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Human Capital in European Regions
since the French Revolution

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Abstract

Human capital is today an important determinant of economic growth. However, evidence on its long-run regional development in Europe is still relatively limited. For this reason, this paper investigates the development of human capital in the European regions over the last 200 years. The results show that ‘the long shadow of history’ plays a major role in the regional distribution of human capital. The most advanced regions were typically located in the core industrialised countries, whereas the lowest values of human capital were found in the periphery. Policy makers need to take into account these geographical long-term structures and the vested interests of stakeholders and create a human capital-promoting environment to successfully improve human capital levels.

Keywords: Human Capital, Regional Development, Economic Policy.

JEL Codes: I25, N33, N93, O18.

1. Introduction

Human capital is a crucial factor for economic development and may be a key element of future growth in many countries. However, the historical role and formation of human capital is still not sufficiently understood. This fact contrasts sharply with its relevance for economic policy because policy makers have to implement effective growth policies that need to take into account underlying long-term evolutions. At the regional level this necessity is even more striking, as human capital is of “paramount importance [...] in accounting for regional differences in development” (Gennaioli et al. 2013, p. 105).

To this end, this paper summarises some fundamental insights into human capital formation in Europe since the French revolution. Given the breadth of this issue, I focus on the regional dimension of economic and educational development in Europe and its lessons for economic policy. The regional dimension plays a crucial role in the comprehension of economic growth. Therefore, Nobel laureate Paul Krugman emphasises that “one of the best ways to understand how the international economy works is to start by looking at what happens inside nations” (Krugman 1991, p. 3).

Accordingly, regional policy is today a key cornerstone of EU policy. Large differences exist among regions although the EU aims to reduce regional economic inequality. For example, 43 % of the EU’s economic output was generated in only 14 % of its area in 2008 (European Commission 2008). Regional GDP per capita differences are also very high in the EU (see Figure 1 for 2011). National averages might give a misleading impression of economic prosperity in Europe, as some regions in countries with a low GDP per capita are on a similar level as richer countries (such as the Lisbon or Bucharest regions). Still, the recent economic and financial crisis has further exacerbated this discrepancy among the countries and regions of the European Union. These rising inequalities among and within member states threaten their very existence and pose a real

challenge to the future of the EU. For example, in 2011, regional inequalities were most pronounced in the UK, where a referendum on regional independence was held this year. Its most prosperous district featured 612 % of the EU average in GDP per capita (in PPS), while its least wealthy district had only about half of the EU average (51 %). Similar major inequalities can be found in most other countries (e.g., in Belgium 54 % to 222 %, Italy 45 % to 182 %, Spain 66 % to 150 %, Romania 21 % to 130 %).¹ Therefore, insights into long-run regional economic and educational differences are essential to understand the fundamental hurdles which may be inhibiting regional convergence in economic wealth. This knowledge may allow us to enhance existing regional policies and ensure economic prosperity in the future.

Furthermore, the historical evolution of human capital in Europe may provide important lessons not only for Europeans but also for developing countries. Many developing countries are faced with similar educational, economic and political decisions that European countries had to take during their earlier phases of economic development. For this reason, considering European regions in the long run may indicate some potential hurdles and solutions to the formation of human capital in developing countries.

With this in mind, the paper reviews the regional distribution of human capital in Europe during the last two centuries. I find that large regional differences have characterised the formation of human capital in Europe. A number of different factors are key causes of this pattern. In particular, these are the geographical location of a region and the interests of different stakeholders (e.g., religious institutions, land owners, parents). In addition, the relationship between historical human capital and current economic outcomes

¹ These data were derived from Eurostat (2014) and refer to the NUTS 3 level. NUTS is the official nomenclature for statistical territories in the EU. NUTS 3 is the smallest category of the NUTS classification, corresponding to, e.g., *Kreise* in Germany, *départements* in France and *provincias* in Spain.

is underlined, illustrating the importance of human capital in general and of taking a long-term perspective for economic policy in particular.

The paper is structured as follows. First, I highlight the basic theoretical concept of human capital and its quantitative measurement. Second, I show the overall regional differences among European regions in the past and then consider some important factors that may have caused these inequalities. Furthermore, I indicate the connection between regional human capital accumulation and economic growth in a long-term perspective. Finally, I emphasise the lessons that can be drawn by these historical experiences and their implications for policy makers. A conclusion sums up the main points of the paper.

2. Human capital: theoretical origins and quantitative measurement

Human capital is one form of capital in analogy to other forms of capital such as physical or natural capital. Schultz explains the term by emphasising that it can be considered a form of capital “because it is the source of future earnings, or of future satisfactions, or of both of them. It is human because it is an integral part of man” (Schultz 1972, p. 5). Accordingly, one of the founders of the concept of human capital, Becker considers human capital to be “the knowledge, information, ideas, skills, and health of individuals” (Becker 2002, p. 3). This is a somewhat wider approach to human capital than proposed by, e.g., the OECD. The OECD focuses more on its economic dimension when defining human capital as “the knowledge, skills, competencies and other attributes embodied in individuals that are relevant to economic activity” (OECD 1998, p. 25). In each case, human capital is considered to be a fundamental factor for economic prosperity (see also Hippe 2014).

The origins of its concept go back to the 17th century, although its current importance is due to the elaboration of proper theories since the Second World War

(Folloni 2010). In particular, the contributions by Becker (e.g., Becker 1964, Becker 1981) and Schultz (e.g., Schultz 1961, Schultz 1971, Schultz 1972) were crucial cornerstones. The development of endogenous growth models in the 1980s and 1990s by Romer (Romer 1986, Romer 1990) and Lucas (1988) further popularised the integration of different forms of human capital into economic growth models. The most recent contribution to human capital theory is Unified Growth Theory, founded by Galor (e.g., Galor and Weil 2000, Galor and Moav 2002, Galor 2005a, b, Galor 2012). In fact, economic prosperity remained on low levels in the world before the Industrial Revolution. Subsequently, the Industrial Revolution enabled an explosion of economic growth in Western Europe and Western Offshoots, engendering the Great Divergence in worldwide prosperity between the ‘West’ and the other world regions (see Figure 2 for the evolution of GDP per capita in major world regions in the long run). Technological change accelerated and human capital was increasingly demanded. Human capital and technological progress brought about the demographic transition which has led to lower population growth. Because population growth does not counterbalance the gains achieved in total output anymore, the result is high and sustainable growth in per capita output. Therefore, Unified Growth Theory emphasises the essential role of human capital in explaining long-run economic growth and the Great Divergence.

