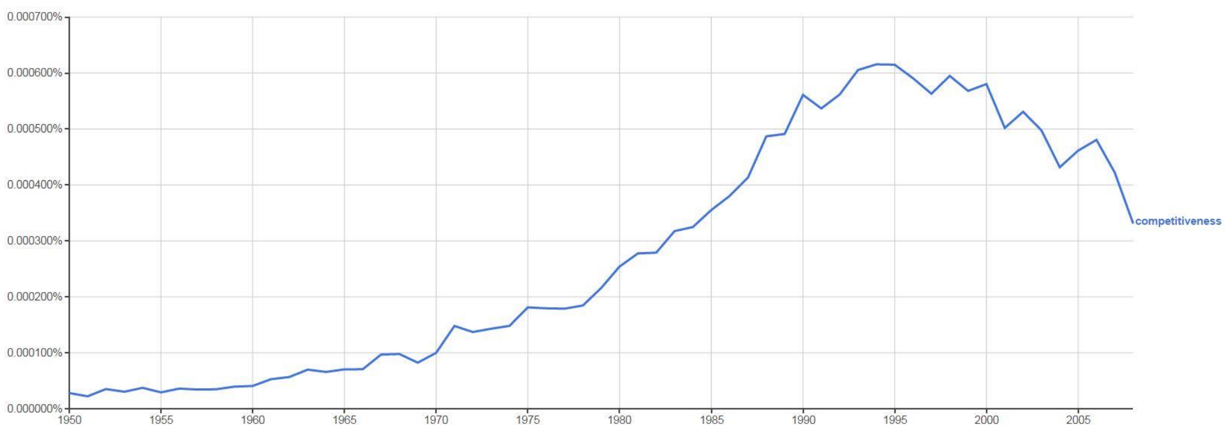
[1] Financial support from the VINNOVA Core Funding of Centers for Innovation Systems Research project 2010-01370 on 'Transformation and Growth in Innovation Systems: Innovation Policy for Global Competitiveness of SMEs and institutional support RVO 67985998 from the Czech Academy of Sciences is gratefully acknowledged. The research contributes to the agenda Strategie AV21 of the Czech Academy of Sciences. We also thank N. Cortinovis and F. van Oort for data (entropy-index, see Cortinovis and van Oort 2015, forthcoming) on inter and intra industry specialization in European regions (used in Section 3).

in a chronological fashion with particular emphasis on the research questions that they give rise to.

Competitiveness and beyond

The term competitiveness has a long history (Reinert, 1995) but, as Figure 1 indicates, the popularity of the term reached particularly high levels during the 1980s and 1990s. This surge of interest arguably had to do with the changes in the global economy at that time, with the rapidly increasing role of Japan and other industrializing countries in Asia, and the correspondingly declining role of the USA and Europe (which was taken by many to reflect declining competiveness). A heated debate took place at the time among economists and social scientists about the relevance of the competitiveness term (Fagerberg, 1996), the concern for which by some (Krugman, 1994) was characterized as a "dangerous obsession". Nevertheless, the term continues to be widely used, at the national as well as the regional level (Huggins, 2003; Kitson et al., 2004).

Figure 1 The popularity of the term competitiveness according to Google



Source: https://books.google.com/ngrams, 7 September 2015

However, the term is not part of the mainstream economic vocabulary, as set out for example in standard text books and courses, and it is therefore not necessarily surprising that it may be used in different ways. Sometimes, the competitiveness term is used in the same sense as 'comparative advantage' or specialization. In this sense, a country's or region's competitiveness in a particular industry or product is said to be high (or at least above average), if its market share in (global) markets for this particular industry/product is higher than its market share for all industries/products combined. It follows that a country or region by definition will always be highly competitive in something.

More commonly, the term competiveness is linked to a country's or region's ability to maintain and increase the living standard of its citizens. An increasing living standard may of course also be realized by increasing debt, but this would - as shown by recent Southern European evidence - not be sustainable in the long run, and lead to declining living standards later (Fagerberg and Verspagen, 2015). Some contributions in this area therefore explicitly assume the external constraint is adhered to (Thirlwall, 1979; Fagerberg, 1988).[2]

A distinction may furthermore be made between output competitiveness, growth in GDP or income per capita for example, and input competitiveness with respect to how advanced the country or region is in the factors that influence 'output competiveness'. A notion such as 'cost competitiveness' obviously is an example of the latter. However, many factors may be relevant, not just costs. In fact, some organizations and consultancy firms have made it a business model to create long lists of indicators for the various aspects taken into account and weigh these together into a synthetic measure of competitiveness (IMD, 2015; Schwab, 2015). This methodology has also been applied at the regional level (Annoni and Dijkstra, 2013; Dijkstra and Annoni, 2016). While illustrative, it may be objected that it is of little help to have a lot of data if a clear understanding of how these various factors interact is lacking. To provide such an understanding is arguably what theory - to which we now turn - is for.

Keynesian and neo-classical perspectives

The emergence of the literature on how differences in economic performance should be explained dates back to the early post-World War II period if not earlier. At the time there were two competing paradigms in economics, the Keynesian, focusing on the role of demand in spurring

[2] An OECD publication defines the international competitiveness of a country as follows: '…the degree to which, under open market competition, a country can produce goods and services that meet the test of foreign competition while simultaneously maintaining and expanding domestic real income' (OECD 1992, p. 237).

economic growth, and the neo-classical which ignored demand and instead emphasized supply factors.

