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BRAIN DRAIN AND BRAIN GAIN:
FROM A GLOBAL PERSPECTIVE TO THE ITALIAN CASE

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List of acronyms

BBD   - Beneficial Brain Drain

CENSIS   - Centro Studi Investimenti Sociali

DIOC   - Database on Immigrants in OECD Countries

FDI   - Foreign Direct Investment

GDP   - Gross Domestic Product

GNP   - Gross National Product

HRST   - Human Resources in Science and Technology

HS   - Highly Skilled

ISCED   - International Standard Classification of Education

ISCO   - International Standard Classification of Occupations

LDC   - Less Developed Countries

LS   - Low Skilled

MS   - Middle Skilled

OECD   - Organization for Economic Co-operation and Development

R&D   - Research and Development

SESTAT   - Scientists and Engineers Statistical Data System

SMEs   - Small and Medium Enterprises

STEM   - Science Technology Engineering and Mathematics

TFP   - Total Factor of Productivity

UK   - United Kingdom

USA   - United States of America

UE   - European Union

WB   - World Bank

WGI   - Worldwide Governance Indicators

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INTRODUCTION

An estimation of the United Nation showed that the flow of highly skilled workers from developing to more advanced countries in years 1961-1972 was around 300,000 migrants. Just forty years later, in the U.S only, the presence of foreign-born with a higher education was of 12 million. The causes of this impressive increase have to be found in an always more globally interconnected world, which led to an amplification of the so-called phenomenon of "brain drain". According to the Encyclopaedia Britannica "brain drain", also defined as "human capital flight", is *the departure of educated or professional people from one country, economic sector, or field for another usually for better pay or living conditions"* (Encyclopedia Britannica, 2006)*. Young talents emigrate from their home countries to countries that offer a wider spectrum of opportunities: higher expected returns, higher standards of living and better institutions.

Both developing and developed countries have always been concerned about the potential loss of highly skilled workers. From the one hand, the loss of potential talents is commonly perceived as detrimental to the exporting economy through a human capital flight: the emigration of elite ingenious entrepreneurs, doctors, specialised technician and all the highly educated individuals can even exacerbate the inequality gap with high-income countries. On the other hand, more advanced economies benefit from the immigration of highly skilled individual, thus the derivation of the term "brain gain". This can lead to a global competition to attract talents, also defined as "battle for brains" (Boeri et al., 2012). Therefore, at a first glance, a dualistic vision of the same phenomenon emerges as it is conceived as either positive for a group of countries or negative for another. This approach is what can be defined as a *standard view* (Beltrame, 2007) and it was the common interpretation from the 1970s to the beginning of 1990s. This view is mainly based on the theory of human capital and it can be summarised in this way: the sending country (the government or private individuals) invests in the formation of high-skilled labour given the expected return from it but then the most talented emigrate abroad in search of better opportunities. This reduces the domestic expected return from investment and, eventually, it lowers the level of human capital and the relative number of educated workers in the economy.

From 1990s, however, the idea that more advanced countries attracting the most educated could be both advantageous for sending and receiving countries spread among scholars. To capture the awareness that immigrants represent a resource of socioeconomic development for "brain exporters" states, the concept of *brain gain* was extended to developing countries. (Hunger, 2002). Eventually this led to the reconsideration of the phenomenon under a more fluid definition, so that the term "*brain exchange"* was coined to capture the complexity of the issue. (Commander et al., 2004)

The purpose of this thesis is to apply the same dualism *brain drain/brain gain* to the case of Italy inasmuch as the most modern definitions. At first, after an overview of the concerning literature, I will present a theoretical investigation of brain drain, analysing the channels through which it affects source economies. In addition, in order to quantify the issue, I will provide a global empirical description based on *The Database on Immigrants in OECD countries*. The use of international comparisons will lead to an assessment of the particular Italian situation. The aim is to shown that the European member is facing a double challenge. From the one hand, it is still lagging behind in the worldwide competition for attracting talents respect to other large industrialised economies such as the USA, the UK, France, Germany and Spain. On the other hand, despite Italy cannot be placed among countries with a dramatic human capital flight, it presents some features typical of countries subject to brain drain. Eventually, in light of a more precise collocation of Italy between brain drain and brain gain, this elaboration will try to stress out the causes (institutional and economic) and the consequence of this particular Italian case.

CHAPTER I: THE IMPACT OF BRAIN DRAIN

The aim of this chapter is to review the literature that concerns brain drain.[1] An introductory section gives an insight on the most important factors that affect highly skilled individuals' decisions to migrate. The first section is a literature review of the

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[1] This chapter will not analyse the theoretical debate behind the phenomenon of *brain gain*, since economists have reached a general consensus that highly skilled immigration is always beneficial for the hosting economy (Holzer, 2011)

economic debate about the issue. Its first sub-section deals with the discussion in the born-stages of the brain drain issue, dominated by a neoclassical view; the second sub-section approaches the studies of the 1970s and 1980s whereby the *standard view* was the main perspective. The third one deals with the modern interpretation of the matter, in light with the more recent theories of endogenous growth.

