



Munich Personal RePEc Archive

**Mobility of human capital and its effect
on regional economic development.
Review of theory and empirical literature**

Mikolaj Herbst and Jakub Rok

University of Warsaw, Centre for European Regional and Local
Studies (EUROREG)

1. March 2013

Online at <http://mpra.ub.uni-muenchen.de/45755/>

MPRA Paper No. 45755, posted 2. April 2013 17:09 UTC

Mikolaj Herbst¹

Jakub Rok²

Mobility of human capital and its effect on regional economic development. Review of theory and empirical literature.

Contents

1. Introduction.....	2
2. Why human capital is important for growth (development).....	2
Core economic theory and evidence.....	2
Stock versus quality of human capital.....	5
Human capital and economic growth on a regional scale	6
Institutional approach and the externalities of education	9
3. Brain drain or brain gain? Effect of migration on the local stock and composition of human capital	11
4. Drivers of human capital migration.....	15
Theory.....	15
Characteristics of an individual	16
Characteristics of a city or region.....	18
Characteristics of a higher education institution	21
Individual decision or social process?	22
5. Regional policies towards skilled migration: efforts and achievements.....	24
Attracting new talents.....	25
Retaining graduates and in-migrants	28
References:.....	30

¹ Mikołaj Herbst is an assistant professor at the University of Warsaw, Centre for European Regional and Local Studies.

² Jakub Rok is a researcher at the University of Warsaw, Centre for European Regional and Local Studies.

1. Introduction

According to economic theory, supported by rich empirical evidence, the ability of an economy to accumulate a high quality human capital is an important factor of economic growth. Since economies better endowed with human capital grow at a higher rate, the mobility of skilled individuals should have a meaningful effect on the economic perspectives of different countries and regions.

In this paper we attempt to systematise the existing literature on the impact that human capital mobility has on economic growth and some other aspects of regional development, in order to better understand the channels through which this impact is accomplished and the significance of the observed effects. We complement it with a typology of drivers of highly skilled migration and, finally, we focus on policy efforts at the regional level that aim at raising the human capital level in a region. The literature on this subject is vast, including both macroeconomic and microeconomic studies, as well as some works rooted in regional science, sociology or generic educational research.

It must be said that human capital is a broad concept, covering many characteristics contributing to an individual's work productivity. This includes not only learned skills, but also natural talents, health, social status, etc. In this paper, however, we refer to the narrow definition of 'human capital', focusing on the level and quality of formal education obtained.

The remaining part of the paper is divided into four major sections. Section 2 is devoted to the theory and empirical evidence on the impact of human capital on economic growth (on both international and regional scales). In section 3 we refer to studies on the effect that skilled migration exerts on the stock of human capital in different economies. In section 4 we discuss the literature on the determinants of migration decisions made by highly educated individuals. Section 5 touches the issue of unfolding regional policies towards migrations of human capital.

2. Why human capital is important for growth (development)

Core economic theory and evidence

According to the neoclassical economic theory, the effect of human capital on economic growth is realized either through the impact on labour productivity or through the impact on so-called total factor productivity (TFP). The original Solow (1956) model included, however, only two production factors – labour and capital, assuming that every employee is identical in terms of productivity. Uzawa (1965) introduced the idea of the education sector in the economy. The employment in this sector, which in addition to traditionally understood education included also health services and some other public services, conditioned labour productivity in the economy. The higher was employment in the education sector, the higher became labour effectiveness.

In turn, Lucas (1988) considered human capital as an individual feature of every labour force member. In his model the employee with human capital equal to 2 is twice as productive as the individual with human capital that equals 1. In Lucas's model the rate of GDP per capita growth is equal to the rate of human capital accumulation. Individual investment in human capital, rather than technological progress (as in the Solow model), becomes the source of economic growth.

Similarly to Lucas model, Manuelli and Seshadri (2007) also consider human capital as being individual endowment, which is created and accumulated during school years and one's early period in the labour market. The authors then develop a model of private investment in human capital over the life cycle.

The second major strand in the economic theory of the role of human capital in determining growth relies on the fact that human capital allows the creation and diffusion of technology. Using the terminology of the Solow model, the effect of human capital on growth is realized by influencing the so-called total factor productivity. Nelson and Phelps (1966) distinguish two channels through which this effect works. First, a high level of human capital in the economy makes it possible to develop new technologies and increase the effectiveness of production factors, which makes the economy grow faster. The second mechanism, frequently referred to as 'catching up', relies on human capital allowing a technologically delayed economy to import solutions from more developed economies. This effect works in favour of economically lagged areas that invest in human capital development. The larger is the technological gap between the lagging and the leading economy, and the higher is the level of human capital in the lagging area, the more it may profit from the catching up effect.

When it comes to verifying the empirical relationship between education and national income, the most important early work was that of Mankiw, Romer and Weil (1992). Using data on national economies from the years 1960–1985, the authors demonstrated that a 10% increase in human capital stock was associated with a gain in GDP per capita of 6.7% to 7.6%, depending on the sample selection.

The results achieved by Mankiw, Romer and Weil opened the debate on human capital's role in generating national income and its growth. This influence (or at least its strength) was repeatedly questioned by researchers who tended to see it as more of a statistical artefact than a real cause and effect relationship. Analysis was repeated using newer, more accurate databases and making methodological modifications. One of the most well-known attempts was the study by Bernanke and Gurkaynak (2001), who repeated the experiment using data covering the period 1960–1995 (the original research covered the years 1960–1985). For a better comparison with the former research the authors used an identical sample selection and the same dependent and independent variables. Their general conclusions were in accordance with the observations of Mankiw, Romer and Weil. The modified Solow model, taking into account the accumulation of human capital, is of a higher quality than the original model. It explains considerably higher proportion of the variance in the GDP per capita between countries and gives a much more realistic estimation of the shares of production factors

in generating national output. Despite slight departures from the original results, the most important findings of Mankiw, Romer and Weil were upheld.

Following the early contributions, the empirical literature on the human capital effect on economic growth rate is organised mostly around the Lucas versus Nelson-Phelps controversy, otherwise called the ‘change versus levels controversy’ (Temple 2001; Engelbrecht 2003). The studies typically used a regression model to verify human capital’s impact on economic growth. Some of them focused on the relationship between the change in human capital stock and the growth rate. Such a relationship, if confirmed, is considered an argument in favour of the direct impact of labour productivity on growth rate (in accordance with the findings from labour economics and the Lucas model). In turn, studies investigating the relationship between the initial level of human capital (instead of change in human capital stock) and the subsequent growth rate are built on the concept of technology development and diffusion being the main channel through which education may affect economic development.

One of the most well-known studies investigating the effect of the initial level of human capital on the growth rate in the subsequent period is the research of R. Barro (1999). It includes data from around a hundred countries in the period 1960–1995. Barro showed that prolonging by one year the average duration of education after primary school has the effect of raising the future rate of economic growth by 0.7 percentage points. An additional outcome of the research was the observation that not only the level of formal education but also its quality bears a strong influence on economic development. In truth, as might be expected, if the model simultaneously takes into account both the duration and quality of education, the impact of the former (measured by R^2) falls by about 50%, while both factors remain key statistical determinants of the rate of economic growth³.

A smaller, although significant, positive influence of human capital resources on the rate of economic growth was found by Chen and Dahlman (2004), who conducted research on a sample of 92 countries using data spanning the period 1960–2000. According to them, extending the average number of years of study (incorporating all levels of education) by one year meant, *ceteris paribus*, an increased average economic growth rate of 0.13 percentage points.

Meanwhile Barro and Sala-i-Martin (2004), using the primary school scholarization rate as a measure of human capital stock (the research covered around 100 countries worldwide), estimated that the difference in the initial value of this indicator (1960) had a significant impact on the economic growth rate in the subsequent years (1965–1995). In particular, an upward shift in the scholarization coefficient by 10 percentage points was expected to increase the average annual growth rate by 0.27 percentage points.

The second approach to modelling the economic growth is based on research into the relationship between growth and changes in human capital stock over the same period. As mentioned

³ The significance of education quality in growth determination is touched on in more detail in Section 3.

earlier, this approach was directly inspired by microeconomic research on the labour market and the theoretical argumentation of Lucas (1988), who assumed that the role of human capital in generating national income was through its influence on labour productivity.

Compared to the estimates based on initial levels of education, the results of the early research, taking into account an increase in human capital, were less conclusive. Particularly in earlier studies, the relation between education and economic growth often turns out to be statistically insignificant, and sometimes the effect of human capital is even negative.

One of the most prominent studies shedding doubt on human capital's influence on the economic growth rate is that of Benhabib and Spiegel (1994), who conducted a cross-sectional analysis on a sample of around 80 countries, taking the average rate of economic growth in the period 1965–1985 as the dependent variable. The regression coefficient by the increase in education levels turned out positive, but statistically insignificant. A similar result was obtained by Krueger and Lindahl (1999), in repeat tests using a larger data set. Interpreting the results, Benhabib and Spiegel referred to the core theory of the model and asserted that the role of human capital in economic development consists above all in enabling the manufacture and import of technology, and not as a direct effect on workers' productivity. However, many researchers believe that the weak statistical relationship between the increase in human capital and economic growth stems from the poor quality of data used in early analyses. Indeed, more recent studies based on improved data sets generally show that changes in human capital resources significantly influence the economic growth rate (De la Fuente and Domenech 2006; Ciccone and Papaioannou 2009; Arnold, Bassanini et al. 2011)⁴.

Stock versus quality of human capital

One key criticism concerning the specifications of the regression equation using human capital is that it does not take into account the varying quality of education in particular countries. The most commonly used variable expressing human capital stock is the average duration of school education (in years). The educational attainment of the adult population (by education levels) is also used. Both these measures relate to human capital 'quantity' in the economy, but overlook the fact that one year in education brings about different improvements in worker productivity depending on the quality of education as well as the institutional differences between educational systems. Overlooking differences in the quality of human capital clearly distorts the perceived influence of this factor on economic growth. In this case it would be better to directly measure the level of useful skills possessed by workers instead of simply noting the fact that they have completed a certain stage of formal education. A hindrance to this approach is, of course, the difficulty in obtaining comparable data on

⁴ Improving the data sets involved, among other things, taking into account different aspects of the institutional environment of the economy as well as country-specific features resulting from, e.g., exploitation of natural resources.

the quality of human capital in different countries. However, since the mid-1990s in particular, the situation in this area has improved. Valuable data is provided by international programmes measuring student abilities, such as the TIMSS research (Trends in International Maths and Science Study) carried out from 1995, as well as the PISA (Programme for International Student Assessment) research initiated in 2000. The number of countries taking part in these ventures is limited and, thus, many analyses still use traditional measures of human capital resources, relating to the formal stage of education completed by inhabitants.