The Keynesian perspective gave rise to models in which differences in national (or regional) economic performance were explained by differences in the demand for each country's or region's exports (Beckerman, 1962; Thirlwall, 1979). Following these models, countries that were specialized in fast growing products or markets would be at advantage. Hence, according to these models, the specialization pattern of the country or region mattered for its rate of economic growth. With this the role of specialization for economic performance was established as a central item on the research agenda. This conclusion, it may be noted, differed from that of neoclassical trade theory, according to which the beneficial effects of changes in specialization based on exploitation of a country's or region's 'comparative advantage' would be temporary in nature, and not matter for long-run growth (Robson, 1987).

Researchers based on the neoclassical perspective instead focused on the growth in supply of the factors of production as the determinants of a country's or region's economic growth. However, the formal model based on this perspective developed by Solow (1956) implied that such differences in supply only mattered in the medium run and that in the longer run – so-called equilibrium – factor supply was assumed to adapt to the growth path[3] determined by exogenous technological progress. Empirical work (Abramovitz, 1956) based on this perspective also indicated that most economic growth had to be explained by exogenous technological progress (the impact of which was calculated as a residual between actual growth and the estimated contribution from growth of factor supply). This naturally placed technological progress in the center of researchers' attention when it came to the explanation of differences in long run economic performance.

Capabilities

However, although the neoclassical growth theory placed strong emphasis on the role of technology, it was a highly simplified account, which among other things completely ignored challenges associated with its exploitation and diffusion. This was of concern to economic

[3] The long run growth path may also be influenced by (exogenous) differences in saving behaviour and demographic trends .

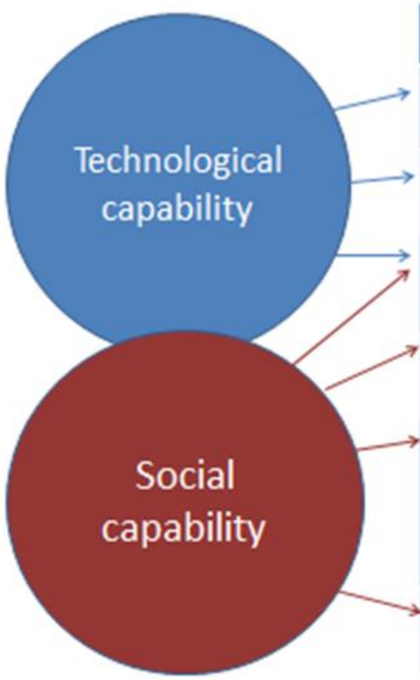
historians and development scholars who studied the possibility of catching up by less developed countries or regions. The economic historian Gerschenkron (1962) pointed out that although the existence of more advanced technology in use elsewhere (a so-called 'technology gap') represents 'a great promise' for backward regions, turning this promise into reality is far from easy, but on the contrary requires substantial efforts and institution-building. Another economic historian, Abramovitz (1986), used the term 'social capabilities' for the collective assets that a backward country or region need to take advantage of technology gaps. When defining it, he cast the net rather broadly, including aspects such as education, infrastructure, finance, the legal system, governance and norms/culture (Abramowitz, 1994a, 1994b).

A similar term, 'technological capabilities', i.e., the capabilities that firms in backward regions have to acquire in order to be competitive, was suggested by the Korean development scholar Kim (1980, 1997). Kim distinguished between three types of technological capability: production capabilities; investment capabilities and innovation capabilities. According to Kim production capabilities are required to produce goods that satisfied global standards, investment capabilities are necessary to move into new areas while innovation capabilities are required for developing new products and services and to compete head on with foreign firms at the frontier. Hence, according to Kim, for a firm or country to continuously improve its position (reduce the technology gap), continuous upgrading of technological capability would be necessary. Thus, following this view, for a firm or country in the process of catching up, the appropriate level of technological capability is a moving target (Bell and Pavitt, 1993).

Although initially developed for analysis of firms, the technology capability concept has also been applied at more aggregate levels. Arguably, firms' performances depend to a crucial extent on the characteristics of the environment in which they operate. For example, a firm's technological capabilities do not only depend on its own activities but also the capabilities of its customers, suppliers and other firms and organizations with which the firm is in regular contact, that is, the broader innovation (national or regional) system in which it is embedded (Lundvall, 1992; Braczyk et al., 1998). Lall (1992), in a survey, emphasized three aspects of 'national technological capability' as he phrased it: the ability to muster the necessary (financial) resources and use them efficiently; skills, including not only general education but also specialized managerial and technical competence; and what he called 'national technological effort', which he associated with measures such as R&D, patents and technical personnel. He also made a distinction between technological capabilities proper and their economic effects. These effects, he noted, did also depend on the incentives that economic agents face whether resulting from political decision making (for example, governance) or embedded in more long-lasting institutions (the legal framework, for example).

Defining and measuring capabilities at different levels of aggregation remains a challenge. However, in recent years the availability of data of many potentially relevant aspects has improved significantly, and several attempts have been made – particularly at the country level - to exploit this to measure capabilities, often by weighing together different (albeit related) information (Archibugi and Coco, 2005). Figure 2, adapted from Fagerberg and Srholec (2008) and Fagerberg (2010), provides an example of how the various dimensions of technological and social capability, highlighted above, may be measured with the help existing data sources (many of which are based on surveys).