The second section analyses the channels through which brain drain affects the economy of the source country: *the human capital channel*, *the screening-selection channel*, *the productivity channel*, *the institutional channel, the transfer channel* and *the return channel*.

Migratory determinants

In order to understand the brain drain phenomenon, it is important to stress out the determinants of international migration in general since high-skilled migration is collocated in this context.

In The Theory of Wages, Hicks claims that differences in net economic advantages, chiefly differences in wages, employment and unemployment are the main causes of migration (Hicks, 1932). A lot more has been added to the economic research since then, but this statement is still universally accepted as a starting point. Many authors that have dealt with migration have recognised the *push-pull factor* as the main behavioural framework to study international mobility. (Cheng & Yang, 1998). This factor works as a double incentive for the potential emigrant. Firstly, the desire to have a job in a country with better opportunities works as "*pulling factor*" that attracts foreign human capital and labour. A fundamental incentive is higher expected returns in destination countries: rational individuals compare their expected earnings in their countries of origin with the one of their dreamed land. Another important driver is the structure of labour market itself: countries that are mostly skilled oriented, are more likely to be subject to shortage in specific technological sectors. (OECD, 2001). The behavioural mechanism behind it is what Anna Ferro defines as "*anticipatory socialisation*". Through this process, the potential emigrant is supposed to have knowledge of lifestyles, values and information, to know the practical possibilities for migration and the entry regulations and to weigh up all the benefits against the costs of

migration. (Ferro, 2006). Therefore, it appears that the *push-pull* mechanism works on the base of two incentives. From the one hand, a cost-benefit assessment belongs to the economic determinants to explain emigration decisions. On the other hand, other factors such as social, cultural and institutional ones are of great importance especially for high-skilled individuals facing the choice to move away.

The *pushing factor* is related to the conditions of the country of origin. The institutional framework plays a central role on the likely emigrant's motivations, in such a way that "pushes" individuals to look for better opportunities abroad. Corruption, a tortuous bureaucracy, poor or inefficient organisation of public services, a less-developed infrastructure system, presence of crime, and an unsatisfactory social and cultural life, they are all a sufficient set of motivations to favour a human capital flight. (Nifo & Vecchione, 2014). On the contrary, the *pulling mechanism* comes into play in the choice of the right country. Within the set of institutions that affect the economic performance of a territory and, as a consequence, its attractiveness for emigrants (voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law and control of corruption) (Knack and Keefer, 1995), one element that falls under "the rule of law" is particularly relevant for potential migrants' choice: the immigration legislation. It concerns all the regulations that deal with immigration policy: emigrants certainly take into account possible barriers to enter both physically into the destination country and into the local labour market. In the case of high skilled workers, skilled-oriented immigration policies significantly influence the mobility incentives. The rationale behind it is that countries that have designated special legislation to allow highly skilled immigrants to take jobs in their local job markets benefit from a growing international pool of high human resources. (Mahroum, 1999b).

Section 1: A literature review

1.1.1 First generation (1960s)

A first wave of literature related in economics related to brain drain occurred in 1966 with "The International Flow of Human Capital" by Grubel and Scott. In this paper, they supposed the immobility of physical capital and the absence of externalities (Vinokur, 2006). At the base of their theory there was a neoclassical vision that conceived labour as factor of production with a diminishing marginal productivity. Within this

framework, the high-skilled emigrants will not negatively affect the source country since they would only take away the value of their marginal product that they would earn anyway in the destination country. If this marginal product is higher than the average, despite a possible decrease in GNP and per capita income, the individual earnings of the source residents will stay the same. Therefore, the result of a human capital outflow would be a welfare improvement and an optimal allocation of resources. Moreover, the two authors theoretically tried to confirm their analysis with the idea of positive spill-over effects: remittances and technological transfers if emigrants come back, free access to the new knowledge (a public good) co-produced in destination countries' research centres might positively affect the source economy (Vinokur, 2006). Thus, Grubel and Scott recommend a "*laisser-passer*" policy towards skilled mobility. (Moguerou, 2006)

1.1.2 Second generation (1970s-1990s)

The second generation, developed during the 1970s, appears to be in contrast with the neo-classic view. The main argument is that an outflow of the educated elite has always a negative effect on the country of origin. The main contributions in this period came from Bhagwati & Hamada (1974) and from Hamada & Bhagwati (1975). They introduced more realistic assumptions such as negative externalities and labour market rigidities. The authors claimed that the departure of skilled workers reduce the expected wages of the unskilled ones left behind. The channel through which this mechanism works is based on market imperfections of the domestic economy. Particularly, the expected wages are set in a non-competitive market by labour unions and through a process of "leap-frogging", that is, a rise in educated labour earnings pushes up the expected wages of the uneducated as well. This increase is due to either a potential skilled emigration that might foster a pressure on wages for the highly skilled, or by the emigration itself that leaves those who remain with higher salaries (*crowding out effect*). Overall, the effect is detrimental since brain drain brings about higher unemployment and reduces per-capita income among the uneducated as well as national income.