Among economists concerned with the questions of education, E. Hanushek is an expert specialising in the influence of education quality on personal income (on a micro scale) as well as on economic growth (on a macro scale). In one of his studies (Hanushek and Woessmann 2007) he showed that the influence (measured by tests) of the real skills of workers on their attained level of income is not only stronger than the influence of their formal education, but the material worth of real knowledge grows with time, while the worth of formal education declines.

Based on the research carried out in the 1990s by the International Adult Literacy Survey, Hanushek showed that the coefficient of income flexibility with respect to the skill level of an individual was as great as 25% (from raising skill levels by one standard deviation). This result was recorded for the US labour market. The results for the remaining markets generally ranged from 5% (Italy) to 15% (Chile and Holland). Interestingly, the only country participating in the study in which the influence of knowledge and skills on attained income showed no influence turned out to be Poland.

The results of research based on a growth regression using quality measures of human capital show that it may indeed be the quality, and not the duration, of schooling that significantly influences a country's economic growth rate and contributes to the differences in income levels. One of the first articles of this kind was the study by R. Barro (1999). In another study Hanushek and Kimko (2000) claimed that adding education quality to the basic specifications, which take into account 'quantity' of human capital and initial income levels, significantly improved the share of the explained variance. The positive influence of the quality of human capital on economic growth (stronger than that of the human capital stock alone) was also observed by Bosworth and Collins (2003) as well as Ciccone and Papaioannou (2009).

Human capital and economic growth on a regional scale

The growing interest of researchers in verifying economic growth theory on a regional level is due to many factors. In terms of politics, the period following World War II was a time of gradual deregulation, as well as empowerment of sub-national administrative units. In a modern, democratic nation, regions hold considerable rights in terms of managing the economy and stimulating development. In foreign trade, national borders have lost significance and the real exchange takes place between regions, most commonly organized around metropolitan cities. Moreover, conducting

research on a regional scale allows to control and isolate the factors linking education and development that are determined on the national level. It is only natural, then, that regions are becoming the subject of research aimed at formulating recommendations regarding economic policy.

Empirical research on economic growth does not differ in terms of methodology from research on a regional level to research on the national level. Growth regression remains the standard tool. Among the explanatory variables different measures of human capital resources are used – for example, the average duration of school education, or the average level of school achievements (test scores). These data are available in contemporary public statistical systems, not only in an aggregated form (for the whole country), but also broken down into smaller territorial units.

Growth regressions based on regional data can be divided into those focused on growth diversity within a single national economy, and international research encompassing regions in many nations. The advantage of the first type is the full comparability of the units studied in terms of the institutional and legal environment of the economy. The lack of this comparability is one of the main criticisms directed at the research conducted on the international level.

An example of research focused on regional differences in growth rates within one country is the study by A. di Liberto and J. Symons (2001) on Italy. The authors, using a panel data set spanning the period 1960s–1990s, show that education did influence regional growth rates, but only in the south of the country. In more prosperous central and northern regions, this relationship was not evident. Moreover, the research indicated that, even in the south, the benefits of accelerated growth were above all the result of the dissemination of primary education in order to eliminate illiteracy in the 1960s. However, later growth of human capital in higher education did not significantly influence economic growth rates of Italian regions. This agrees with results of many studies showing that the benefits of investing in education are characterized by diminishing economies of scale – the lower the initial level of human capital in a region, the greater the benefits of improving it.

The great majority of studies on regional growth concern the US. This is due, among other aspects, to the considerably better availability of data in comparison with Europe. An example of important research is the study by J. Persson and B. Malmberg (1996) concerning the factors of economic growth in US regions in the period 1920–1990. In their conclusions we read that, in the past, the level of human capital (measured by the average number of years of school education) produced a strong positive influence on regional growth rates. However, this influence only appeared in cases where the model took into account differences in the demographic structure of regions. Moreover, the authors concluded that incorporating human capital into the model significantly increases the estimated rate of regional convergence, which indicates that the process is strongly conditioned by the educational resources of individual regions.

Economic convergence on the regional level is also the subject of an article by Cardenas and Ponton (1995) concerning Columbia. And in this instance it appears that regions investing in education (or rather – whose inhabitants invest in education) develop faster, irrespective of their

wealth at the beginning of the period in question, in this case 1950. In contrast with the findings of Person and Malmberg, the significant influence of human capital on growth rates is here unconditional. In other words, it does not depend on the inclusion of other variables in the model specification.

The impact of human capital on regional growth rates is equally supported by the work of de la Fuente (2002), concerning Spain. The author shows that the main factors responsible for regional economic convergence in that country are equalization of education levels as well as the diffusion of technology.

The empirical research covering the regions across nations most often concerns Europe and addresses the need for knowledge on emerging processes in the European Union (EU). This line of research has developed along with the creation of a universal statistical database concerning EU regions. One example is the study by Badinger and Tondl (2002), the aim of which was to verify the factors of economic growth in the EU regions in the 1990s. The research covered 10 of the 15 then EU members (excluding Austria, Denmark, Greece, Great Britain and Sweden), which include 128 NUTS2 regions. The findings indicate that both physical and human capital have a positive influence on the regional growth rate. The authors noticed, however, that only human capital at the higher education level had a significant influence on growth rates in the 1990s. Raising the percentage of persons with a higher education by 10 percentage points resulted, according to the findings, in an increase in the average growth rate of about 1 percentage point in the years 1993–2000. However, there is no clear relation between the rate of growth and school attainment at the secondary level.

Moreover, the research provides some support for the existence of the previously discussed ‘catch-up’ effect. On the one hand, regions that have economically lagged behind are often handicapped by a low level of human capital, but, on the other hand, their situation allows them to develop rapidly by adopting innovations created elsewhere. Badinger and Tondl demonstrated that this effect is strengthened where the economy of a given region is more open (international trade plays a bigger part). This finding favours a liberal trade policy as an effective instrument in promoting development in backward areas.

The latest studies concerning selected regions of the EU also show the strong influence of human capital on regional growth rates. Lesage and Fischer (2008) researched a sample of NUTS2 regions in the period 1995–2003 and find that human capital not only has a positive impact on economic growth in the regional framework, but also shows a positive spatial effect. This means that growth occurs faster in regions neighbouring areas with a high educational potential. The significance of human capital for regional economic growth is also supported by the research of Del Bo, Florio and Manzi (2010).

Institutional approach and the externalities of education

Differently from the core economic approach, focused on human capital as the element of production function, some authors concentrate on the role of educational institutions in the socio-economic development of their environment. As shown by Uyarra (2010), the perceived role of university in local economy has significantly evolved over the last 25 years. The former knowledge ‘factory’, focused on its primary functions (teaching and research publication), has recently become much more engaged in cooperation with regional stakeholders and responsive to the problems of local development. Numerous research attempts emphasise also the indirect effect of human capital on economic growth through externalities or investigate the issue of human capital as a subject of public (government) investment.

The institutional approach underlines the transformation of education’s role in the economy and society over the centuries. This particularly applies to the mission of universities. As summed up by Herbst, Olechnicka and Ploszaj (2011), based on the extensive literature survey, the university has come a long way – from the elitist ‘house of knowledge’ (13–14th centuries), through the supplier of technology for industrial mass production (19th–20th centuries) to the centre of knowledge that is rooted in its region and is accessible to all (21st century). The central concept behind this transformation is that modern, higher education institutions have strongly developed their ‘third role’ – beyond teaching and academic research, which were their two traditional roles. The third role relies on direct engagement of universities in the widely understood development of their home regions. This may take different forms:

- Inclusion of regional issues in the curricula (Holland 2001)
- Providing expertise to regional and local authorities, and the university engaging in resolving local economic problems e.g., (Gunasekara 2006; Healey 2008)
- Acting as a significant local employer and taxpayer, transferring technology to local firms (Asheim and Coenen 2005; Edquist 2005; Srinivas and Viljamaa 2008)

Cooperation of regional administration, business, and higher education (research) institutions is considered a necessary condition for fast economic development of a region in the era of knowledge-based economies. One of the most prominent formulations of this model is called ‘triple helix’ (Etzkowitz and Leydesdorff 1995) .

Independently of the direct impact of human capital on growth and the institutional effects of education, many authors emphasise the presence of education-related externalities. Both the stock of human capital and the presence of educational institutions in a neighbourhood affect indirectly a territory’s socio-economic development potential. Lucas (1988) included in his growth model the average level of society’s human capital in addition to human capital attributed to individual workers. One of the possible interpretations of such a model specification is that higher levels of human capital

stock not only improves labour productivity, but also reduces transaction costs in the economy, which affects well-being for all individuals, even those who don't invest in their individual human capital.

Overall, education externalities may affect collective welfare, by the following:

- Shifting demand for specific services in the local economy, e.g., commerce, child care (Boucher, Conway et al. 2003)
- Contributing to the increase of land value by investing in university-related infrastructure (Benneworth and Hospers 2007)
- Building regional prestige by association with education (Power and Malmberg 2008)
- Reducing transaction costs through improving security, confidence and contributing to social capital development (Dasgupta 2003)
- Increasing the attractiveness of certain areas for highly educated and creative individuals and thus spatially clustering the 'creative class' (Florida 2002)
- Improving public health (Grossman and Kaestner 1997)
- Contributing to democratization, reducing social inequalities, improving political stability (McMahon 2004)
- Rationalising the use of natural resources (Appiah and McMahon 2002)

The existence of education externalities makes many researchers distinguish between the private and social returns to educational investment (the latter exceeding the former). McMahon (2004) also considered separately a 'monetary' and 'non-market' externalities, attempting to estimate their contribution to the total welfare in the economy.

As human capital is recognized as an important economic growth factor, it is also a subject of public spending. Some empirical research aimed at verifying the influence of spending public money on human capital investments and the subsequent growth rate. One of the most influential papers of this kind was written by Rodriguez-Pose and Fratesi (2004), who analysed the effectiveness of the EU structural funds allocation in so-called Objective 1 NTS2 regions, 1990–2000. The authors found that, despite the concentration of development funds on infrastructure and, to a lesser extent, on business support, the returns to expenditures in these areas were not significant. Support to agriculture had only short-term positive effects on growth, and only investment in education and human capital – which represented about one-eighth of the total commitments – had medium-term positive and significant impacts on the regional growth rates.

3. Brain drain or brain gain? Effect of migration on the local stock and composition of human capital

As human capital is an important determinant of economic growth, and even of more widely understood socio-economic development, migrations of human capital should have a significant impact on the development perspectives of a given economy. Since individuals who are well-endowed with human capital tend to migrate from the less developed economies to the more affluent ones, the first intuition is that their migration contributes to the widening of the human capital gap between the donor and destination areas. This effect, frequently referred to as a 'brain drain' has historically dominated the academic literature of the subject as well as the political discourse on migration. However, as much research proves, there exist also less obvious and not necessarily adverse effects of migration on the human capital stock in the sending country.