Figure 2 Technological and social capabilities



Dimension	Measure
Innovation capability	Scientific publications, scientists and engineers, R&D, patents
Production capability	International (ISO) standards, telecommunication, internet
Finance capability	Access to bank credit, stock-market, functioning of financial market
Education	Literacy, educational attainment, teacher-pupil ratio, PISA-score
Innovation-friendly governance	Corruption, law and order, property rights, business friendly regulation, strength of bureaucracy
Social characteristics	Honesty, trust, tolerance, social inclusion, cooperative behaviour

Fagerberg and Srholec (2008) used factor analysis on various indicators on technological and social capabilities for 115 countries between 1992 -2004 to arrive at a smaller number of synthetic variables, which they then used to explain economic growth. The results suggested that capability building has a powerful effect on economic growth, much more so than for example differences in political system or openness to trade, variables often emphasized by economists. These results were found to be robust to inclusion of a number of control variables reflecting differences in nature, history and culture.

The research reported above applies mostly to the national level. Some studies have attempted to take into the account the role of technological and social factors at the regional level as well (for example, Crescenzi et al., 2007; Fagerberg et al., 2014). This research, although demonstrating the fruitfulness of the approach, has arguably been constrained by lack of relevant data on the subject. The supply of relevant information is continuously on the increase, however, and we will return to this issue in section 5.3 of this paper.

Innovation-driven growth

For technology gaps to be reduced and eventually totally eliminated (through catching up), they first need to be created, and one would expect a theory explaining differences in economic performance across countries or regions to allow for that, although that has proved very challenging. An early attempt to do that was Posner's (1961) technology gap theory, in which a country's or region's technological lead was enhanced by innovation and reduced by imitation. A similar mechanism was later suggested by Krugman (1979), Fagerberg (1987, 1988) and by Dosi et al. (1990). These contributions were clearly influenced by Schumpeter (1934, 1943) and his emphasis on technological (innovation-driven) competition as the engine of capitalist development.[4]

The increased interest among scholars in the role of technology and innovation for long-run economic performance, and the related renaissance for Schumpeterian ideas, also led

[4] See Fagerberg (2003) for a more detailed treatment of how Schumpeter's ideas were taken up by his followers (the so-called neo-schumpeterians).

neoclassical economists to develop formal models of growth that emphasized R&D and invention as the ultimate source of long-run economic growth (Romer, 1990; Aghion and Howitt, 1992; Grossman and Helpman, 1991). In these models, R&D leads to inventions, protected by patents, this protection gives investors the required incentives for undertaking the required R&D investments. However, as a side-effect (‘externality’), R&D is also assumed to lead to some learning/new knowledge that cannot be appropriated (‘spillovers’), this will be accessible for other inventors free of charge, and fuel further invention and, hence, economic growth. These models led to increased interest for research on patenting and spillovers of various sorts including knowledge flows across different locations (including regions) and economic fields (being sectors, industries or more narrowly defined segments within these) and their relationship with economic growth. However, since it is invention, not innovation, that fuels growth in these models, many of the challenges associated with successful innovation-diffusion highlighted in the innovation literature (see, for example, Fagerberg et al., 2004) – and which led to emphasis on building capabilities of various sorts as discussed above – came to be overlooked in subsequent work inspired by this perspective.

Another strand within the new growth literature arguably implied a return to the old Keynesian theme of how specialization affects economic performance. In particular, Lucas (1988) proposed a model that, assuming different scope for learning across sectors or activities, raised the possibility of powerful effects of specialization in such learning-intensive activities (and hence structural change) for economic performance. Lucas (1993) suggested this as a possible explanation of rapid growth in East Asia when compared with other countries. However, empirical work indicates that specialization and structural change explain only a part of the difference in performance between East Asia and other countries (Fagerberg, 2000), and that there hence may be other economy wide factors at work.

Economies and diseconomies of specialization

As the above example shows, in economics increased specialization is generally thought of as associated with higher prosperity. This goes both for specialization across industries (so-called inter-industry specialization), often assumed to reflect differences in factor supply (that is, so-called comparative advantage), or specialization at a finer level within a specific industry (so-called intra-industry specialization), which may for example have to do with differences in knowledge, demand, tastes etc.

However, to the extent that proximity is good for learning and innovation,[5] specialization may arguably also have a negative effect on productivity, in the sense that it reduces the proximity to other firms from which a firm may learn. How important is this in practice, and which effect prevails? Frenken et al. (2007), in an analysis on Dutch data from around the turn of the millennium, suggest that this can be tested with the help of an 'entropy measure' of diversification (the opposite of specialization) originally proposed by Jacqemin and Berry (1979). When applied to a region's production structure this measure splits the total variance in two parts, one associated with inter-industry specialization (which Frenken et al. (2007) term 'unrelated variety') and another, which is their main focus, reflecting the degree of specialization across more narrowly defined segments within industries (so-called 'related variety'). The hypothesis entertained by Frenken et al. (2007), then, is that the less specialized (more diversified) a region is within industries (as reflected in 'related variety'), the better the opportunities for benefitting from external knowledge are and, hence, the higher innovation activity and productivity (or its growth rate) should be. However, Frenken et al. (2007) fail to confirm this suggestion, as the relationship with productivity growth turns out be the opposite of what was expected (and significantly so), which would imply that the advantages of (intra-industry) specialization are larger than the possible disadvantages. Boschma and Iammerino (2009), in an analysis based on Italian data, similarly fail to confirm the hypothesis in two of three reported specifications. A third study by one of the same authors (Boschma et al., 2012) does not report results for productivity growth and hence throws little additional light on the issue.