Human capital is a theoretical concept which cannot be measured directly but only through the use of proxies (Hippe 2014). In most cases, human capital is measured by educational variables such as educational attainment, years of schooling, enrolment rates or educational expenditure (for a full overview see Woessmann 2003). In a longer-term context, at least parts of these variables are not available due to the lack of data. For this reason, the measurement of human capital is limited to a few proxies. The most important historical proxies of human capital are, among others, literacy, numeracy, book production

and enrolment rates. Book production data is typically available only at the national level whereas literacy, numeracy and enrolment rates are also common to be found at the regional level. However, enrolment data are often not available for many European countries. Exceptions include Prussia (e.g., Becker et al. 2012).

A similar statement can be made of literacy which is most often only measured from the middle of the 19th century onwards, in some countries even later. An earlier proxy of literacy are signature rates, i.e. if a person is able to sign a document (e.g., marriage contract, recruitment list) with his name. The availability and usability of this indicator is relatively limited. For this reason, other proxies have to be employed if the aim is to understand regional human capital formation in most European regions before the middle of the 19th century. A proxy that has increasingly been used during the last years is numeracy as measured by the age heaping method (e.g., A'Hearn et al. 2009, Crayen and Baten 2010, Hippe and Baten 2012).² Age heaping has the advantage that it uses census data.³ Censuses have been carried out by states and governments for many centuries and millennia. In fact, censuses were already held in the early advanced civilisations of China, Egypt or Rome to inform the governors of their economic and military resources. In other words, the use of census data allows to trace back human capital much farther back in time than other data. The particular advantage of the age heaping method is that it can be derived from any data where information on ages by year (or birth year) is included. In addition, the history of numeracy and literacy is highly intertwined (e.g., Schmandt-Besserat 1992) and also empirically these two human capital variables are well-correlated in Europe (Hippe 2012e). For these reasons, I use collected evidence on numeracy (the so-

² Earlier work on numeracy includes, e.g., Mokyr (1983), Thomas (1987) and Emigh (2002). Age heaping uses the fact that in many historical censuses the distribution of ages is biased. More specifically, individuals tended to round their ages on zero and five because they did not know their exact age. For this reason, the age heaping method calculates the deviation from the expected ideal age distribution and is able to measure the share of people that were not aware and not able to count.

³ But also other methods are possible, as show, e.g., Juif and Baten (2013).

called ABCC), literacy and educational attainment for the description of the evolution of regional human capital. Numeracy data is used for the earliest time during the 19th century, literacy is employed between 1900 and 1960 and higher educational attainment for the current time period. These variables are defined in the following way:

$$ABCC_{jt} = 125 - 125 \times \left(\frac{\sum_{i=5}^{14} n_{5i,jt}}{\sum_{i=23}^{72} n_{i,jt}} \right), \quad (1)$$

where i represents the number of years, j represents a region, t represents the point in time and n represents the number of individuals,

$$Literacy_{jt} = \frac{\sum_{i=10}^N rw_{i,jt}}{\sum_{i=10}^N n_{i,jt}}, \quad (2)$$

where rw represents the ability to ‘read and write’ and N represents the overall number of years, and, finally,

$$Eduatt_{jt} = \frac{\sum_{i=20}^{64} st_{i,jt}}{\sum_{i=20}^{64} n_{i,jt}}, \quad (3)$$

where st represents the number of individuals that have attained upper secondary or tertiary education (see also Hippe 2012d).

Note that numeracy and literacy are proxies for relatively basic human capital (see Hippe 2012e). Numeracy measures the ability to calculate and literacy the ability to read and write. Clearly, there are other proxies that can measure much higher levels of human capital, such as the number of university graduates. Still, one has to keep in mind that during most of history only basic levels of education characterised the largest part of the population. For example, Cipolla (1969) emphasises that above 90 per cent of the worldwide population was not literate at the middle of the 18th century. In fact, education was only available to the elites of society. In consequence, it is appropriate to use proxies that measure such basic abilities. In addition, in many parts of the developing world a

proxy such as literacy is still a major indicator of human capital and is employed by international organisations such as UNESCO (UNESCO 1953, UNESCO 2005).

A methodological aspect that has also to be addressed is the geographical unit. As put forward earlier on, I focus on regions as my unit of analysis.⁴ These regions constitute the European countries. Therefore, taking a regional perspective is more detailed and exact than a national perspective because regional inequalities in countries can be analysed instead of mere national averages. In fact, many countries may show important regional differences, so that regions in two different countries can have much more in common in a given variable than two regions in the same country. The size and number of regions is also relevant. The underlying data and quantitative analyses are based on regions that may be as small as counties. For example, data on about 570 regions in 39 European countries during the 19th century have been collected in one of the underlying studies (Hippe and Baten 2012). This very high number of regions gives a very clear picture of subnational differences at a European scale.

3. Regional human capital formation in Europe, 19th and 20th centuries

The distribution of human capital shows a clear regional pattern during the 19th and 20th centuries. One may characterise it as a core-periphery structure. The core industrialised countries of Europe, including Germany, Northern France, Benelux, England and Wales, Switzerland, Austria and Scandinavia, had high levels of numeracy and literacy (Hippe and Baten 2012, Hippe 2012a). In contrast, the European periphery in Western, Southern and

⁴ Because it is not of major practical importance in this paper, I want to refer to the exact regional terminology only very briefly. To be able to compare this regional unit over time, I need to standardise them. To this end, the current NUTS (Nomenclature of Territorial Units for Statistics) classification as developed by the European Union has generally been used over the entire time frame. This means that historical regions were adapted as best as possible to current regional borders (see, e.g., Hippe and Baten (2012) for a more detailed explanation of the methodological background). This makes it possible to compare the same standard unit throughout time, which is the idea of this paper.