The investigations of the consequences of talent mobility usually concentrate on the well-being of those remaining behind, although some studies (Di Maria and Lazarova 2012) distinguish between the domestic and national effects of skilled migration.

The literature names several channels through which migration of talents affects the sending economy. Khamene and Saroukhani (2011) used four keywords: absence, diaspora, prospect, and return. A more sophisticated typology was developed by Giannocolo (2006). A so-called absence effect, which with respect to highly skilled migrants is referred to as a 'brain drain', is emphasised in numerous studies conducted at both international and regional levels. As talented individuals leave a country or region in search of better life opportunities the country (region) suffers a loss of human capital. The early literature, referring mostly to international migration, almost unambiguously concludes that mobility of skilled individuals is harmful for the less-developed countries (Grubel and Scott 1966; Bhagwati and Hamada 1974; Kwok and Leland 1982).

More recently, Frederic and Marfouk (2006) provided the estimates of emigration rates for 195 origin countries, covering the period 1990–2000. They demonstrated that, although in absolute terms the largest numbers of highly educated migrants are from Central America, Eastern- and Southern Asia, and Europe, if considered in proportion to the educated labour force, the highest skilled migration rates are observed in the Caribbean, Central America, and Western-, Middle- and Eastern Africa. This observation confirms the existence of a brain drain phenomenon on a global scale.

In turn, Beine et al. (2008) estimated the net effect of the brain drain for 127 developing countries, taking into account also positive impulses coming from the emigration of highly skilled individuals. They found that countries combining relatively low levels of human capital and low-skilled workers' emigration rates are likely to experience a net gain in human capital stock. However, there appear to be more losers than winners among origin countries and, in addition, the losers tend to lose relatively more than the winners gain.

Naturally, the brain drain phenomenon describes a human capital flow that is heavily asymmetrical (biased in one direction). In turn, a two-way flow is referred to as ‘brain exchange’ (Giannocolo 2006). Probably the worst kind of brain drain (from the point of view of the sending country) occurs when skilled individuals outflow to apply for jobs below their qualifications. This process is described in the literature as a ‘brain waste’. One recent example of such brain waste in Europe is the migration from Poland to the UK after the former country’s accession to the EU in 2004, involving high numbers of well-educated persons (Kaczmarczyk 2010; Kaczmarczyk 2012).

The cumulative nature of skilled migration is also the subject of more theoretical works. Zakharenko (2011) developed a model of learning in which skill acquisition is possible only through personal interaction with a skilled individual. Moreover, the income of the skilled is sensitive to financial constraints for the unskilled. Cross-country differences in such constraints have a multiplicative effect on the skill premium, causing out-migration of skilled individuals from a less-developed country.

The effect of migration on human capital stock in the ‘sending’ economy has been also studied at the regional level (within a country). In one of the most recent works, Marinelli (2011) discussed the case of Italy. Applying the conditional logit models to the data on 26,000 university graduates, the author found, not surprisingly, that the migrants are likely to move towards large and more economically vibrant regions. Graduates also prefer highly innovative areas offering a good quality of life, with cultural opportunities. Since regional innovation and quality of life are key structural drivers of migration, Marinelli concluded that, in fact, we observe a concentration of human capital accumulation and knowledge creation in the most developed regions, leading to an increase in the interregional economic disparities.

In a somewhat older study on Finland (using individual data from Finnish census) Ritsila and Ovaskainen (2001) observed that long distance migration is selective: highly educated individuals are more prone to move than the rest of the population. In line with the brain drain hypothesis, graduates are more likely to migrate from remote regions to centres of economic activity.

Some authors show that the location of educational institutions is an important factor determining the inflow of human capital. Winters (2011) empirically analysed skilled migration between US cities. The results suggest that the greater immigration to *smart cities* (i.e., cities with high initial levels of educational attainment) is due almost entirely to persons moving to pursue higher education. Smart cities are growing because in-migrants often stay in the city after completing their education. The growth of smart cities is also mostly attributable to population redistribution within the same state and has little effect on population growth at the state level.

Although in the US smart cities are frequently relatively small settlements hosting colleges and big universities, in the European reality the migration of human capital usually favours large metropolitan areas. This was clearly shown by Faggian and McCann (2009) for the whole of Great Britain, as well as by Hoare and Corver (2010) for the UK. As the latter authors put it, London is

overwhelmingly the winner region for graduate recruitment, if marginally less so than it was. It enjoys high attraction rates across different pathways (locals, returners, stayers, outsiders) and is the only region to depend mostly on the outsider pathway for its graduate recruitment (which means it is very successful in absorbing graduates who have completed their education elsewhere). A similar conclusion was reached by Herbst (2010) with respect to Warsaw, based on data on the mobility of approximately 2 million Polish tertiary students and graduates during the period 1990–2008.

Even though the brain drain mechanism has been considered a dominating effect of human capital mobility for less-developed economies, many studies also show some positive aspects of skilled migration. Mobility of human capital causes not only brain drain, but also brain gain.

The possibility of migration has some impact on the education demand in the donor country or region as well as on the composition of the human capital stock. These two mechanisms are jointly referred to as ‘prospect channel’. First, the prospect of migration and the fact that high educational attainment improves the chances of migration result in higher incentives to invest in education. The mechanism of brain gain through incentive effect was explained by Stark, Helmenstein, et al. (1998), who specify conditions under which a strictly positive probability of employment in a foreign country raises the level of human capital formed by optimising workers in the home country. According to these authors, while some workers migrate, taking along more human capital than if they had migrated without factoring in the migration possibility (brain drain), other workers stay at home with more human capital than they would have formed in the absence of the migration possibility (brain gain).

In line with this reasoning, Di Maria and Lazarova (2012) found, analysing the sample of developing countries covering the years 1990–2000, that a 1% increase in the migration rate of high-skilled workers increased the growth of human capital formation by 0.05%–0.08%. At the same time, however, they estimated that almost 70% of the population in the sample suffers lower growth as a consequence of skilled migration.

Another aspect of brain gain through the rise of an incentive to study is linked to the shift in return to education in the sending country. As pointed out by (Zakharenko 2011), although migration makes skill acquisition in the sending country more difficult, the unskilled may still be better off: increased cost of skill acquisition is offset by higher income once the skill has been acquired. Similar arguments were presented earlier by Stark et al. (1997).

There is no doubt that both the adverse drain effect of human capital mobility and the beneficial prospect (incentive) effect really take place in relatively less-developed economies that educate students and let them migrate. Most research so far found that the drain effect is stronger, and that the developing country or region loses some development potential in the consequence of skilled migration. Nonetheless Beine et al. (2001) proposed a theoretical model of brain drain in which they confronted the two effects and derived the conditions required for the occurrence of a so-called Beneficial Brain Drain (BBD), which takes place when the brain gain effect is dominant over the brain drain effect. It seems that BBD is likely in two cases: (1) when the economy invests a lot in human

capital and migration probability is low; (2) when the economy already exhibits a relatively high growth rate with low border permeability (probability of migration).

Compositional effect of migration refers in turn to the shift in the structure of students by academic fields in reaction to the demand from labour markets abroad (or outside the region). Well-known examples are the development of IT education in India or of medical studies in the Philippines. Di Maria and Lazarova (2012) have measured the compositional effect using data on international migration from developing countries. They estimated that a percentage point increase in the skilled migration rate leads to an increase of about 0.19% points in the proportion of higher education students enrolled in science and technology degrees. However, in countries with relatively low levels of technological sophistication the migration possibility reduces the enrolment in science and technology specialties, compared to a situation in which no emigration is allowed. The opposite occurs in relatively more developed countries.

Even if we consider the effect of migration in domestic, not national, terms – that is, we focus on the well-being of those remaining behind and not on the whole nation, a diaspora effect of migration on the sending economy still exists. The large groups of citizens residing outside the home country or region may contribute to enabling the flow of ideas and technology from their current place of residence to the homeland. Diaspora may also help in introducing domestic business, science, and other branches of economy into the international network.

Finally, the existence of diaspora usually implies the flow of financial remittances to the country or region of origin. Some of them take the form of transfers to the families left behind, while others are just investments. In the case of large scale migration, transfers from the diaspora may become a noticeable support for the sending country's economy. Obvious examples are Albania or Moldova (Cuc, Lundbaeck et al. 2005; King, Dalipaj et al. 2006; Hagen-Zanker 2010; Siegel 2010). There is also recent evidence from Poland, after this country's accession to the EU in 2004. In this case, however, the impact of remittances is not that significant due to the relatively small scale of migration (up to 6% of the total population) (Kaczmarczyk and Okólski 2008; Kaczmarczyk 2010; Kaczmarczyk 2012; Krzesicki 2012).

Migration's impact on the sending economy may also be realised through a return channel. In an early work, Bowman and Myers (1967) pointed out that many analyses of migration focus on net numbers, while gross flows are important to understand regarding the role of human capital mobility in development processes. Although it has been shown that studying abroad increases the probability of currently living abroad (Oosterbeek and Webbink 2011), re-emigration is quantitatively meaningful and should be considered an agent of positive change in the donor country, even though the net flow of human capital is negative. Emigrants return to their home country with more knowledge, experience and enhanced connections to the international economic network, which contributes to the domestic human capital stock. This view regards skilled migration as part of the brain circulation process rather than a brain drain (Johnson and Regets 1998).

4. Drivers of human capital migration

Knowing migration's impact on regional growth, we move on to examine fundamental factors underlying the migration of highly educated individuals. As Venhorst et al. noted '*the key notion in migration literature is that migration is strongly selective*' (Venhorst, Van Dijk et al. 2010, p.522). First of all, it is the education level that increases an individuals' likelihood of migrating – see Ritsila and Ovaskainen (2001) for the evidence review. Narrowing our analysis to highly educated individuals, we seek other socio-economical, spatial, institutional and political phenomena that shape the migration flows of students and graduates.

Theory

A significant body of literature analyses the determinants of migration. The *traditional approach*, tracing back to Ravenstein's work from the late 19th century, highlights the role of structural factors, such as size, distance and borders, which acts as a 'push' and 'pull' factors, attracting or repulsing an individual (Delisle and Shearmur 2010). Recently, there is a growing debate around a *new approach to determinants of migration*, embodied in Richard Florida's theories, highlighting the importance of cultural amenities.

A more economic-oriented view allows for distinguishing two distinct models of migration, that is, the *human capital model* and the *job search/competition model*. In the former approach, devised by (Sjaastad 1962), the likelihood of migration is explained by the present value of potential moves from a given region. Thus, higher expected returns to individual human-capital investments produce geographic mobility (Faggian and McCann 2009). This approach highlights the importance of the personal characteristics of a given individual. In the job-competition model, regional labour markets allocate a given job to the candidate with the best applicable skills (Venhorst et al., 2010). Such an approach gives priority to the economic and employment characteristics of both the origin and destination regions (Faggian, McCann et al. 2006). Migration research often combines these two approaches, in order to provide a broader picture of the analysed phenomena.