Thus, despite claims to the contrary (see for example, McCann and Ortega-Argiles, 2015), the jury seems still to be out with respect to the economic effects of inter- and intra-industry specialization (or unrelated and related variety). This may of course have to do with limitations of data or methods. For example, while the theory is about proximity of knowledge holders, the statistics used are for production, trade etc. This clearly complicates the matter, as it does not appear obvious that knowledge bases and products necessarily coincide. But it can also reflect weaknesses of a theoretical nature. Arguably, firms, particularly technologically advanced ones, do not rely solely on one type, or source, of knowledge but on many different ones. Can it really

[5] See Boschma (2005) for an overview and discussion of the role of proximity for innovation.

be taken for granted that 'distant' knowledge necessarily is less valuable for the firm than what is available close by? If so, why do firms, large and small, regularly devote efforts and resources on searching for knowledge that is not ready to hand? In fact, the reasons for doing this, and how to do it in the best possible way, have for a long time been among the most central issues in the literature on innovation management and strategy (Cohen and Levinthal, 1990; Chesbrough, 2003).

The discussion has identified two central issues with respect to which countries and regions perform, related to capability building and specialization, respectively. However, as pointed out above, the empirical evidence considered with respect to capability-building is mainly from the national level. Moreover, for specialization evidence appears inconclusive. Using empirical evidence from a sample of European regions the next section explores these issues in more depth.

3. Capability building, specialization and performance: evidence from European regions

At the country level there are strong theoretical arguments and empirical evidence suggesting that capability building and economic development go hand in hand. As emphasized in the introduction to this paper, theories that apply to countries may also hold for regions (and vice versa), indicating that exploring capability building and its effect for regions may be a profitable avenue for research. But as pointed out above, the existing literature on this is scarce, which to a large extent may have to do with lack of relevant and comparable information at the regional level.

Nevertheless, the supply of relevant information is continuously improving, not the least in connection with the publication of the EU-sponsored Regional Competitiveness Index (RCI 2013) by Annoni and Dijkstra (2013) and Dijkstra and Annoni (2016), which is the main source of information for this analysis, supplemented by statistics obtained from Eurostat (online).[6] The

[6] In a few cases, there were missing data points that had to be estimated, for the purpose of which we used the impute procedure in Stata 11.2 (for more information see Stata, 2005, pp. 217-221).

analysis will be carried out for a sample of 254 European regions.[7] A limitation is that as this data gathering exercise is fairly recent, this also holds for the statistics it contains (from the last few years mostly), so that a time series analysis (or analysis of changes and their impacts) will not be possible. The main purpose of what follows, therefore, is to illustrate how available information can be used to measure technological and social capabilities at the regional level, and analyze the relationships between these and regional economic development.[8] Hence, due to the nature of the available data, no claims regarding causality can – or will – be made.

The analysis will follow in the steps of previous studies on this topic at the national level. Technological capability will be measured by four different indicators, reflecting the strength of science and engineering research (measured through publications), R&D in the private and public sectors and inventive activity as reflected in patenting. These indicators are then combined together, using factor analysis, and the result is reported in Table 1. As the factor loadings indicate, the four indicators are highly correlated, increasing the confidence in the procedure.

Table 1 Technological capability: results of the factor analysis

	Factor loadings
Scientific and engineering publications (per mil. people)	0.77
Patent applications (per mil. people)	0.67
Business R&D expenditures (% of GDP)	0.71
Public R&D expenditures (% of GDP)	0.70
Number of observations	254

Note: 51.0 per cent of total variance explained, the extraction method is principal factors.

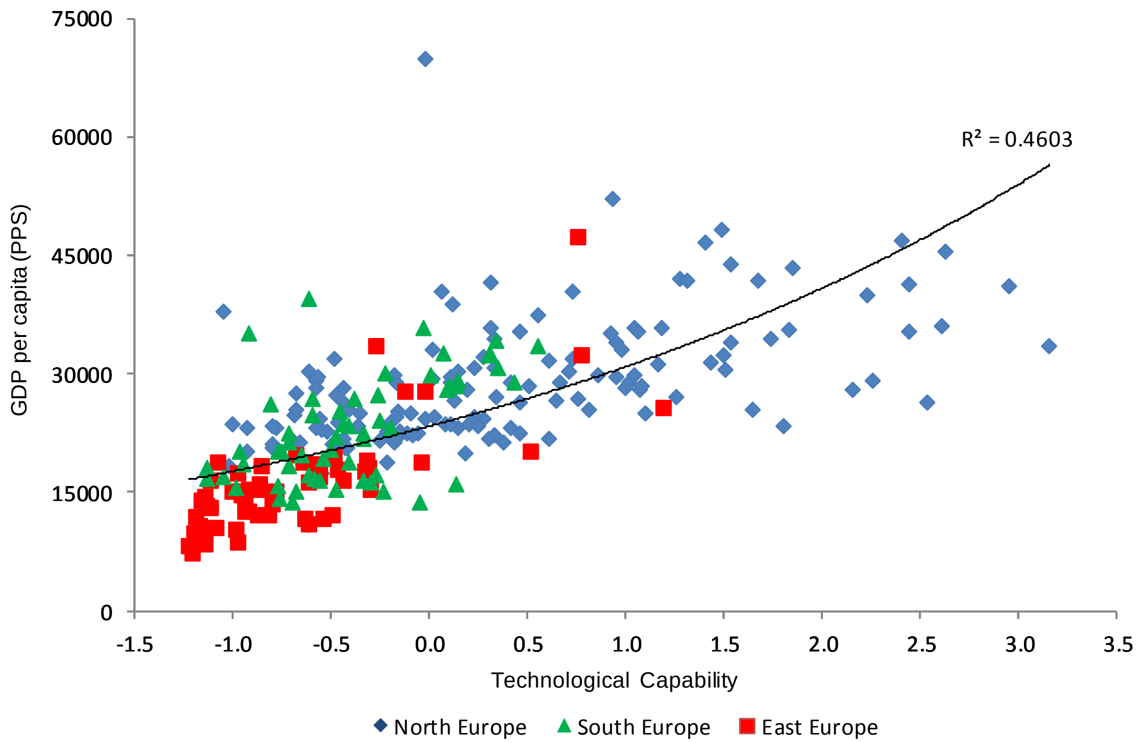
Figure 3 plots technological capability on the horizontal axis against economic development as reflected in GDP per capita on the vertical axis. As the figure shows there is a close correlation