Eastern Europe had lower levels of human capital. This European periphery includes countries such as Ireland, the Iberian Peninsula, Southern Italy, the Balkans and the former Russian Empire.

However, given the fact that regional data, i.e. *intranational* data, are available, it is possible to make much more precise statements about the spatial distribution of human capital in the European countries. This is important because national data conceal, to an important degree, striking regional differences within countries. Using regional data, different kinds of schemes become apparent in the various European countries (as an example, see numeracy map in Figure 3 and literacy map in Figure 4). On the one hand, some countries are characterised by a conspicuous north-south or south-north gap. For example, one can mention the well-known case of Italy. Italy shows a clear north-south gap already during the 19th century. The north had continuously higher levels of human capital than the south. A similar observation can be made in France. A reverse pattern is discernible in the United Kingdom, where the northern parts of Scotland (the Highlands) had lower numeracy than other regions. The same case applies to Norway.

Nevertheless, not all countries show the same pattern. Spain, for example, is rather characterised by a core-periphery pattern, with central/central-northern regions outperforming regions in the west, south and east. In the Russian Empire the effects of urban centres are quite apparent. The regions of the largest cities, St. Petersburg and Moscow, had a striking higher share of numerate or literate individuals. In general, urbanised centres were marked by higher levels of human capital in many European countries than more rural areas. In addition, the regions with the lowest human capital levels were located in the Balkans and the Caucasus region.

The evolution of these patterns over time reveals that basic human capital levels increased and regional differences become less evident. However, outliers do exist. For

example, an outlier was Bulgaria during the last decades of the 19th century. In this country, northern regions advanced faster than their southern counterparts and caused regional inequality to increase (when measured by an inequality index such as the coefficient of variation).

Later on, literacy data show a particular steep increase in the number of individuals that were able to read and write also in other regions, such as Armenia or Italian Sicily. Nevertheless, the general European regional pattern found in the middle of the 19th century still persists until 1960, the latest period when literacy data can be used for major peripheral regions in Europe.

4. Factors for regional human capital formation

Different factors may have caused the regional formation of human capital. A first aspect that arises from the pure cartographic description is that geography plays an important role. It is evident that regions that are close to regions with a high level of human capital are more prone to have a high level of human capital than regions that are farther away. This descriptive statement can be further analysed by more elaborate spatial econometrical techniques such as Exploratory Spatial Data Analysis (ESDA) (Hippe 2012b). Using such tools has proven to confirm the simple cartographic impression of the existence of a major European core region with several periphery regions surrounding it. Theoretical explanations as advanced by New Economic Geography (NEG) also allow to understand better this phenomenon (Hippe 2012c). For example, individuals in peripheral regions may have fewer incentives to invest in human capital than in core regions (López-Rodríguez et al. 2007). One of the reasons for this is that the skill premium in a primarily agrarian-based economy in the periphery is lower than in an industrialised region which is typically

located in the core. Core regions are more industrialised because they have a higher market access than more remote locations. The core region of Europe is at the same time the one with the highest market access. Thus, educational levels at the periphery are lower than in the core, as can be seen in Europe.

Still, not all regions behave in accordance with such a mere geographical pattern. Other factors related to religious, social and economic policy are also important. Education-friendly institutions and values may have been important. As famously postulated by Max Weber (1958), Protestantism may have generated a particular work ethic which allowed Protestant countries to advance faster in basic education than other countries. More recently, Becker and Woessmann (2009) have challenged this view by emphasising the importance of literacy for economic growth. Protestants considered it important to be able to read the Bible. Therefore, Protestant Churches and Protestant countries encouraged and implemented reading-friendly policies for the population. However, once an individual is able to read for religious purposes he is also able to use this knowledge for his economic activities. This gave a comparative advantage to Protestant societies, allowing them to increase economic prosperity. Alongside the rise of Protestant Prussia in the 19th century one may also indicate the case of the Scandinavian countries. They introduced preliminary literacy laws very early. For example, Sweden passed a Church law in 1686 which aimed at raising literacy levels (or more specifically, reading ability levels). Later on, these economies were successful despite their relative remote location from the European core.⁵

⁵ We have focused here on Protestantism and the Protestant Churches as a driver of educational advancement. Other examples may be added. For example, the Orthodox Church played an important role in education in many Eastern European countries such as Bulgaria over many centuries. Education was promoted by the Orthodox Church as “an important means for upholding the Christian faith under the Ottomans” (Daskalova 1996, p. 6). The religious motive was also important here, although for other reasons. Nevertheless, the influence of the Orthodox Church was quite limited and educational levels were relatively low until independence from the Ottoman Empire (Crampton 2007).

How early this Church law in Sweden was passed becomes clear when comparing it with the first compulsory schooling laws in Europe. In fact, the first compulsory schooling law was passed by Prussia only after the middle of the 18th century (see Table 1). The Prussian leader was followed by Denmark in 1814, Greece in 1834 and Spain in 1838. On the other hand, it took much longer for other industrialised countries such as the Netherlands and Belgium, which introduced compulsory schooling in 1900 and 1914, respectively. However, passing a law was often not sufficient. Take the example of Greece. Greece passed a law on compulsory education in 1834 and almost a century later (in 1928) its literacy rate was still only 59 %. This literacy rate was comparable to other countries in the Balkans, the Soviet Union and Portugal but it was much lower than in more advanced European countries. This shows that passing a law was not identical with implementing the consequences that it implied. Whereas the state was able to achieve its educational targets quite early in countries such as Prussia, the central governments in Greece or Spain lacked sufficient power (and maybe in part willingness) to increase educational levels.

Note that European governments had a variety of reasons to improve educational standards. Clearly, one of the reasons was economic in nature. A better educated population was perceived to be beneficial for generating economic growth (Mishkova 1994). Yet this was not the only reason. For example, better educated recruits with a minimal knowledge of reading (and writing) were deemed to be better operational in military actions. In consequence, military reasoning played a role (Cipolla 1969).