Marinelli (2011) contrasts two streams of research on spatial features that drive migration – gravity models and mainstream economic theory. The former approach posits that population flows depend on the size of and the distance between the areas of origin and destination. Movements are encouraged by proximity and are directed towards larger localities. Mainstream economic theory, drawing on the human capital approach, claims that population flows are directed from poorer to economically flourishing areas. Over the last 50 years the mainstream theory has been broadened to include softer factors, like quality of life and cultural amenities, which are supposed to be specifically

relevant to the highly skilled migrants (Marinelli, 2011). Yet another theme that has been encompassed in migration theory is the notion of migration as a collective rather than individual decision (Stark, 1991).

Delisle and Shearmur (2010) reminded us that – when studying migration flows – geographical scale matters. Thus, characteristics conceived to play an important role in determining population movement differs according to the spatial scale of analysis. For instance, in studying international migration flows, the systems approach is particularly relevant, e.g., highlighting the difference between the US and Europe in the observed patterns of behaviour.

In this part of the article, we review empirical studies on migrations of highly educated individuals in order to devise a comprehensive list of migration factors, regardless of the theoretical approaches adopted by authors. We focus mainly on a national and regional scale, but – where relevant – refer also to the empirical evidence from international studies. We consider both migration to study and migration of graduates.

Drawing on the in-depth literature review, we group the migration factors into the three following categories: (1) characteristics of an individual, (2) characteristics of a city or region, and (3) characteristics of a higher education institution. After elaborating on the factors constituting each category, we refer to the ongoing debate on migration as a social process, as opposed to viewing it as an individual decision. In Section 5 we assess the impact of local and regional policies on migration flows.

Characteristics of an individual

According to the human capital model, migration is an individual's choice, and most of the cost and benefits linked to the migration decision are also borne by individuals (Delisle, Shearmur, 2010). Drawing on this approach, personal characteristics are the major factor driving the migration process. As stated by Di Cintio and Grassi (2011) '*migration is recognized as human capital investment carried out by income-maximizers individuals*' (Di Cintio and Grassi 2011, p. 2). But returns to migration and willingness to make such a decision will vary according to different personal characteristics. A number of non-malleable, inborn personal variables play an important role in determining the migration likelihood, such as gender, age and ethnicity.

There are several implicit assumptions regarding the impact of gender on migration behaviour. The traditional view holds that men are devoted to developing their careers, while women are more attached to their locality than men are, for reasons of family support. In this line, women's migration is usually attributed to coupling and marriage, or to following their male partners in a job-search process (Faggian, McCann et al. 2006). Yet another argument for a lower mobility of women is that, due to the lower wages and fewer hours spent in paid-work, their returns to mobility is significantly reduced compared to that of men (Faggian et al. 2007). The empirical evidence of the role of gender is mixed.

On the one hand, Faggian et al. (2007) found that female graduates are generally more migratory than male graduates. But on the other hand, results obtained by Groen (2004) and Haapanen and Tervo (2011) suggest that gender does not play a significant role in explaining highly skilled mobility.. A third study falls between the results of studies cited above, stating that men are less likely than women to be non-migrants and more likely to be late migrants (Faggian et al. 2006). It is argued that a higher mobility of women might be regarded as a partial compensation mechanism for gender bias in the labour market (Faggian et al. 2007).

Age is another important predictor of migratory behaviour. Gottlieb and Joseph (2006) found that older graduates are more likely than younger graduates to stay in the metropolitan area where they earned their most recent degree. A study conducted by Mosca and Wright (2010) corroborates this finding, showing that the probability of migrating declines sharply after the age of 30.

Ethnicity plays an important role in predicting migration behaviour, though it is strongly context-dependent. Only studies from Anglo-Saxon countries are available, showing that Whites are more migratory than others, in both the US and the UK (Kodrzycki 2001; Faggian, McCann et al. 2006; Ishitani 2011).

Regarding family ties, marital status seems to influence the migratory behaviour of highly educated individuals. Newbold (2001) found that married individuals are less likely to return to their previous province of residence. This is corroborated by (Parsad and Gray 2005), who proved that unmarried bachelor's degree students were 47% more likely to out-migrate than were their married counterparts. Spouse's employment decreases the probability of onward migration for both those studying away from home and those studying at home. In the latter case, migration decreases also with spouse's labour income and is positively correlated to his or her educational level (Haapanen and Tervo 2011). The decision to return home is significantly discouraged after children's enrolment in school (Haapanen and Tervo 2011).

According to the human capital model, the class of qualification should play a crucial role in determining migratory behaviour of highly skilled workers. Individuals obtaining higher grades and qualifications are expected to have higher returns to migration and a greater range and variety of the available set of choices. Also, as noted by Venhorst et al. (2010), individuals with high human capital suffer higher opportunity cost when unemployed or working in a job below their competences, as compared to less skilled individuals. Those better endowed with human capital are also more capable of gathering and processing information about opportunities elsewhere (Venhorst et al. 2010).

Several studies proved that the higher the class of qualification obtained, the higher the probability of migrating (Faggian et al. 2006, Mosca and Wright 2010, Ishitani 2011). Here, the question of geographical scope appears. Mosca and Wright (2010) found that this rule applies especially to international movers but holds true in a national perspective as well. While Venhorst et al. (2010) showed that in the case of peripheral areas, those with higher grades are equally likely to go to the urban growth centres within country as those with lower grades are, but they are significantly

more likely to go abroad (Venhorst et al. 2010). It is interesting to see that the field of study might also have an impact on the basic assumption of the human capital model. In the case of the Netherlands it was found that only economists appear to follow the model of maximizing their human capital, as the best college students tend to move significantly more often to the local development centres (cities) and the best university graduates move abroad, compared to those in other fields (Venhorst et al. 2010).

Thus, we should add that the field of study affects graduates' mobility but the findings are mixed, probably due to differing higher education institutional settings in various countries. It is usually argued that natural scientists are more mobile (Faggian et al. 2006, Faggian et al. 2007, Mosca and Wright 2010). In the case of Dutch graduates, it is an economy, law or agriculture diploma that increases the probability of migration, while in Finland graduates with health, welfare or sports education have high migration rates (Haapanen and Tervo 2011). Net benefits of moving depend on the uniqueness of a given field of study and on the demand for such graduates. Both of these features vary across different countries.

Finally, it is the prior migration that is highly correlated with subsequent migration. This finding might be traced back to the research on the migration of US families done by DaVanzo (1976, cited in: Faggian et al. 2006). Later, Kodrzycki (2001) confirmed that this argument applies to high human-capital individuals as well, and that both migration to college and migration between birth and high school are significant. The effect of migrating to study is much stronger in the probability of being a national mover compared to being an international mover (Mosca and Wright 2010). A study on the mobility of US college graduates by Gottlieb and Joseph (2006) proved that people who were born in the state where they earned their most recent degree are less likely to migrate. This feature is of particular importance for higher education officials, as it is malleable to policy intervention (e.g., admission policies). Why does previous willingness to migrate help to identify individuals who are more likely to migrate in future? Faggian et al. (2007) answered this question by pointing to an individual's traits, like lower psychological costs imposed by mobility.

Kodrzycki (2001) attempted to estimate the lumped importance of individual characteristics for the migration behaviour, i.e., migration's history, sex and ethnicity. It turned out that these variables explain over 20% of the variation in individual migration patterns, and they remain at a similar level after adding further explanatory variables (regarding regions' economy and amenities).

Characteristics of a city or region

As noted above, migration decisions are made by individuals, but this process does not happen in a void. One particular example of such external phenomena is attraction and repulsion incentives, i.e., push and pull factors. The majority of these might be attributed to regional characteristics, constituting a crucial set of determinants of mobility. Different regions offer varying levels of opportunity.

Migrants seek to improve their well-being levels, choosing more buoyant and prosperous areas. As Delisle and Shearmur (2010) put it, *'if sufficient people decide to move away from particular regions, and if they tend to converge on regions with particular characteristics, then migration patterns emerge, which will in part be determined by regional-level factors.'* (Delisle and Shearmur 2010, p. 310).

In a knowledge economy, competitiveness of a region depends on its level of human capital. Maintaining a region's competitiveness relies on the region's capability to both retain its own university graduates and to attract student and graduates from other regions. Neoclassical regional theory depicted mobility as a force for interregional equilibrium, but nowadays it seems to be the opposite (Hoare and Corver 2010). Regional disparities are widening (see Krugman 1991), and if migrants are attracted by economically flourishing areas, the virtuous cycle of cumulative causation occurs. Hoare and Corver (2010) soberly noticed that *'in an inter-regional, zero-sum game context, there will inevitably be regional winners and losers'* (Hoare and Corver 2010, p. 482). So, which regional characteristics determine the outcome of this game, driving the migration flows?

Briefly, there are two distinct categories of such factors: (1) economic factors, such as level of economic development or labour market features; and (2) so-called new factors of migration associated with quality of life, i.e., various types of amenities (Delisle and Shearmur, 2010). Using the empirical evidence, we discuss these factors in detail below.

The debate on the impact of labour market features focuses on two fundamental factors: employment opportunities and wage premium. According to the advocates of the former factor, graduates are heavily attracted by regions with an absorptive labour market. This argument applies both to students oriented towards universities located in areas with positive employment prospects (Krugman 1991) and to graduates, who tend to choose cities experiencing employment growth over the 10 years prior to their graduation year (Gottlieb and Joseph, 2006) or return to their regions if unemployment in their region of graduation is high (Haapanen and Tervo 2011). Delisle and Shearmur (2010) delved into the reasons for employment opportunities outweighing the wage premium at the intraregional level in Canada. They found that it is due to the rising productivity of specialised resource-dependent areas, which in turn decreases the number of jobs and drives the out-migration of young graduates.

However, there is also evidence that employment opportunities do not necessarily play an important role in explaining migration flows of individuals with high human capital. While graduates are a self-selected group with low unemployment propensities, labour market characteristics might be of relatively less relevance for their migration behaviour than they are for the general population (Faggian et al. 2006). A study by Gibbons and Vignoles (2012) proved that students are not attracted by employability itself in a region, as they seek institution quality. The importance of employment opportunities diminishes also after including variables associated with amenities (Kodrzycki 2001).

Finally, Gottlieb and Joseph (2006) found an ‘inexplicably’ positive effect of regional unemployment at the destination on raising in-migration levels.

The role of wage premium seems to raise fewer concerns than is the case with employment opportunities. The present value of expected income and the regional differences in return to skills are both well-established factors underlying migration (Di Cintio and Grassi 2011). The importance of interregional variation in wages for explaining migration flows was empirically confirmed, e.g., by Kodrzycki (2001) and Faggian et al. (2007). However, a study by Delisle and Shearmur (2010) showed that wage premium has a more marked effect for nongraduates than for graduates.