[7] Following RCI 2003 data for some major cities were merged with the surrounding regions. In the figures, regions were labeled after which part of Europe they belong to, that is, North Europe (Austria, Belgium, Germany, Denmark, Finland, France, Ireland, Luxembourg, Netherlands, Sweden and United Kingdom), South Europe (Cyprus, Spain, Greece, Italy, Malta and Portugal) and East Europe (Bulgaria, Czech Republic, Estonia, Croatia, Hungary, Lithuania, Latvia, Poland, Romania, Slovenia and Slovakia).

[8] Regional economic development is measured by GDP per capita (PPS) data and refers to the year 2012. The source is Eurostat on-line.

between technological capability and economic development. With a few exceptions Eastern European regions tend to cluster in the bottom left of the figure, indicating low values on both, and this also holds for many Southern European regions. The observations for Northern European regions (as defined here) are fairly well spread out, and although there is clear correlation between the two indicators, there is also considerable variation around the regression line, indicating that there may in some cases be relatively large differences in economic returns for regions with relatively similar technological capabilities. This suggests that there are also other factors at play.

Figure 3 Technological capability and GDP per capita (PPS)



A central aspect of social capability, emphasized already by Abramovitz (1986, 1994a, 1994b), has to do with the capability (education) of a region's labour force. In the present case this is measured by the share of population with higher education, the share of knowledge workers in the labour force and the propensity of the adult population to engage in education and training. The result is reported in Table 2. As the table indicates, the correlation between the indicators taken into account is again relatively high.

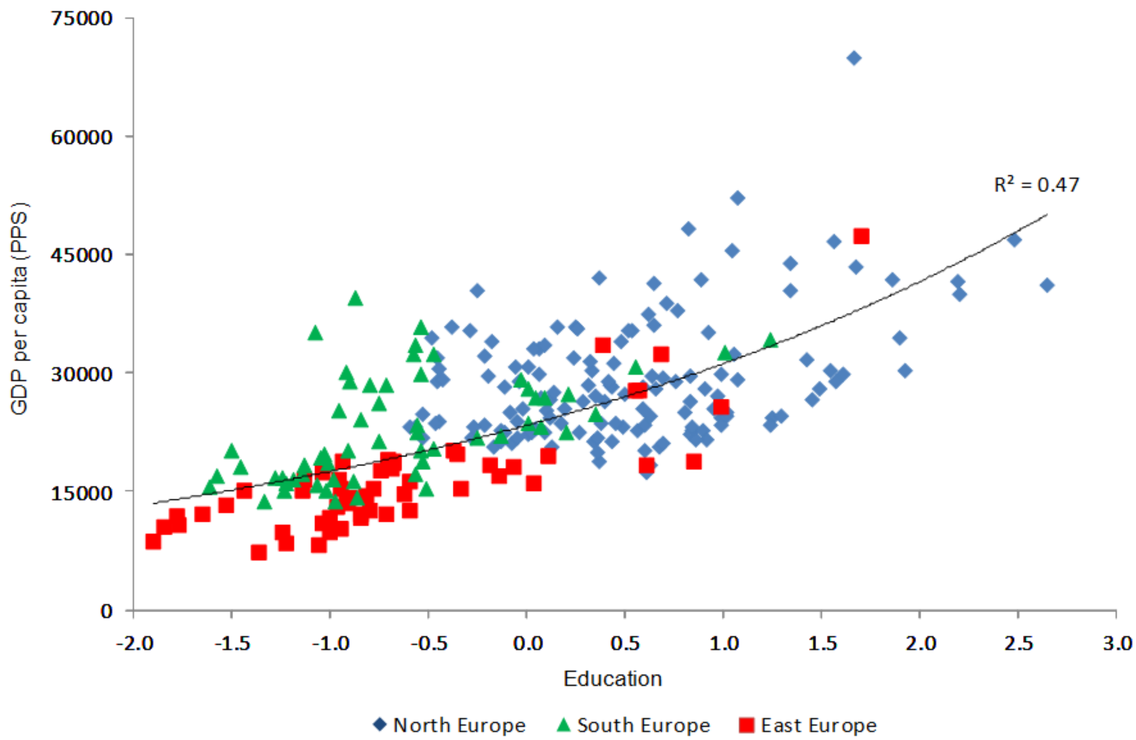
Table 2 Education: results of the factor analysis

	Factor loadings
Population aged 25-64 with higher education (% of total)	0.81
Knowledge workers (% of total)	0.82
Participation of adults aged 25-64 in education and training (% of total)	0.63
Number of observations	254

Note: 57.8 per cent of total variance explained, the extraction method is principal factors.