Furthermore, advancing the state's authority was a major aim of government policy (Green 1990, Vincent 2000). The provision of education by the state served this aim and also helped to spur nation building and national integration. One may take here the example of Bulgaria (see Mishkova 1994 for more details). Bulgaria had been part of the Ottoman Empire for centuries until the Bulgarian Principality was finally created in 1878.

Already in 1879, the new Bulgarian constitution included the obligation to provide primary education. This educational policy was strengthened by a number of laws during the following years. However, these laws were also complemented by government action. For instance, new schools were built and more pupils were able to attend these schools. In this way, Bulgaria rapidly improved its educational standards and was ahead of other countries in the region during the first decades of the 20th centuries (e.g., Report of the International Commission 1914).

At the international level, illiteracy also became to be seen as a disgrace for a nation (Cipolla 1969), putting pressure on governments that did not want to fall behind the ‘civilised’ leaders. Therefore, international reputation can be seen as a factor that influenced government policy in this context.

In addition, major social transitions spurred educational success and economic growth. One example is the demographic transition that took place in Europe mostly at the end of the 19th century and the beginning of the 20th century. The radical shift in the trade-off between the number and the education of children (‘Quantity-Quality trade-off’) has reshaped family life (e.g., Guinnane 2008, Bleakley and Lange 2009, Becker et al. 2010, Becker et al. 2012). Before the demographic transition, it was important for parents to have many children and investments in the education of each child were low. Educating one’s children was associated, among other things, with time and financial costs which many parents were not able or willing to take. Not only that the attendance of a school implied costs (buying school books, cloths, etc.) but the children were not even available to do work in the field or in the household (Vincent 2000). However, the importance of education for increasing a child’s future salary increased, giving parents incentives to invest in the human capital of their children. This higher investment allowed technological progress and economic growth. At the same time, this meant that each child needed more

resources, implying that parents preferred to have fewer children than before, engendering the demographic transition. In consequence, the family decisions taken by parents were essential for increasing the education of future generations. Once the demographic transition set in, there has not been any way back to the earlier demographic structure, neither in Europe nor in the world. This implies huge social and economic challenges for today's aging industrialised countries and those countries that have made the transition in the last decades.

Finally, human capital values in countries such as today's Belarus were also lower in the 19th and the first half of the 20th century than one would expect from a geographical point of view. Here, a factor such as inequality in land ownership is important. According to Unified Growth Theory (Galor et al. 2009), land owners did not have an interest in advancing the general education of workers and children. They had different reasons not to promote but to hinder educational progress. For instance, they needed unqualified workers on their fields. Enabling them to obtain better education would threaten their willingness to work on the fields for a low pay and rather bad working conditions. Thus, education was seen as a threat to the authority of land owners. More educated workers could more easily migrate to the industrialising urban centres and engender a 'rural exodus'. On the other hand, improving the education of the people had to be financed. An important share of the costs associated with the establishment of mass education was taken by the state. Therefore, the state had to levy taxes to be able to finance these new expenses. These taxes concerned in particular the higher levels of society which were often land owners at the same time. In consequence, land owners were not willing to pay a tax that would give them economic and social disadvantages. Because the state was controlled by the most influential and wealthiest layers of society, land owners had often an important stake in the government and government policy. By influencing the government either externally

(through their power) or internally (through their own members in the government), they were able to inhibit educational policies that would be costly and might threaten their own economic and social position. Thus, there are many examples for different European countries where land inequality was high and educational levels were low. One well-known example is Spain. Latifundists, in particular in southern Spain, were quite powerful and influential. But this was also the case in southern Italy and Eastern Europe (Hippe and Baten 2014). Only when capitalists, in need of more educated workers for their factories, became more powerful (or former land owners had an increasing stake in industries) the support for mass education increased, spurring educational development and ultimately economic growth (Galor et al 2009).

5. Human capital and economic growth in the long run

The positive relationship between human capital and growth has been postulated by many academics and taken up by policy makers today.⁶ From a historical perspective, this might not have always been the case. Whereas, e.g., Baten and van Zanden (2008), come to the conclusion that human capital was a significant factor for economic growth before the beginning of the Industrial Revolution, authors such as Mitch (1993) or Mokyr (2002) believe that education did not play an important role in the first part of the Industrial Revolution. It is more generally argued that human capital became an essential driver of the process of industrialisation since the second part of the Industrial Revolution. The success of the United States has been put forward as an example. Among others, Goldin and Katz (2008) argue that the United States was leading the world in terms of education during the 20th century which boosted economic growth and enable them to become an

⁶ Note that there have been different waves of optimism and scepticism on the positive impact of education on economic growth (for an overview see Demeulemeester and Diebolt 2011).

economic and political world leader. In reference to this contribution, Acemoglu and Autor (2012) have recently enlarged their analysis and emphasise once more the crucial role of education.

In Europe, the case for the current relationship between education and economic development can be highlighted using higher educational attainment as a proxy for human capital and GDP per capita for economic prosperity using Eurostat data (see Figure 5, Hippe 2012d).⁷ There is a clear positive relationship between these two variables in Europe. The lowest human capital values come from Portugal which historically had known very low educational levels. It is followed by (Southern) Spanish and Italian regions. The highest education attainment levels are reached by some Eastern (former Communist) German regions and the urban regions of Prague (CZ01) and Bratislava (SK01). Outlier regions with exceptionally high GDP per capita levels are (Inner) London (UKI1) and Brussels (BE10). In addition, Europe is divided into two categories. It becomes evident that regions from Eastern Europe that were part of the Communist block have mostly lower GDP per capita values. This results in two ascending groups, one for 'Western' Europe and the other for former 'Communist' Europe. The incidence of Communism appears to have left its traces with relatively higher attainment rates but lower GDP per capita. This might tentatively suggest that the economic environment did not allow to unfold the potential economic effects of education as in Western Europe.