There is also evidence (though less prominent) that labour market structure influences the mobility decisions of graduates. Out-migration is encouraged by increased specialisation of a domicile region (Faggian et al. 2007) or by a focus on primary production (Ritsila 2001). In turn, a high share of local employment accounted for by public sector jobs seems to reduce the outward migration (Faggian and McCann 2009).

Taking a broader perspective, graduates prefer highly developed regions over peripheral ones. Graduates tend to leave lagging regions (Ritsila 2001, Haapanen and Tervo 2011) and move towards or stay in more prosperous ones, as measured by GDP level (Ishitani 2011). However, traditional measures are not able to capture a full picture of a region’s economy. Especially in times of a knowledge-based economy, an innovative milieu seems to emerge as a key prerequisite of growth. It is also reflected in migration flows of individuals with high human capital – graduates tend to migrate towards knowledge intensive regions. They are particularly attracted by regions where there are higher proportions of graduates (Gottlieb and Joseph 2006, Delisle and Shearmur, 2010, Winters, 2011). In their search for employment, graduates prefer innovative regions (Faggian and McCann 2009a) where they can apply their specific knowledge.

Regions with buoyant economies, providing both employment opportunities and high wages, have a potential disadvantage – high living costs. There is clear evidence that students tend to avoid institutions located in higher-cost areas (Baryla and Dotterweich 2001, Faggian et al. 2006). Regarding graduates, the evidence is rather patchy. A study by Kodrzycki (2001) showed, on the one hand, that high house prices are not correlated with out-migration of recent college graduates. On the other hand, the ‘inexplicably’ attractive effect of unemployment – found by Gottlieb and Joseph (2006) – may be conceived of as a sign that local living costs are low due to low local demand.

We have discussed the attractive and repulsive power of the economic features of regions. But there is another strand of research, which highlights the role of amenities in migration behaviour. According to Florida (2002), the major advocate of this approach, young, creative individuals are amenity-oriented in choosing their preferable location. A considerable amount of variables have been employed to account for the vague concept of amenities, but only a limited number proved to have a significant explanatory power. For instance, Kodrzycki (2001) found that graduates are less likely to leave their home state if it were on a seacoast or had low average wind speed, while Faggian et al.

(2006) observed that high local crime rates in domicile areas encourage students to move away and prevent them from returning home after graduation. Also destination size proved to have a positive effect on in-migration (Delisle and Shearmur 2010). This result, in line with the main assumptions of traditional gravity models, might be also seen as a (rather poor) proxy of the flourishing cultural life.

Among younger age cohorts and recent college graduates amenities play a minor role in explaining their migration behaviour, compared to the economic characteristics of a region (Kodrzycki 2001, Gottlieb and Joseph 2006). And while a number of amenities were found to influence one's migration decision, the effects of such amenities are mainly subject to individuals' preferences, hampering the formulation of general rules. The importance of quality of life seems to depend on the bargaining power of an individual, applying rather to more experienced workers or graduates with a PhD (Gottlieb and Joseph 2006). However, different behaviours in this respect might also be considered an effect of different regional background of migrants. Marinelli (2011) found that, while migration is a lifestyle choice for graduates moving within more developed regions of Italy, it is driven by economic necessity for those who leave the peripheral, southern part of Italy.

Characteristics of a higher education institution

When dealing with migration of high human-capital individuals, preferences towards given university features gain prominence as a key determinant of students' migration flows (Baryla and Dotterweich 2001). Before deciding where to apply for admission, students can account for (1) the prestige and overall quality of an institution, (2) the distance to it, and (3) the cost of studying there. Simultaneously, universities pursue their admission policies, which allow them to shape students' inflow. These policies might be further influenced by local and regional policymakers interested in attracting and maintaining the level of human capital in a region.

First of all, high quality universities have a greater ability to attract nonresident students (Baryla and Dotterweich 2001, Alm and Winters 2009, Gibbons and Vignoles 2012). Quality might be accounted for by using variables like prestige, formally recognized quality of programs, institutional selectivity, and research intensity. Furthermore, graduates of such universities tend to be more migratory as well (Faggian et al. 2007, Faggian, McCann, 2009, Mosca and Wright 2010). This brings us back to the question of personal characteristics, as a high quality of university overlaps with the reputation of a qualification obtained by an individual.

Secondly, the distance to a given university affects institutional choice. A study by Gibbons and Vignoles (2012) showed that home to institution distance is an extremely important factor explaining choice of institution. On the one hand, students' sensitivity to this factor is negatively correlated with income and occupational status, which suggest that cost barriers play an important role here. On the other hand, it seems that geographical accessibility of higher education institutions have only a minor effect on enrolment at that level (Alm and Winters 2009, Gibbons and Vignoles 2012).

Of course, the latter finding is relevant only for countries with a well-developed network of higher education institutions.

The impact of the cost of studying on students' mobility differs according to the type of migration. On the one hand, there seems to be consensus in the literature that resident tuition is negatively correlated with resident student enrolment (Mixon 1992; Alm and Winters 2009). At the same time, the impact of nonresident tuition levels on nonresident enrolment does not seem to be significant. Alm and Winters (2009) found a distinct quality effect – nonresident students tend to care primarily for the quality of a university, while being indifferent to tuition levels. It corroborates earlier findings of McHugh and Morgan (1984, in: Baryla and Dotterweich 2001). However, it is worth noting that the impact of tuition fees relies heavily on the institutional setting, and all of the studies cited above were conducted in the US.

Individual decision or social process?

Numerous factors listed above constitute a broad picture of determinants of students and graduates mobility, ranging from age and gender, through wage premium and to tuition costs. But it is still not sufficient. Recently, a growing critique of traditional approaches highlights the role of structural, economic or cultural features. What is omitted is the social dimension of the migration phenomena. In this Section, we review the logic behind this critique and explore the theory of migration as a social process.

The main assumption challenged in the critiques of the traditional approach is that the migration is an individual process, whereby the decision to migrate is a result of comparing features of origin and destination areas (Stark 1991). An individual's choice is based on utility maximisation, whereas collective mobility patterns emerge from the sum of such individual decisions. Such a model of migration behaviour has been criticized for being overly simplistic, neglecting the key notion of the sociology of migration – that the decision-making entity in migration is not the migrant in isolation (Radu 2008). Instead, migration is a collective phenomenon, relying on social networks, which helps to facilitate the process of relocation (Marinelli 2011). In other words, migration is a joint process, engaging both the migrant and a group of non-migrants. How does the role of these 'significant others' affect the process of migration?

First, there is a question of the criteria that allow the constituting of social networks. According to migration studies, such networks are family- (Boyd 1989), nationality- and community-based (Portes, Guarnizo et al. 1999). The first has a wider scope and often builds on family-based relations, thus we focus on this in further analysis.

The clustering of immigrants from one location is driven by two main forces: network externalities and herd behaviour (Epstein 2008). The former implies that individuals tend to choose localities where their peers are already in community, which might help in facilitating the migration

process. Potential benefits have both psychological and material dimensions, including reducing the anxiety attached to relocating to a new place as well as assistance in finding an accommodation, work or applying for credit (Epstein 2008). A social network allows for facilitating a whole migration process through a beaten path, starting with helping migrants finance their travel, through crossing borders (either legally or illegally), up to finding a job and shelter (Haug 2008). The important aspect of a social network is increased access to information about a destination. Franco et al. (2010) found that the ability to acquire and assess employment opportunities in potential destinations is a critical factor in making the migration decision.

Herd behaviour implies that migrants choose to follow the migration patterns of others, assuming that those who have already done it can't be wrong. In fact, both herd behaviour and network externalities complement each other in choosing destinations, as network externalities might be available in a number of places (Epstein 2008). Clustering of immigrants often leads to the emergence of a shadow economy, built on strong relationships inside the community of migrants from a given country or region. However, there is a question as to what extent high human-capital individuals are able to step out of such a shadow economy and join a mainstream economy.

The basic, overly simplistic economic model of migration has been gradually refined to incorporate social determinants of spatial mobility. Two concepts are particularly important here: migration networks and cumulative causation (Radu 2008). The former serves as a mechanism that allows for decreasing the costs and risks attached with a search process, given the imperfect information available. The latter reflects a dynamic perspective on the search and settling processes that account for a virtuous cycle effect. Passing from one stage of the migration process to another might affect factors underlying the behaviour of potential migrants. In particular, social interactions may enter the utility functions of individuals through three channels: constraints, expectations and preferences (Manski 2000).

The cumulative nature of social determinants of migration highlights the importance of duration dependence. Negative duration dependence, or cumulative inertia, is based on growing attachment to home and friends with time. As research shows, developing such social networks can be particularly important for retaining graduates (Wulff 2008, Busch and Weigert 2010). However, as shown by Haapanen and Tervo (2011), cumulative inertia might be overtaken by cumulative stress at a certain point. Migration is more likely shortly after graduation from university, but soon becomes dominated once more by cumulative inertia. According to Haapanen and Tervo (2011) this effect applies both to those who study in their domicile region and to those who are studying away from home.

Further evidence suggests that social networks have a more profound impact on graduates' destination choice than do regional characteristics (Marinelli 2011)⁵. Franco et al. (Franco, Haase et al. 2010) highlighted the role played by the socio-cultural environment in determining the graduates' migration decision. According to their study, social networks – as a mechanism that facilitates access to desired resources, such as work possibilities – might be a key to understanding the nature of the socio-cultural environment's impact on migration.

Summing up, it seems that traditional and sociological perspectives on migration are complementary rather than alternative. As noted by Marinelli (2011), the former accounts for the structural features underlying migration flows, while the latter focuses on mechanisms that actually enable and sustain migration.

5. Regional policies towards skilled migration: efforts and achievements

Transformation to a knowledge-based economy, ageing and widening skill gaps all result in increased competition for highly skilled individuals. Those 'knowledge spillover agents' (Bergman and Schubert 2005) have become increasingly mobile, transferring valuable knowledge across regions and strengthening their innovation potential (Reiner 2010). As competitive policies have been transferring from the level of countries to those of regions and localities, numerous policy measures aiming at facilitating high-skilled immigration and retention are starting to be implemented at the regional level as well. Such policies should build on the evidence about drivers of migration, as presented in Section 4, but that is not always the case. This section reviews regional policies towards skilled migration, starting with their rationale then we describe particular policy measures and recommendations formulated in other studies, and conclude with an outlook.

The main rationale behind policies towards skilled migration is to foster growth in the struggling economies of developed countries. It is believed that attracting highly skilled workers will help to improve labour market conditions and, in turn, will increase demand for native workers regardless of their qualifications level (Zimmermann 2005).