Figure 4 illustrates the relationship between educational standards and economic development (GDP per capita). Again there is a clear correlation. But compared to the previous case (Figure 2), there is much more variation among Eastern and Southern European regions, indicating that there are a number of Eastern and Southern regions with a relatively well educated labour force that have yet to transform this into a similarly high level of technological capability. This holds, it may be noted also for some Northern regions.

Figure 4 Education and GDP per capita (PPS)



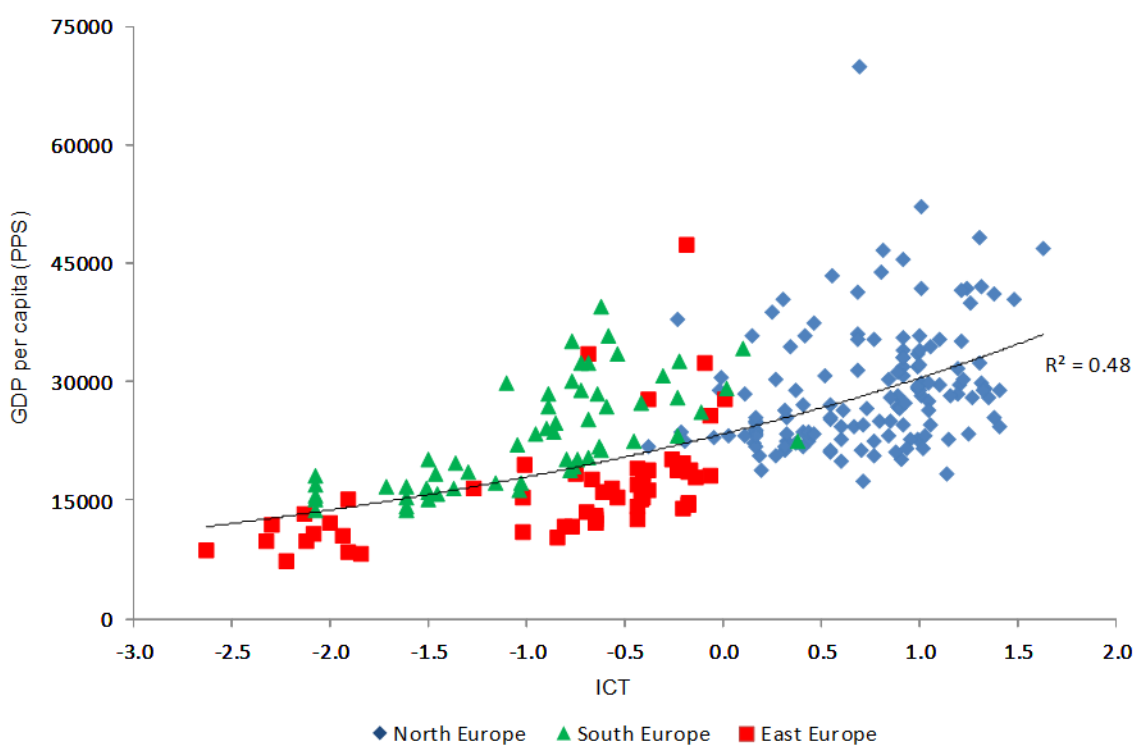
Another central feature of social capability has to do with the development of a society's infrastructure of which the prevalence of Information and Communications Technologies (ICTs) nowadays appears as one of the most important. Three aspects are taken into account, related to broadband penetration, internet use and purchases over the internet. As Table 3 indicates, the three indicators are very highly correlated, and the resulting factor explains almost 90 per cent of the total variance.

Table 3 ICTs results of the factor analysis

	Factor loadings
Households with access to broadband (% of total)	0.96
Individuals buying over internet (% of total)	0.93
Households access to internet (% of total)	0.95
Number of observations	254

Note: 89.3 per cent of total variance explained, the extraction method is principal factors.

Figure 5 ICTs and GDP per capita (PPS)



Again there is a clear correlation between the two variables but in this case there is an almost complete divide between the Northern regions to the right in the figure (indicating relatively high ICT capability) on the one hand and the Southern and Eastern regions to the left (with lower ICT capabilities and a lot of internal variation) on the other hand. Thus the digital divide often alleged to exist between the rich and the poor part of the world appears to exist between European regions as well.

Finally, we seek to construct a measure of the quality of regional governance. This is measured through the frequency of corruption (or rather the lack of such), whether law and order are adhered to, how effective governance is perceived to be and the extent to which it is accountable. As Table 4 shows, the indicators are very highly correlated, and the resulting factor accounts for nearly 90 per cent of the total variance of the data set.