But is there also a positive relationship between historical levels of education and current economic prosperity? More quantitative evidence at the regional level is needed to answer this question. One possible way is to consider their correlation. Taking historical regional data from 1930 and regressing them on current GDP per capita, it appears that

⁷ The countries included in the data are Austria, Belgium, Germany, Denmark, Estonia, Spain, France, Hungary, Ireland, Italy, Lithuania, Luxembourg, Latvia, Netherlands, Poland, Portugal, Romania, Slovakia and the United Kingdom.

historical education is a stable and significant explanatory variable. Note that other variables might affect this result, which is why I have controlled for factors such as country fixed effects, capital regions and the level of economic and social development at that historical time (e.g., share of the population dependent on agriculture in a region, fertility, population density). The correlation between historical human capital and current economic outcomes is also shown for other historical dates such as 1850, 1900 and 1960. In all cases, human capital appears to be the most significant historical factor explaining current regional GDP per capita values. Interestingly, a similar result emerges when replacing the GDP per capita data with patents per capita. Patents per capita are one standard way of measuring regional innovative activity today. Therefore, one may conclude that there is a striking relationship between historical human capital levels and current economic and innovative activity.

6. Lessons and policy implications

Some important lessons can be learnt from the long-term regional distribution and evolution of human capital.

The first one is that a long-run perspective allows to better understand fundamental economic processes that are essential to economic prosperity and that are difficult to change in the short run. I have shown that the regional distribution of human capital has been relatively persistent over time. For this reason, improving the understanding of long-run processes enables to take into account factors that are important for the long-run evolution of the economy. Major transitions of the economy and society, such as energy, demographic or ‘human capital’ transitions, have shaped the structure of the economy of today’s industrialised and developing countries. Short-run analyses

including only few years are not able to cope with the complexity and the time dimension of such fundamental processes. The implications of a particular geographical location can also be better understood. If policy makers are interested in developing a longer run strategy for safeguarding the prosperity of society in the future, for example by implementing policies focusing on Green Growth, they have also to consider a longer timeframe in the past. In consequence, longer run analyses may offer important lessons that can be derived from the past.

Second, there may be different hurdles to educational and economic progress. Other than geographical location, important public and private institutions such as the government or religious groups may have an important influence on the provision and formation of human capital. Government policy has to consider the interests of powerful societal stakeholders, such as landowners, to implement their policies. Policy makers need to focus on providing an environment that produces incentives for individuals to increase their human capital in keeping with economic conditions, particularly in periphery countries. However, governments or members of governments may also not be willing to advance social, educational or economic progress due to their own vested interests in the *status quo*. Other major stakeholder groups such as capital owners or, in more modern times, civil society and the media may help to put pressure on the successful implementation of long-run growth enhancing policies. Still, the incentives for an individual at the micro level have also to be taken into account. If individuals in peripheral regions have lower incentives to invest in their own human capital, then particular efforts have to be made to overcome the crucial threshold so that it becomes profitable for them to become more educated. At the same time it is important to increase these incentives by connecting peripheral regions more to core regions. This can be done by, e.g., investing in infrastructure. Similarly, parents may have particular incentives to invest in the human

capital of fewer children instead of having many children. In consequence, an essential point is to get the incentives right of important stakeholders to successfully implement economic and educational policies.

7. Conclusion

This paper has considered human capital formation in the European regions since the French revolution and its implications for economic policy. It takes a long-term view which allows to consider fundamental economic and social evolutions that have shaped the European economy and will shape economic prosperity in the future. Because short-term analyses cannot appropriately consider these trends, the long-term perspective is able to put human capital differences in Europe into a larger picture. In fact, today's societies are faced by many challenges affecting economic development in the longer run, let alone climate change. In consequence, it is crucial to have an understanding of past evolutions to take the right policy decisions for today and the future.

Methodologically, the paper considers different indicators of basic human capital. In particular, numeracy and literacy data have been used in this study. These data have been complemented by current educational attainment data. Because low levels of education have characterised most European societies until relatively recent times and are still prevalent in many developing countries, the use of these basic indicators allows to proxy for the overall education of the population (as opposed to the education of the elites of society) in the past.

The results show that there has been a striking regional distribution of human capital in the past. The most advanced regions were typically located in the core industrialised countries, whereas the lowest values of human capital were found in the

Western, Southern and Eastern periphery. This core-periphery structure has been relatively time persistent. Regional inequalities in human capital have also been immense within a number of European countries. Why are some countries more unequal than others, especially associated with human capital? Clearly, there is a huge literature on this issue. I have discussed, among other things, the important impact of geography (e.g., distance to large markets), heterogeneity of the population (e.g., the use of different spoken languages) and the level of economic development. For example, land owners are very powerful and have vested interests in keeping the status quo in a land-based economy. Their actions limit human capital formation. With ongoing industrialisation and increased importance of capitalists, partly the interests of land owners are overcome, partly they have themselves more interest in supporting educational development due to their capitalist investments. When the state provides 'education for all', regional inequalities should become less striking. Taking the ideas of Schumpeterian growth models (e.g., Aghion and Howitt 2006), governments should seek to focus on the level of education in correspondence with their distance to the technological frontier. In other words, least developed countries should concentrate their efforts on primary education, whereas emerging economies may focus on secondary education and more advanced economies on higher education. Accordingly, developing countries with low economic output levels should emphasise mass education in lieu of elite education.

Nevertheless, the analyses of this paper suggest that path dependence plays a major role in the distribution of human capital. It seems difficult to create high levels of human capital 'from scratch' because the accumulation of human capital is a long-term process which can take several generations. Similarly, the current economic divergence in Europe may represent a step back to core-periphery patterns of economic prosperity in the 19th and 20th century, threatening the ideals of overall economic convergence in the EU.

Still, governments can take action and importantly influence the accumulation of human capital. Investments in education and infrastructure appear to be crucial to overcome economic and geographical hurdles. In addition, governments have to take into account the interests of societal stakeholders such as land owners to advance and implement their economic and educational policies. Vested interests need to be clearly identified and appropriate measures have to be taken to overcome them.