Particularly, foreign graduates are considered to be perfect candidates for immigration as they are already assimilated and have relevant professional training that enables them to enter local labour markets quite easily (Suter and Jandl 2008). Such a premise leads to growing interest in attracting and retaining foreign students. Internationalisation of higher education is believed to bring numerous benefits to a host region, including stronger economic relations with sending countries, improved

⁵ Marinelli (2011) operationalized social networks as the proportion of migrants coming from the same region of study as the graduate, for each potential region of destination.

higher education quality as a result of international competition, a slowing down of demographic decline and filling skill shortages (Suter and Jandl, 2008).

Speaking of regional policies towards skilled migration, we inevitably face two questions. First, to what extent are these flows manageable and, second, do regional authorities have a capacity to significantly influence them. The former brings us back to drivers of migration. As was shown in Section 4, many important factors are malleable to policy intervention (e.g., cultural amenities, quality of higher education, employment prospects, and even establishing and developing social networks). Also, there is a long tradition of public interventions at the national level aiming at shaping migration flows (see Suter and Jandl 2008, Ferry and Vironen 2010) for European-wide reviews of such policies and (Bertoli, Bruecker et al. 2009), Cerna 2010 for the world-wide perspective). The answer to the second question is less clear-cut, as capability of regional authorities is conditional on institutional setting and law. Nonetheless, effects of political practices already in place prove that highly skilled migration might be influenced by sub-national public authorities as well.

Regional policies towards skilled migration cover a wide array of policy fields, reflecting the complex set of factors determining the mobility of this group (Reiner 2010). Probably, the most discussed part of this so-called brain competition policy (term coined by Reiner, 2010) is migration legislation. Even though that migration policy has traditionally been restricted to national level policymakers, there is a recent trend of devolution of such competences to regions. Canada and Australia are two most prominent examples of this glocalised response to regional labour-market challenges (Cameron 2011). Migration policies aiming at attracting and retaining highly skilled individuals are usually based on a skill-selection mechanism (point systems), which was first introduced in Canada in 1967. Its demand-driven character allows policymakers to react flexibly to changing market conditions (Sá, Florax et al. 2004). Approximately 30 years later, the first such mechanisms were implemented at a regional level in Australia. Migration legislation, when mobility is demand driven and primarily economical, is often linked to labour market schemes. The remaining main fields of policy intervention include labour market and business policy, higher education policy and communication policy. Particular mechanisms are described below, divided according to two main processes: attracting new talents and retaining highly skilled individuals.

Attracting new talents

Labour market schemes are one of the most prominent policy measures aimed at attracting new immigrants. At a regional level, they have been implemented in Australia and Canada, in order to satisfy skills and demographic needs that remain unmet by the standard, national immigration programs (Suter and Jandl 2008, Griffiths, Laffan et al. 2010). Such schemes benefit regional candidates by favourable practices, such as wage premium (in case of interregional migration), longer validity of temporary work permits, or bonuses integrated into points systems – lower threshold for

admission, additional points for former training in the region or taking up a job offer in a peripheral area (in the case of international migration) (Suter and Jandl 2008). The former proved to be effective in influencing interregional migration patterns in Australia, where graduates deciding to work in remote areas command the highest salary (Corcoran, Faggian et al., 2010). Well-known examples of the latter include the following:

- Provincial Nominee Program (Canada), which allows provinces to apply their own criteria of admission in order to recruit workers with specific qualifications
- Regional Sponsored Migration Scheme (Australia), under which employers from regional parts of Australia may sponsor immigration of individuals with qualifications that supply their needs, unmet on the local labour market.

(Sá et al. 2004, Suter and Jandl 2008, Cameron 2011)

Labour schemes are often accompanied by softer mechanisms, like regional monitoring systems, which allow effective matching of demand and supply. For instance, Skill Matching Database is a free online tool used by Australian regional policymakers and employers to address skill shortages identified in their regions (Cameron 2011). Another soft policy measure from this field is a support and information centre for employers seeking for skilled migrants with particular qualifications, e.g., Regional Certifying Bodies in Australia. In the case of Australia, both employers and regional authorities are supported by Outreach Officers, who help to determine the best regional skilled-migration options (Cameron 2011)

Employment and business opportunities are key factors underlying migration flows, but only a few regions can tap this potential with targeted migration policies. The remainder may focus on developing regional specialisation and raising the region's profile. Devising a specialised regional strategy in order to build regional identity is recommended, which in turn allows the region to be widely recognized as 'a place to be' for a given occupation (METT 2005, Reiner 2010). Such efforts might be complemented with developing specialised higher education institutions, which are able to attract students from further away (Sá et al. 2004). In order to gain momentum and connect to a 'global pipeline' of professionals and innovations, policymakers should foster cooperation between regional clusters (Reiner, 2010). In this view, the primary policy focus towards skilled migration should be on enhancing general economic conditions (Arntz 2010).

However, as noted by Hugo (2008), while suitable employment is a necessary condition for attracting immigrants, it is usually not sufficient. Non-economic aspects are also important attraction factors, especially in the case of highly skilled individuals' mobility (Coniglio and Prota 2008). But recommendations regarding the particular attraction factors in the vast area of quality of life are sparse. McGranahan and Wojan (2007) highlighted the importance of investments in outdoor recreational opportunities. Further studies point to community safety and low crime levels (Coniglio and Prota 2008, Hugo 2008). Sceptics argue that investing in amenities in order to encourage highly

skilled individuals' in-migration may in turn lead to overlooking needs of current, weaker inhabitants, and that focusing on attracting creative class is in itself questionable (Delisle and Shearmur 2010)

A third policy field (after immigration and broad economic issues) that might be geared towards attracting new talents is higher education policy. In discussing such experiences, we have to remember that differences in institutional settings result in varying regional authorities' discretion in this field. Most of the policy measures implemented or recommended in this field in order to bring new talents into the system fall into two broad categories: (1) widening the participation through increased spatial accessibility, and (2) attracting new students through improved conditions of studying. Results reported in the former strain are not clear-cut. Sá et al. (2004) argued that policies aiming at increasing student flows originating from remote areas have the potential to significantly increase demand for higher education. This is in tune with Alm and Winters (2009), who found that at the intrastate level, decreasing the distance between high school and the nearest higher education institution encourages more high school graduates to enrol in higher education. In France, improving the provision of higher education in medium-sized cities (lobbied by regional officials in order to postpone migration of young people) turned out to have a positive impact on in-migration of white collar workers (Ferry and Vironen 2010). On the other hand, Gibbons and Vignoles (2012) report that in the case of the UK, enhancing geographical proximity does not lead to widening the participation.

Evidence about the higher education policy measures aimed at attracting new students through improved conditions of studying is sparse. Sá et al. (2004) recommended selective lowering of the tax burden on rental costs, in order to diminish housing costs for students. On the contrary, Gibbons and Vignoles (2012) claimed that these kinds of policies would not effectively lead to improved access to higher education. In the US, where state merit scholarships programmes are quite widespread, increases in merit-based grants have positive and significant effects on overall college-going rates (Toutkoushian and Hillman 2012). Other higher education policy measures reported include funding programmes for directing students' occupational choices, which turned out to have no impact on aggregate migration trends (Franco et al. 2010, Hawley and Rork 2012).

There is a clear consensus that favourable regional characteristics and potential benefits to in-migrants should be marketed in order to raise the profile of a given region. Lack of information on regional opportunities is a market failure that can be at least partially corrected by adequate policy measures (Coniglio and Prota 2008). These measures include regional migration websites, regional attraction campaigns, participation in various expos, and establishing advisory services targeting potential in-migrants (Ferry and Vironen 2010, Griffiths et al. 2010, Cameron 2011).

Accounting for the 'migration as a collective process' notion, effectiveness of devised policies might be enhanced through understanding and accessing migration networks. Thus, regions should pay more attention to human resources originating from the region or with social links to it (Reiner 2010). Following this rationale, a number of regions launched programs aiming at return migration. For instance, the regional government of North Rhine-Westphalia (Germany) offers tenures and a

possibility to build autonomous research teams for German postdoc nanotechnology researchers, who stayed abroad for at least 2 years (Reiner 2010). A less costly program is implemented in several regions of Eastern Germany, attempting to reestablish links with young out-migrants through regional contact points (Ferry and Vironen 2010). Also, social networks might be accessed through universities, which can actively engage with their alumni (Marinelli 2011).

Retaining graduates and in-migrants

Attracting new talents is just a first step of the policy toward highly skilled migration. The second one is about retaining in-migrants and graduates. These two ends can be jointly embedded in a single policy mechanism, like various labour market schemes. For instance, Australia's Regional Sponsored Migration Scheme (described earlier) requires applicants to remain for 2 or 3 years with the same employer, thus tapping the potential of cumulative inertia (Wulff and Dharmalingam 2008). And, as the evaluation study shows, 86% of applicants intend to stay in the same region as their host employer for 1 year (Cameron 2011). Labour market schemes (for a brief review of country-level labour market schemes, see Suter and Jandl 2008) might also influence the retention rates of foreign students, i.e., a key measure of higher education internationalisation effectiveness. Such efforts tap a considerable potential for improvement, as retention rates of foreign students are estimated to vary between 10% and 30% only (Suter and Jandl 2008). However, due to limited capacity in this regard, the majority of regional policy measures aiming at retaining high human-capital individuals involve various support services and student aid programs.

Support services for in-migrants facilitate their transition to a new place, new community and to a regional labour market. In a way, it is an institutionalisation of some of the basic functions of ethnic social networks (Sá et al. 2004). Such services can be broadly divided into the two following categories: professional support, and social and family support. The former consists of the following:

- Professional development support such as career advancement opportunities, specialist career and recognition advice, upgrading and updating qualifications
- Networking and peer support, including professional peer groups and mentoring
- Employment information and support, such as pre- and post-arrival employment information or professional work placements.

(Miles, Marshall et al. 2006, Cameron 2011)

Social and family support services rely on enhancing social connectedness, providing access to local and regional social networks. To this end, several studies highlight the importance of proper welcoming upon arrival. Examples showing how this can be supported by regional and local authorities include community introduction (Miles et al. 2006), establishing a welcome centre and web-based welcome portal, which provides necessary information and consulting services (Sá et al. 2004), and developing social community infrastructure in order to enhance shared participation with

migrants in communal activities (Wulff and Dharmalingam 2008). Attempts to satisfy the family-specific needs are vital, as families with children are especially likely to get involved in local social networks (Wulff and Dharmalingam 2008). Adequate policy measures include raising the quality of primary and secondary education and meeting the need for extracurricular programs for children (Miles et al. 2006). Social- and family-support services gain importance, especially in peripheral regions, where economic opportunities are underdeveloped compared to core economic areas.