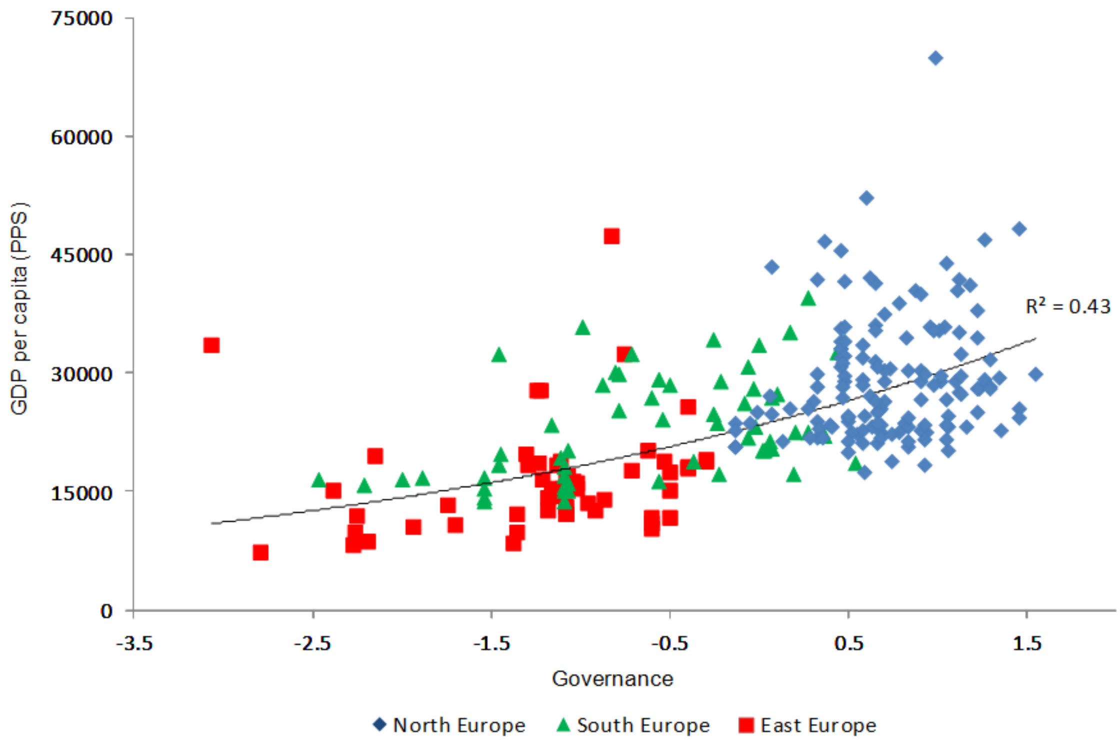
Table 4 Governance: results of the factor analysis

	Factor loadings
Corruption	0.95
Rule of Law	0.96
Government Effectiveness	0.95
Voice and Accountability	0.92
Number of observations	254

Note: 89.6 per cent of total variance explained, the extraction method is principal factors.

Figure 6 presents the now familiar relationship but this time for governance and level of economic development. The figure resembles the previous one with a clear divide between the North one the one hand (to the right in the figure), with a relatively good governance, and the South and East on the other hand with less well functioning governance systems (to the left in the figure). Note, however, that there are a number of Southern regions with relatively well developed governance (middle of figure).

Figure 6 Governance and GDP per capita



As shown in Figures 3 to 6, technological and social capabilities are closely correlated with economic development. This implies that it may be difficult to test for their joint relationship with economic development because of the potential multicollinearity problems it might lead to. However, the different technological and social capabilities measure aspects of regional capability that may be clearly distinguished, conceptually as well as empirically (as Figures 3 to 6 show). So it may also be the case that their mutual correlation, although high, is still not high enough to preclude a multivariate test of their relationship with economic development. In testing this relationship we also find it pertinent to include the measures of inter- and industry specialization, discussed in the previous section,[9] as well as a measure of specialization in

[9] These data (related and unrelated variety) refer to the year 2012. See Cortinovis and van Oort (2015) for further details.

technologically progressive (knowledge-intensive) activities[10], as right-hand side variables. Finally, to control for the possible impact of agglomeration economics population density was added to the regression.

Table 5 presents the correlation matrix for the variables included in the test. The capability measures are all highly correlated with GDP per capita and with each other. The highest correlations are for ICT and Governance (0.85) and ICT and education (0.79). Specialization in knowledge-intensive activities is also highly correlated with GDP per capita and the capability measures with a partial exception of Governance. The 'related variety' measure is negatively correlated with the capability measures and GDP per capita, indicating that higher levels of intra- industry specialization (lower diversification) is associated with higher productivity, while the opposite holds for so-called "unrelated variety" (reflecting inter-industry specialization). Population density is positively correlated with GDP per capita and the capability measures.

Table 6 contains the results. In the first column (basic model) only the four capability measures and population density are included. All five variables are positively correlated to GDP per capita but technological capability is not significant at conventional levels. In the second column the specialization variables are added. The results for the capability measures and population density are not much affected although technology is now significant at the 10 per cent level. Specialization in knowledge-intensive activities is positively correlated with GDP per capita at the 1 per cent level of significance. Unrelated variety, or inter-industry specialization, is not significant, while related variety – measuring intra-industry specialization (or diversification) - turns up with a negative sign, significantly different from zero at a 5 per cent level, the opposite of what should be expected following Frenken et al. (2007). The third column repeats the previous test without possible outliers. Most of the previous results are upheld, although in this case the related and unrelated variety measures are both insignificant. Moreover, in this case the coefficient for technological capability is significant at the 1 per cent level while that of governance is not. A possible explanation for the latter is, as pointed out above, that it is difficult to discriminate between their impacts due to the presence of multicollinearity.

[10] These data refer to employment in medium-high/high-tech manufacturing and knowledge-intensive services (as per cent of total workforce) in the latest available year obtained from Economic Commission (2014).