Cultural values, in part derived from religious beliefs, can importantly contribute or hinder human capital formation. For example, Protestant beliefs have often been associated with higher human capital levels. Altering cultural values is difficult and involves a longer time horizon. Clear and strong convictions about the positive effects of education are needed, in other words a ‘myth of education’ (e.g., Ramirez and Boli 1987). Such a ‘myth’ is particularly important in those (developing) regions lacking human capital, urging parents, children, governments and society as a whole to invest in human capital in keeping with economic conditions. Successful past government campaigns on eradicating illiteracy may demonstrate that it can be done. The current ‘education fever’ in parts of Asia may be an example for other developing regions (e.g., see BBC News 2013). Government actions can have important value, not only in financial or regulatory but in symbolic terms. Symbolic acts are important for moving public awareness and debate to education, and thereby increasing demand for education. Still, the early compulsory schooling laws in a number of Southern European countries illustrate that, for example, the act of passing laws may not always be sufficient to effectively improve human capital levels if the central state is weak and local stakeholders resist or are indifferent to educational change. Such a situation may still be found in numerous developing countries. In consequence, policies have to be designed in a way that explicitly addresses regional

and local levels because these levels are crucial for the actual implementation of policies fostering human capital.

The knowledge and know-how of international organisations such as the OECD and the insights from specialised researchers may contribute to the design of these policies in developing and advanced economies alike. International studies such as the famous ongoing PISA studies that compare a range of worldwide countries may open a public and governmental debate on the education system.⁸ At the same time, international comparisons and benchmarking may put pressure on governments which for different reasons and interests may resist to implement changes in the education sector. But also regional governments may effectively inhibit educational progress.⁹ In such circumstances, central governments, local actors and the public need to put pressure on regional governments to open the door to the enhancement of educational standards.

Looking ahead, the internet may provide new incentives and tools to improve human capital levels. For example, the ‘Wikipedia Zero’ initiative aims to provide free mobile access to the online encyclopaedia Wikipedia in many developing countries (The Economist 2014). In this way, anybody possessing a mobile phone in these countries can have access to the world’s most important knowledge base (provided that his location is covered by the participating operators). Furthermore, the developments in e-learning and Massive Open Online Courses (MOOCs) are still in their infancy in comparison to their huge potential. Thus, we may be at the brink of a new human capital era. While basic skills such as numeracy and literacy have been relevant in the past and present, generic skills (such as problem solving, online ‘information mining’) might be particularly important in

⁸ For instance, the initial PISA study was a shock for the German public and opened a hot debate on the issue.

⁹ For example, Woessmann has recently deplored that it is still forbidden and punishable for researchers to use a number of important educational datasets (e.g., PISA e-studies) to compare regions in Germany (Der Spiegel 2013). While the reasons for these punishments are not clear, he conjectures that no regional government wants to have bad news before an upcoming election.

the future (see also Collins and Halverson 2010). Taking the idea of leap-frog technologies, one could imagine that those developing countries that are not yet heavily entrenched in the traditional schooling model may possibly more easily find new, creative and low-cost solutions to their human capital challenge if they are able to combine these new opportunities with their local economic, social, religious and political culture. In this context, getting the incentives right for all stakeholders appears to be fundamental to implement efficient growth-enhancing policies in both industrialised and developing countries.

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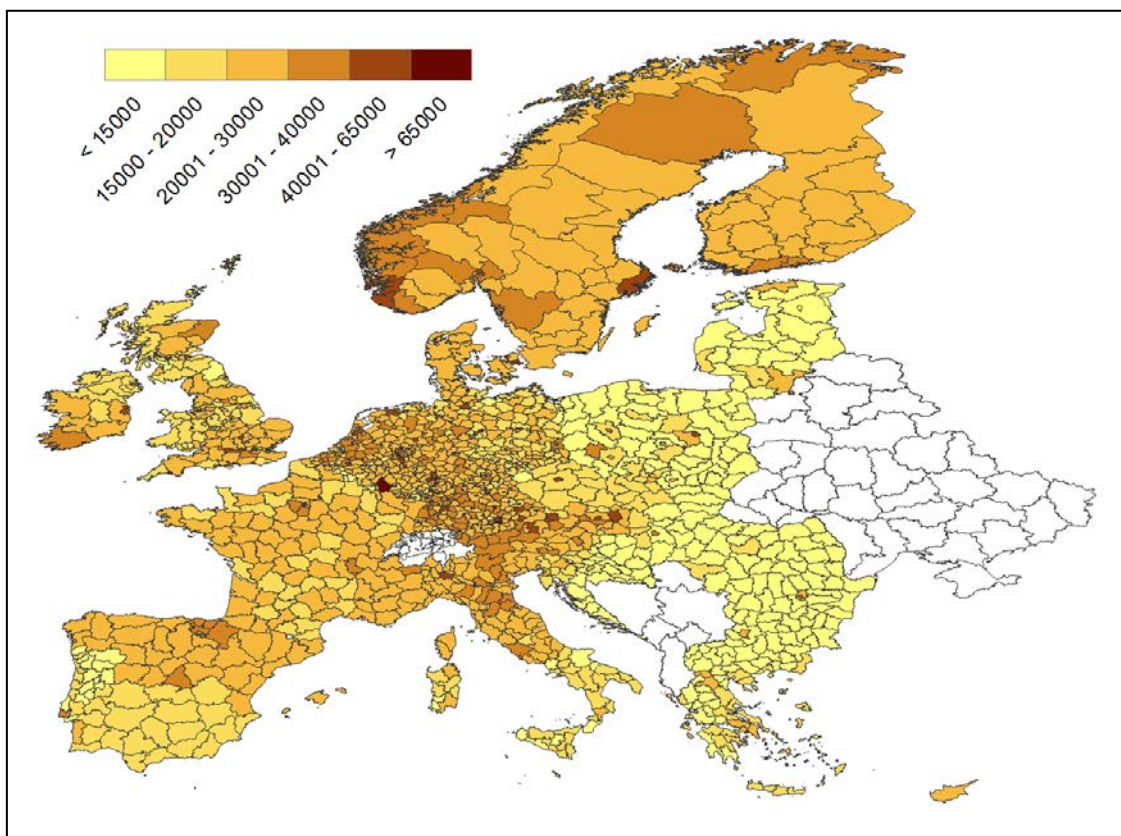
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Table 1 Laws on compulsory schooling in selected European countries