Student aid programs constitute the second category of regional policy measures aiming at retaining high human-capital individuals. Most of the evidence comes from the US, where different states pursue distinct policies in this regard. Results show that merit aid policies, prepaid tuition plans and scholarships requiring students to remain in state after graduation are significantly decreasing out-migration of local students (Orsuwan and Heck 2009; Zhang and Ness 2010). There are also scholarships funded by public authorities, which subsidize students or graduates willing to undertake studies either abroad or irrespectively of its localisation. Evaluation conducted in Basilicata, where regional government subsidised postgraduate courses either inside or outside the region, showed that only 27% of those who received the financial support were employed in Basilicata after graduation (Coniglio and Prota 2008). A brain drain effect was also found in the case of a Dutch program awarding scholarships to study abroad (Oosterbek and Webbink 2011).

In this Section we conducted a review of regional policies towards skilled migration. Regional policies might be understood as policies undertaken by regional (sub-national) authorities or national policies aiming at regional development. We focus on the former, in an attempt to shed light on this unfolding issue. Implementing such policies often requires discretion available only to federal regions. That is why so many examples were derived from Australia, Canada, the US and Germany. Moreover, many of them were dedicated to bridging the skills gap and preventing demographic decline specifically in remote and peripheral areas (Australia, Canada). All these policies described above are a prospective, but still minor part, of a broad development policy of a region, and level of development itself constitutes probably the most important attractive factor for both skilled and unskilled migration.

Regions wishing to follow the leaders of internationalisation of higher education or regional labour market schemes for migrants must take into account that these are traditionally the immigrant societies, mostly English-speaking and, generally, a popular destination for migrants for decades. First, raising the profile of migration policies would face a challenge of convincing public opinion, affected by financial crisis and views presenting immigrants as scapegoats for unemployment. And even more importantly, the majority of the policy mechanisms described above serve rather as a filter of migration flows and facilitation of adjusting to local labour market conditions. Raising the inflow itself is much more demanding, as it requires improving the general attractiveness of a region, including developing a flourishing economy and securing a high quality of life. It seems that there is no shortcut to success, but one can always walk faster.

References:

(2005). Maximising the use of overseas skills employment assistance for newly arrived migrants, Submission to the Inquiry into Skill Shortages in Rural and Regional NSW, Migrant Employment and Training Taskforce, NSW Parliament, Sydney.

Alm, J. and J. V. Winters (2009). "Distance and intrastate college student migration." Economics of Education Review **28**(6): 728-738.

Appiah, E. and W. W. McMahon (2002). "The social outcomes of education and feedbacks on growth in Africa." Journal of Development Studies **34**(4): 27-68.

Arnold, J., A. Bassanini, et al. (2011). "Solow or Lucas? Testing speed of convergence on a panel of OECD countries." Research in Economics **65**(2): 110-123.

Arntz, M. (2010). "What attracts human capital? Understanding the skill composition of interregional job matches in Germany, , Vol. 44. 4, pp. 423–441." Regional Studies **44**(4): 423-441.

Asheim, B. T. and L. Coenen (2005). "Knowledge bases and regional innovation systems: Comparing Nordic clusters." Research Policy **34**(8): 1173-1190.

Badinger, H. and G. Tondl (2002). Trade, human capital and innovation: The engines of European regional growth in the 1990s IEF Working Papers Nr 42. Vienna, Research Institute for European Affairs, University of Economics and Business Administration.

Barro, R. J. (1999). "Human capital and growth in cross-country regressions." Swedish Economic Policy Review **6**(2): 237-277.

Barro, R. J. and X. Sala-i-Martin (2004). Economic Growth. Cambridge, MIT Press.

Beine, M., F. Docquier, et al. (2001). "Brain drain and economic growth: theory and evidence." Journal of Development Economics **64**: 275-289.

Beine, M., F. Docquier, et al. (2008). "Brain drain and human capital formation in developing countries : winners and losers." Economic Journal **118**: 631-652.

Benhabib, J. and M. Spiegel (1994). "The role of human capital in economic development." Journal of Monetary Economics **34**(2): 143-173.

Benneworth, P. and G. J. Hospers (2007). "Urban Competitiveness in the Knowledge Economy: Universities as New Planning Animateurs." Progress in Planning **67**(2).

Bergman, E. and U. Schubert (2005). Spillovers and innovation, environment and space: Policy uncertainties and research opportunities. Spillovers and innovations. Space, environment and the economy. G. Maier and S. Sedlacek. New York, Springer.

Bernanke, B. S. and R. S. Gürkaynak (2001). Is growth exogenous? Taking Mankiw, Romer and Weil seriously. NBER Working Paper No 8365, National Bureau of Economic Research.

Bertoli, S., H. Bruecker, et al. (2009). The battle for brains: How to attract talent. Milano, Fondazione Rodolfo De Benedetti.

- Bhagwati, J. N. and K. Hamada (1974). "The Brain Drain, International Integration of Markets for Professionals and Unemployment: A Theoretical Analysis." Journal of Development Economics **1**(1): 19-42.
- Bosworth, B. P. and S. M. Collins (2003). "The empirics of growth: An update." Brookings Papers on Economic Activity **2**: 113-206.
- Boucher, G., C. Conway, et al. (2003). "Tiers of Engagement by Universities in their Region's Development." Regional Studies **37**(9).
- Bowman, M. J. and R. G. Myers (1967). "Schooling, experience, and gains and losses in human capital through migration." Journal of the American Statistical Association **62**(319): 875-898.
- Boyd, M. (1989). "Family and Personal Networks in International Migration: Recent Developments and New Agendas." International Migration Review **23**(3): 638-70.
- Cameron, R. (2011). " Responding to Australia's Regional Skill Shortages Through Regional Skilled Migration " Journal of Economic and Social Policy **14**(3).
- Cárdenas, M. and A. Pontón (1995). "Growth and convergence in Colombia 1950-1990." Journal of Development Economics **47**: 5-37.
- Cerna, L. (2010). Policies and practices of highly skilled migration in times of the economic crisis International Migration Papers. Geneva, International Labour Office.
- Chen, D. H. C. and C. J. Dahlman (2004). Knowledge and Development: A Cross-Section Approach, The World Bank, Policy Research Working Paper Series: 3366.
- Ciccone, A. and E. Papaioannou (2009). "Human Capital, the Structure of Production, and Growth." The Review of Economics and Statistics **91**: 66-82.
- Coniglio, N. and F. Prota (2008). "Human capital accumulation and migration in a peripheral EU region: The case of Basilicata." Papers in Regional Science **87**(1): 77-95.
- Cuc, M., E. Lundbaeck, et al. (2005). Migration and Remittance in Moldova. Washington D.C, International Monetary Fund.
- Dasgupta, P. (2003). Social capital and economic performance. Foundations of social capital. E. Ostrom and T. K. Ahn. Cheltenham (UK), Edward Elgar.
- de la Fuente, A. (2002). "On the sources of convergence: A close look at the Spanish regions." European Economic Review **46**: 569-599.
- De la Fuente, A. and R. Domenech (2006). "Human Capital in Growth Regressions: How Much Difference Does Data Quality Make?" Journal of the European Economic Association **4**: 1-36.
- Del Bo, C., M. Florio, et al. (2010). "Infrastructure and Convergence: Growth Implications in a Spatial Framework." Transition Studies Review **17**(3): 475-493.

Delisle, F. o. and R. Shearmur (2010). "Where does all the talent flow? Migration of young graduates and nongraduates, Canada 1996-2001." Canadian Geographer / Le Géographe canadien **54**(3): 305-323.

Di Cintio, M. and E. Grassi (2011). "Internal migration and wages of Italian university graduates." Papers in Regional Science.

Di Liberto, A. and J. Symons (2001). Education and Italian regional development, Centre for Economic Performance, London School of Economics and Political Science.

Di Maria, C. and E. Lazarova (2012). "Migration, Human Capital Formation, and Growth: An Empirical Investigation." World Development **40**(5): 938-955.

Edquist, C. (2005). Systems of Innovation: Perspectives and Challenges. The Oxford Handbook of Innovation. J. Fagerberg, D. C. Mowery and R. R. Nelson. Oxford&New York, Oxford University Press.

Engelbrecht, H. J. (2003). "Human capital and economic growth: Cross-section evidence for OECD countries." Economic Record **79**(SPECIAL ISSUE): S40-S51.

Epstein, G. S. (2008). "Herd and Network Effects in Migration Decision-Making " Journal of Ethnic and Migration Studies **34**(4): 567-583.

Etzkowitz, H. and L. Leydesdorff (1995). "The Triple Helix - University - Industry - Government Relations: A Laboratory for Knowledge Based Economic Development." EASST Review **14**(1): 14-19.

Faggian, A. and P. McCann (2007). "Some evidence that women are more mobile than men: Gender differences in U.K. graduate migration behavior." Journal of Regional Science **47**(3): 517-539.

Faggian, A. and P. McCann (2009a). "Human capital, graduate migration and innovation in British regions." Cambridge Journal of Economics **33**(2): 317-333.

Faggian, A. and P. McCann (2009). "Universities, agglomerations and graduate human capital mobility." Tijdschrift voor Economische en Sociale Geografie **100**(2): 210-223.

Faggian, A., P. McCann, et al. (2006). "An analysis of ethnic differences in UK graduate migration behaviour." The Annals of Regional Science **40**(2): 461-471.

Ferry, M. and H. Vironen (2010). Dealing with Demographic Change: Regional Policy Responses. European Policy Research Paper. **72**.

Florida, R. (2002). The Rise of the Creative Class: And How it's transforming work, leisure, community and everyday life. New York, Perseus Book Group.

Franco, M., H. Haase, et al. (2010). "Do universities impact regional employment? A cross-regional comparison of migration effects." Actual Problem of Economics(7): 301-312.

Frédéric, D. and A. Marfouk (2006). International Migration by Educational Attainment (1990-2000). International Migration, Remittances, and the Brain Drain. C. Ozden and M. Schiff. New York, Palgrave Macmillian: 151-199.

Giannoccolo, P. (2006). The Brain Drain. A Survey of the Literature. working paper, Department of Economics, University of Bologna.

Gibbons, S. and A. Vignoles (2012). "Geography, choice and participation in higher education in England." Regional Science and Urban Economics **42**(1-2): 98-113.

Gottlieb, P. D. (2006). "College-to-work migration of technology graduates and holders of doctorates within the United States." Journal of Regional Science **46**(4): 627-659.

Griffiths, J., W. Laffan, et al. (2010). Factors that influence skilled migrants locating in regional areas. A report for Department of Immigration and Citizenship (DIAC), Institute for Social Science Research (ISSR).

Groen, J. a. (2004). "The effect of college location on migration of college-educated labor." Journal of Econometrics **121**(1-2): 125-142.

Grossman, M. and R. Kaestner (1997). Effects of education on health. The Social Benefits of Education. J. R. Behrman and N. Stacey. Ann Arbor, University of Michigan Press.

Grubel, H. G. and A. Scott (1966). "The International Flow of Human Capital." American Economic Review **56**(1/2): 268–274.