Table 5 Correlation table

	GDP per capita (PPS)	Techno-logical capability	Education	ICT	Gover-nance	Knowledge-intensive activities	Related variety	Unrelated variety	Population density (logs)
GDP per capita (PPS)	1.00								
Technological capability	0.68	1.00							
Education	0.66	0.65	1.00						
ICT	0.63	0.57	0.79	1.00					
Governance	0.57	0.52	0.69	0.85	1.00				
Knowledge-intensive act.	0.61	0.57	0.52	0.55	0.35	1.00			
Related variety	-0.24	-0.14	-0.34	-0.30	-0.38	0.13	1.00		
Unrelated variety	0.22	0.17	0.30	0.11	0.09	0.15	0.14	1.00	
Population density (logs)	0.44	0.36	0.42	0.38	0.20	0.40	-0.14	0.19	1.00

Table 6 Multivariate test of relationships with GDP per capita (PPS), OLS regressions

	(1) Basic model		(2) Including specialization measures		(3) Excluding major outliers	
Technological capability	0.10	(1.47)	0.09	(1.84)*	0.13	(3.06)***
Education	0.62	(6.66)***	0.50	(5.36)***	0.42	(5.14)***
ICT	0.44	(3.11)***	0.43	(3.30)***	0.50	(4.97)***
Governance	0.31	(2.91)***	0.28	(2.68)***	0.13	(1.56)
Knowledge-intensive activities		..	0.16	(3.09)***	0.19	(4.55)***
Related variety		..	-0.12	(2.21)**	-0.07	(1.46)
Unrelated variety		..	-0.01	(0.19)	-0.04	(1.04)
Population density (logs)	0.11	(2.17)**	0.11	(2.30)**	0.13	(3.39)***
Country dummies	Included		Included		Included	
F-test	35.35***		40.21***		68.97***	
R^2	0.84		0.87		0.90	
Number of observations	254		244		225	

Note: Beta values are reported. Absolute values of robust t-statistics are in parentheses. *, **, *** denote significance at the 10, 5 and 1 per cent levels.

In conclusion, this section has provided evidence for the proposition that capability building and economic development go hand in hand and that this applies not only to nations but to regions within nations as well. Unfortunately data does not allow us to test this hypothesis as extensively as we would have liked. But there are reasons to believe that that will improve in the future as more data and longer time series become available. In addition we have tested for the relationships between specialization of various kinds and economic development, controlling for differences in capabilities and other factors. The only type of specialization that seemed to matter for economic development was specialization in knowledge-based activities.

4. Concluding remarks

The point of departure for this paper has been that research, theoretically as well as applied, on national and regional economic performance have much in common, and that continuing cross-fertilization between these two research areas may be a fruitful strategy. In this spirit the second section of this paper examined theoretical perspectives aiming at understanding differences in economic performance at the regional as well as the national level. The discussion came to focus on two central issues, capabilities and specialization, respectively, in explaining such differences, and in Section 3 we looked further into the empirical support for the various hypotheses that have been suggested concerning the role that these factors play in economic development.

As explained in Section 2 of this paper the capability approach to economic development was mainly developed by economic historians and development scholars trying to explain the large differences in performance with respect to the exploitation of the potential for catching up with economic and technological leaders. The literature identified two types of capabilities, technological and social, as being of particular importance for catch up processes. While technological capabilities may be defined as the abilities of firms (including their networks) to produce, improve and create new goods and services, social capabilities reflect the quality of the environment with which firms interact and draw resources from (including the quality of governance). The results reported in this paper, based on recent data for European regions, confirm that the close connection between capability building and economic performance, which previously has been shown to exist for nations, also holds for regions. Thus supporting capability building is a good strategy for policy-makers at the regional as well as the national level.

The economics of specialization is as noted a recurrent theme in economic research. A common assumption has been that countries or regions by specializing can become more efficient and, hence, better off, resulting in higher GDP per capita and welfare. However, the research presented in this paper fails to provide robust support for the idea that the degree of specialization matters a lot for regional economic performance. Nor does it support concerns by some regional researchers that specialization, particularly intra industry, may have a negative impact on a region's productivity. However, specialization in knowledge-intensive activities was found to be positively associated with both regional economic performance and the capabilities that underpin it. This makes sense of course. A primary manner in which, say, improving the qualifications of the labour force and its command of ICTs may yield economic benefits is through expansion of economic activities that depend on such factors, that is, knowledge-intensive activities. Whether this is a cause or an effect (or both) of capability building we cannot tell with the available data. But it nevertheless suggests that it may be a good idea for policy makers to keep an eye not only on capability-building but also on how these capabilities are put into productive use in the regional economy.

The idea that the match between capabilities and a region's industrial structure may merit policy makers' attention has gained increasing attention recently due to the suggestion of a so-called 'smart specialization' strategy (Foray, 2009), originally developed for the country level, but subsequently applied to the regional level in the European Union. That a good match between a region's capabilities and its industrial structure may carry benefits is intuitively sensible. However, to the best of our knowledge there is no robust evidence yet on this issue, and it may arguably be very difficult to obtain given the limited data that currently exist at the regional level. This may be of some concern to policy-makers. Moreover, if 'smart specialization' is used as an argument for restructuring public R&D support and educational systems to better match the existing industrial structure in a region, it may end up conserving an inherited pattern ('lock-in') that perhaps may not be sustainable in the longer run. In general, policy may need to balance exploitation based on the existing path with exploration of opportunities generated from innovation elsewhere. Therefore, capability building at the regional level may require broader objectives than just matching the existing pattern of specialization.[11]

[11] For example, one might imagine regions that would be better off scrapping (some of) the existing structure and instead engage in deeper transformations based on, say, tapping into advanced knowledge and resources available elsewhere. And, in case, wouldn't it be good if the R&D infrastructure and educational institutions had some competences that could support such transformations even if they do not have a perfect match with the existing industrial structure?

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