Until 1850	Until 1900	After 1900
Prussia (1763)	Austria (1869)	Turkey (1913)
Denmark (1814)	German Empire (1871)	Belgium (1914)
Greece (1834)	Scotland (1872)	Finland (1921)
Spain (1834)	Switzerland (1874)	Russia (1930)
Sweden (1842)	Italy (1877)	
Norway (1848)	England and Wales (1880)	
	France (1882)	
	Ireland (1892)	
	The Netherlands (1900)	

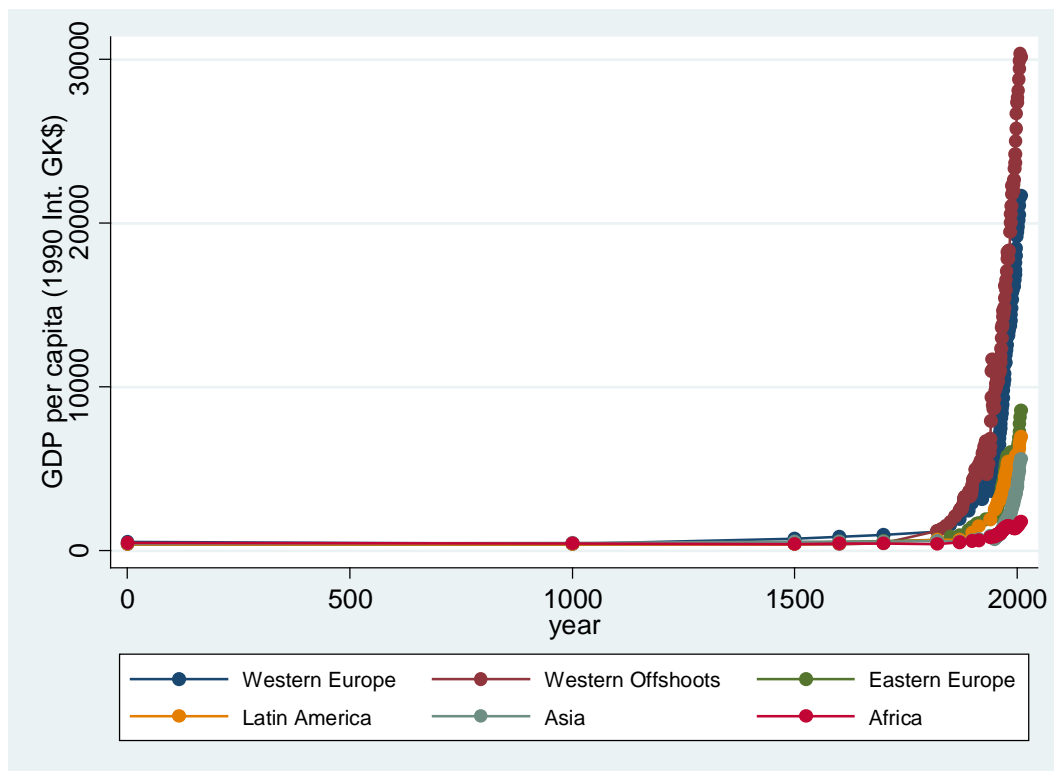
Source: Adapted from Adick (2003).

Figure 1 Regional GDP per capita (in PPS) in Europe, NUTS 3, 2011



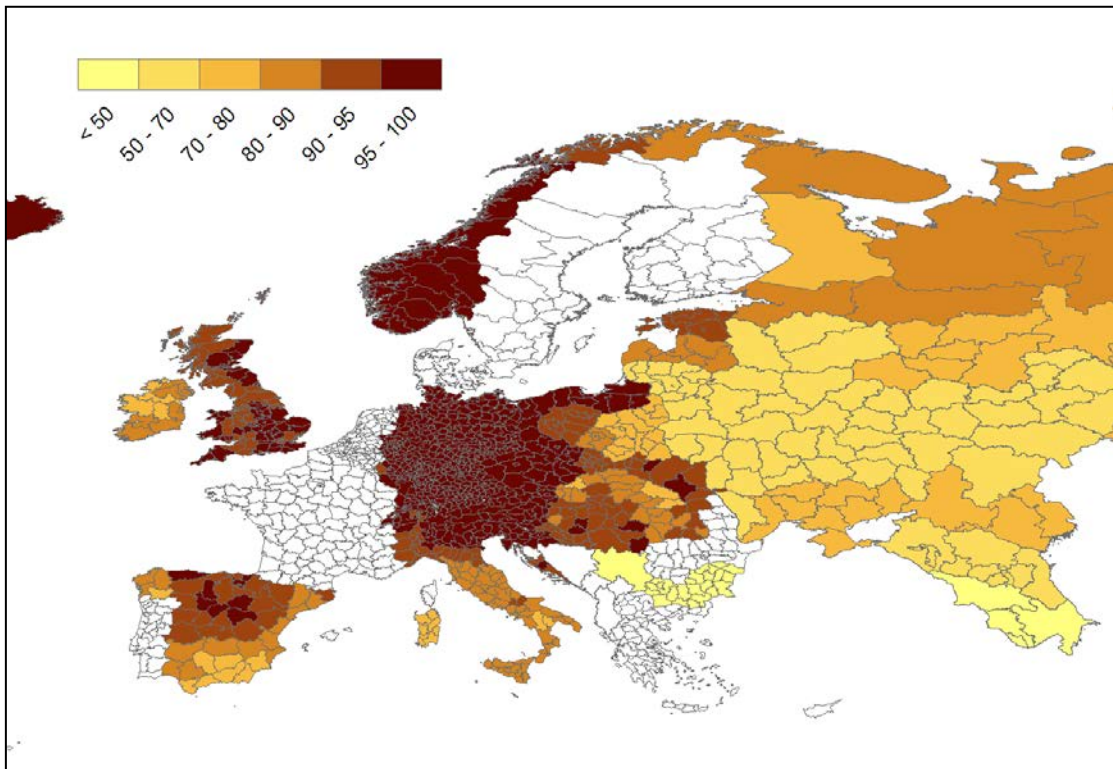
Source: Data from Eurostat (2014).

Figure 2 GDP per capita by world region in the long run



Source: Data from Maddison (2007).