Gunasekara, C. (2006). "Universities and associative regional governance: Australian evidence in non-core metropolitan regions." Regional Studies **40**(7): 727-741.

Haapanen, M. and H. Tervo (2011). "Migration of the Highly Educated: Evidence From Residence Spells of University Graduates." Journal of Regional Science **51**(5): 1-19.

Hagen-Zanker, J. (2010). Modest expectations. Causes and effects of immigration on migrant households in source countries. . Maastricht, Boekenplan.

Hanushek, E. A. and D. D. Kimko (2000). "Schooling, labor force quality, and the growth of nations." American Economic Review **90**: 1184-1208.

Hanushek, E. A. and L. Woessmann (2007). The role of school improvement in economic development. Program on Education Policy and Governance, research paper 07-01, Program on Education Policy and Governance, research paper 07-01.

Haug, S. (2008). "Migration Networks and Migration Decision-Making." Journal of Ethnic and Migration Studies **34**(4): 585-605.

Hawley, Z. B. and J. C. Rork (2012). The Case Of State Funded Higher Education Scholarship Plans And Interstate Brain Drain. , Regional Science and Urban Economics.

Healey, P. (2008). "Knowledge flows, spatial strategy making, and the roles of academics." Environment and Planning C: Government and Policy **26**(5): 861 – 881.

Herbst, M. (2010). "Creation and Absorption of Human Capital by Academic Cities in Poland." Studia Regionalne i Lokalne(special issue): 59-76.

Herbst, M., A. Olechnicka, et al. (2011). Higher Education Institutions: Potential, Barriers, Costs, Opportunities. The Resource-integrating state: Development Potential vs. the Quality of Public Regulations. S. Mazur. Kraków, The Malopolska School of Public Administration and Cracow University of Economics.

- Hoare, A. and M. Corver (2010). "The Regional Geography of New Young Graduate Labour in the UK." Regional Studies **44**(4): 477-494.
- Holland, B. (2001). "Toward a definition and characterization of the engaged university." Metropolitan Universities **2**: 20-29.
- Hugo, G. (2008). "Australia's State-Specific and Regional Migration Scheme: An Assessment of its Impacts in South Australia." Journal of International Migration & Integration **9**(2): 125-145.
- Ishitani, T. T. (2011). "The Determinants of Out-Migration Among In-State College Students in the United States." Research in Higher Education **52**(2): 107-122.
- Johnson, J. and M. Regets (1998). International Mobility of Scientists and Engineers to the United States: Brain Drain or Brain Circulation, National Science Foundation (NSF 98-316).
- Kaczmarczyk, P. (2010). Brains on the move? Recent migration of the highly-skilled from Poland and its consequences. A Continent Moving West? EU Enlargement and Labour Migration from Central and Eastern Europe. R. Black, G. Engbersen, M. Okólski and C. Panțiru. Amsterdam, Amsterdam University Press.
- Kaczmarczyk, P. (2010). "Poakcesyjne migracje Polaków – próba bilansu." Studia Migracyjne - Przegląd Polonijny(4): 3-36.
- Kaczmarczyk, P. (2012). Labour market impacts of post-accession migration from Poland. OECD: Free Movement of Workers and Labour Market Adjustment. Recent Experiences from OECD Countries and the European Union. OECD. Paris, OECD.
- Kaczmarczyk, P. and M. Okólski (2008). "Demographic and labour-market impacts of migration on Poland." Oxford Review of Economic Policy **24**: 600-625.
- Khamene, A. D. and B. Saroukhani (2011). "Investigating the Main Concerns over the "Brain Drain" in Developing Countries." American Journal of Scientific Research (14): 93-100.
- King, R., M. Dalipaj, et al. (2006). "Gendering migration and Remittances: Evidence from London and Northern Albania." Population, Space and Place **12**: 409-434.
- Kodrzycki, Y. K. (2001). "Migration of Recent College Graduates : Evidence from the National Longitudinal Survey of Youth." New England Economic Review(1): 13-34.
- Krugman, P. (1991). "Increasing returns and economic geography." Journal of Political Economy **99**: 483-499.
- Krzesicki, O. (2012). "Transfery od migrantów. Teoria i praktyka na przykładzie polskich migrantów w Wielkiej Brytanii i Irlandii. ." Studia Migracyjne - Przegląd Polonijny **3**.
- Kwok, V. and H. Leland (1982). "An Economic Model of the Brain Drain." American Economic Review **72**(1): 91-100.
- Lesage, J. P. and M. M. Fischer (2008). "'Spatial Growth Regressions: Model Specification, Estimation and Interpretation." Spatial Economic Analysis **3**(3): 275-304.

- Lucas, R. E. (1988). "On the mechanics of economic development." Journal of Monetary Economics **22**: 3-42.
- Mankiw, N. G., D. Romer, et al. (1992). "A contribution to the empirics of economic growth." Quarterly Journal of Economics **107**(2): 407-437.
- Manski, C. (2000). "Economics analysis of social interactions." Journal of Economic Perspectives **14**(3): 115-136.
- Manuelli, R. E. and A. Seshadri (2007). Human Capital and the Wealth of Nations. Madison, WI, Department of Economics, University of Wisconsin-Madison.
- Marinelli, E. (2011). Graduate migration in Italy - Lifestyle or necessity ? ERSA conference papers, European Regional Science Association.
- McGranahan, D. and T. Wojan (2007). "Recasting the Creative Class to Examine Growth Processes in Rural and Urban Counties." Regional Studies **41**(2): 197-216.
- McMahon, W. W. (2004). The social and external benefits of education. International Handbook on the Economics of Education. G. Johnes and J. Johnes. Cheltenham, UK and Northampton, MA, USA, Edward Elgar Publishing.
- Miles, R. L., C. Marshall, et al. (2006). "The Attraction And Retention Of Professionals To Regional Areas." Australasian Journal of Regional Studies **12**(2): 129-152.
- Mixon, F. (1992). "Factors affecting college student migration across states." International Journal of Manpower **13**: 25-32.
- Mosca, I. and R. E. Wright (2010). "National and international graduate migration flows." Population trends(141): 36-53.
- Nelson, R. and E. Phelps (1966). "Investment in humans, technological diffusion, and economic growth." American Economic Review: Papers and Proceedings **51**(2): 69-75.
- Newbold, K. B. (2001). "Counting Migrants and Migrations: Comparing Lifetime and Fixed-Interval Return and Onward Migration." Economic Geography **77**: 23-40.
- Oosterbeek, H. and D. Webbink (2011). "Does Studying Abroad Induce a Brain Drain?" Economica **78**(310): 347-366.
- Orsuwan, M. and R. H. Heck (2009). "Merit-Based Student Aid and Freshman Interstate College Migration: Testing a Dynamic Model of Policy Change." Research in Higher Education **50**(1): 24-51.
- Parsad, B. and L. Gray (2005). Interstate migration patterns of recent recipients of bachelor's and master's degrees in science and engineering. Arlington, National Science Foundation.
- Persson, J. and B. Malmberg (1996). Human capital, demographics and growth across the U.S. states 1920-1990, IIES, Stockholm University and Institute for Building Research, Gävle, Sweden.
- Portes, A., L. E. Guarnizo, et al. (1999). "Transnational Communities." Ethnic and Racial Studies **22**(2): 463-477.

Power, D. and A. Malmberg (2008). "The Contribution of Universities to Innovation and Economic Development: In What Sense a Regional Problem?" Cambridge Journal of Regions, Economy and Society **1**(2).

Radu, D. (2008). "Social Interactions in Economic Models of Migration: A Review and Appraisal." Journal of Ethnic and Migration Studies **34**(4): 531-548.

Reiner, C. (2010). "Brain competition policy as a new paradigm of regional policy: A European perspective." Papers in Regional Science **89**(2): 449-462.

Ritsila, J. and M. Ovaskainen (2001). "Migration and regional centralization of human capital." Applied Economics **33**(3): 317-325.

Rodriguez-Pose, A. and U. Fratesi (2004). "Between Development and Social Policies: The Impact of European Structural Funds in Objective 1 Regions " Regional Studies **38**(1): 97-113.

Sá, C., R. J. G. M. Florax, et al. (2004). "Determinants of the Regional Demand for Higher Education in The Netherlands: A Gravity Model Approach " Regional Studies **38**(4): 375-392.

Siegel, M. (2010). Money and Mobility: Migration and Remittances. Maastricht, Boekenplan.

Sjaastad, L. A. (1962). "The costs and returns of human migration." Journal of Political Economy **70**: 80-93.

Solow, R. M. (1956). "A contribution to the theory of economic growth." Quarterly Journal of Economics **70**: 65-94.

Srinivas, S. and K. Viljamaa (2008). "Emergence of Economic Institutions: Analysing the Third Role of Universities in Turku, Finland." Regional Studies **42**(3): 323-341.

Stark, O. (1991) The Migration of Labor. Cambridge, Mass: Blackwell.

Stark, O., C. Helmenstein, et al. (1998). "Human capital depletion, human capital formation, and migration: a blessing or a curse?" Economic Letters **60**(3): 363-367.

Suter, B. and M. Jandl (2008). "Train and Retain: National and Regional Policies to Promote the Settlement of Foreign Graduates in Knowledge Economies." Journal of International Migration & Integration **9**(4): 401-418.

Temple, J. (2001). "Growth effects of education and social capital in the OECD countries " OECD Economic Studies **33**: 57-101.

Toutkoushian, R. K. and N. W. Hillman (2012). "The Impact of State Appropriations and Grants on Access to Higher Education and Outmigration." Review of Higher Education **36**(1): 51-90.

Uyarra, E. (2010). "Conceptualizing the Regional Roles of Universities, Implications, and Contradictions." European Planning Studies **18**(8): 1228-1246.

Uzawa, H. (1965). "Optimum technical change in an aggregative model of economic growth." International Economic Review **6**: 18-31.

Venhorst, V., J. Van Dijk, et al. (2010). "Do the Best Graduates Leave the Peripheral Areas of the Netherlands?" Tijdschrift voor economische en sociale geografie **101**(5): 521-537.

Winters, J. V. (2011). "Why Are Smart Cities Growing? Who Moves and Who Stays." Journal of Regional Science **51**(2): 253-270.

Wulff, M., and Dharmalingam, A. (2008). "Retaining Skilled Migrants in Regional Australia: The Role of Social Connectedness." Journal of International Migration and Integration **9**(2): 147-160.

Zakharenko, R. (2011). "Human capital acquisition and international migration in a model of educational market." Regional Science and Urban Economics.

Zhang, L. and E. C. Ness (2010). "Does State Merit-Based Aid Stem Brain Drain?" Educational Evaluation and Policy Analysis **32**(2): 143-165.

Zimmermann, K. F. (2005). "European labour mobility: Challenges and potentials." De Economist **153**(4): 425-450.