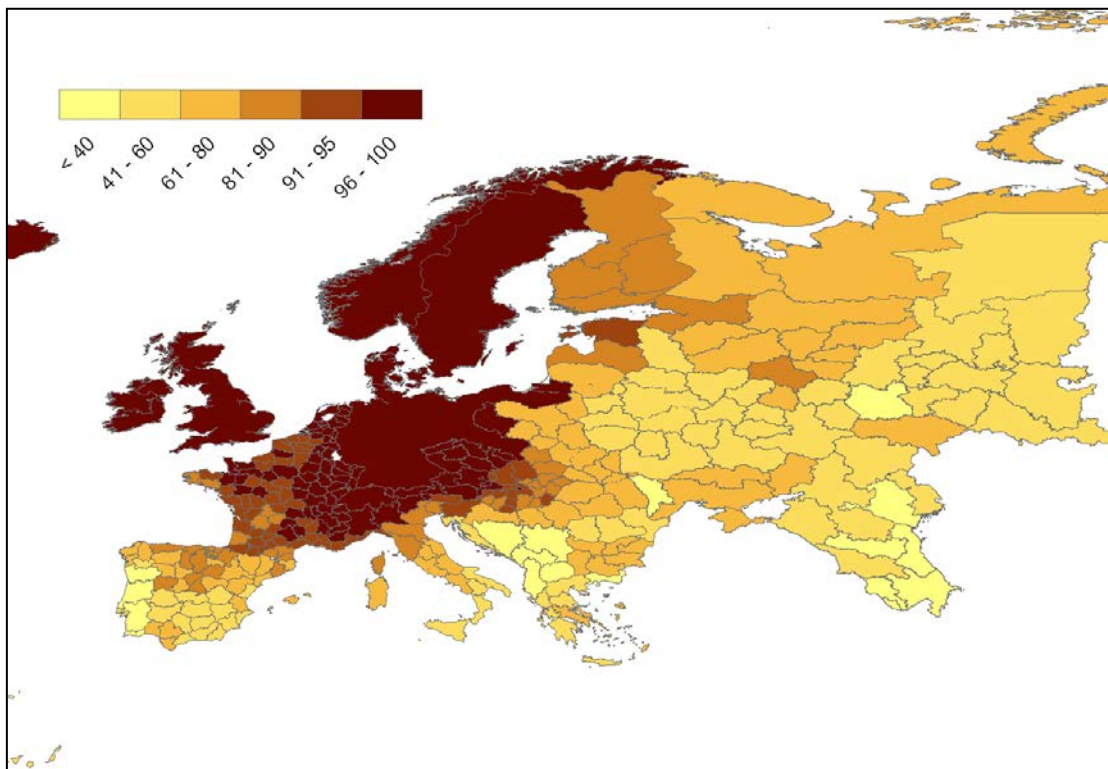
Figure 3 Regional distribution of numeracy (ABCC) in Europe, 1830 birth decade



Source: Hippe and Baten (2012).

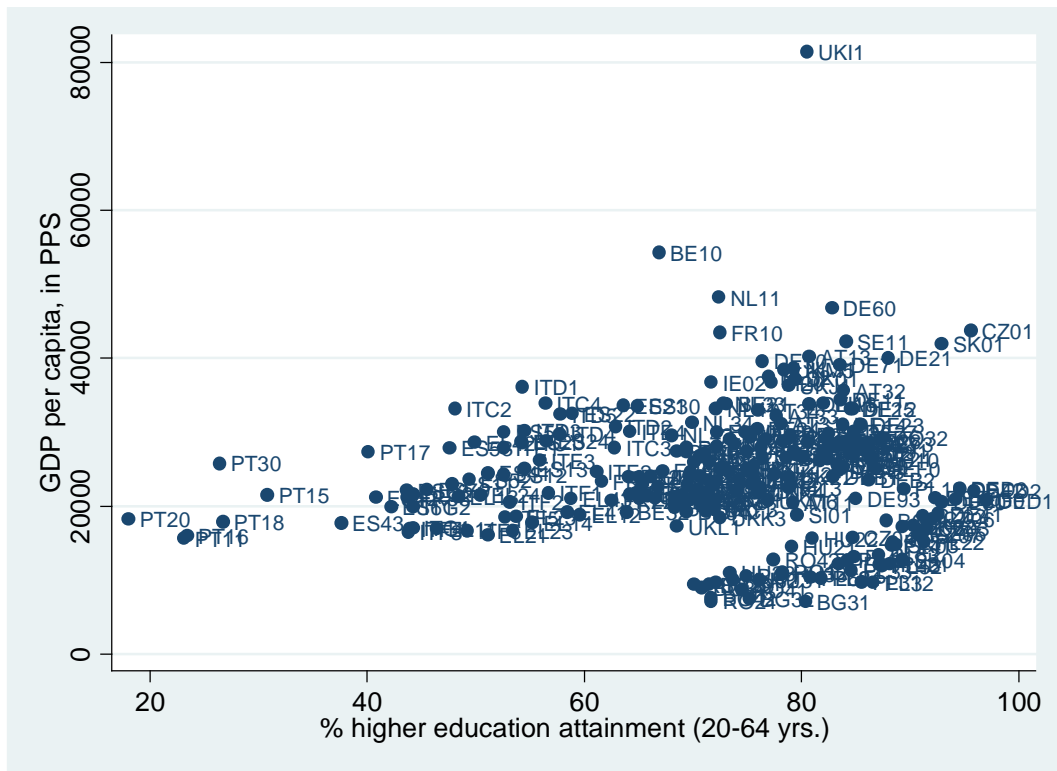
Note: Albania, Benelux, Bosnia-Herzegovina, Cyprus, Denmark, Finland, France, FYROM, Greece, Kosovo, Montenegro, Portugal, Sweden and parts of Bulgaria and Romania are missing values.

Figure 4 Regional distribution of literacy in Europe, ca. 1930



Source: Hippe (2012b).

Figure 5 Regional relationship between higher educational attainment and GDP/c in Europe, 2008



Source: Hippe (2012d).

Note: Higher education attainment refers to the share of “persons aged 25-64 and 20-24 with upper secondary or tertiary education attainment” (Eurostat 2012).

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