1.1.3 Third generation (1990- modern days)

During the '90s, the economic debate about the importance of human capital gained a new vigour thanks to the innovative theories of endogenous growth by Romer (1986) and Lucas (1988). The idea that human capital is a key determinant for the economic performance already emerged in the '50s and '60s in labour economics studies, mainly by Mincer (1958) and Becker (1964). In these studies, human capital was considered as a mean of production as well as land, labour and physical capital. However, in the mid-1980s a new literature about endogenous growth began. "Endogenous" because variables such as technology innovation and education have a direct effect on the productivity function (TFP) which is largely considered as the engine of long-run growth. Theoretically, Romer (1990) considered the human capital as a *private good* (excludable and rival) that creates a competitive advantage over contenders. Additionally, the endogenous growth theory predicts the presence of an increasing return to scale: the larger the population proportion of educated, the faster the spread of knowledge through a positive externality. In this framework, a country's accumulation of human capital (an increase of an input of production) has a positive contribution to the economic growth. Empirically, Barro and Sala-I-Martin (1995) and Mankiw et al. (1992) have shown that differences in the average level of schooling across countries (used as a proxy for human capital) significantly explain the differences in growth rates.

Within the context of endogenous growth, the approach to the phenomenon of brain drain has been different among economists. Haque and Kim (1995) claimed that brain drain is always detrimental for the sending economy. Indeed, if deprived of the highest skilled workers, the beneficial effect deriving from the positive externality due to the high level of human capital decreases. This implies a welfare and a per-capita income reduction for the country of origin's population. Nevertheless, on the other side of the coin, brain drain has a direct positive impact on the destination economy through a rise in the accumulation of human capital, which further boosts the competitive advantage over developing countries.

A first critique to this *standard view* had origin from Mountford (1991). He demonstrated that the average productivity of the source economy might even rise thanks to an incentive mechanism on education. In fact, rational individuals may choose to post-pone the entrance into the labour market and to invest in education if the expected returns are high enough. It has to be noticed that this argument does not add anything new to the

previous literature of *standard view*, which typically believes that rational agents take into account the possibility to emigrate while computing the educational returns. However, Mountford's innovative theory was that the educational incentives might even foster the economic growth through brain drain. The idea was that if a limit to the high-skilled workers' emigration is set, the accumulation of human capital, derived from the choice to continue the studies, does not get dispersed abroad. In this way, within the framework of endogenous growth, brain drain may even generate a positive externality (thanks to a proportion of elite workers in the economy) that counterbalances the absolute loss of educated labour. For the first time, brain drain has been perceived as beneficial for the source economy, thus it follows a new definition of *"brain gain view"*[2].

Other authors have dealt with BBD. Stark et al. (1997) proceeded from the standard argument of the accumulation of capital due to the incentive from higher foreign expected returns. Similarly to Mountford (1997), they reached the conclusion that brain drain can be beneficial for the home country. The basic rationale behind it is given by the presence of asymmetric information between foreign employers (F) and migrants (M). The former do not have a complete and detailed knowledge about M's skills due to a different culture, language and habits background. Thus, F initially assign an average wage reflecting an average productivity of M, so that low skilled workers enjoy a temporary higher return than what their marginal productivity would presume. Afterwards, F assess the correct value of M's marginal productivity and this adjustment forces lower skilled to return to their source country. Knowing *ex ante* this mechanism created by imperfect information, an optimizer individual would invest in education as much as possible in order to be assessed as "highly skilled". This pushes up the average level of productivity of M as well as the productivity of those who return home.

Beine et al. (2001) analysed the effect of brain drain in lights of the new theories by Mountford (1997). They distinguished between *ex ante* "brain effect" and *ex post* "drain effect". The former follows the above-discussed benefit deriving from the accumulation of human capital in an open economy. In this case, the model is slightly different from Mountford (1997) because they take into account an intergenerational positive externality (the more educated the parents, the more likely the children will be

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[2] Notice that "brain gain" can indifferently refer either to a beneficial brain drain for the country of origin or to the positive effect of human capital inflow for the country of destination. To avoid confusion, from now on I will use "beneficial brain drain" (BBD) to indicate the former and "brain gain" for the latter.

too). The latter is nothing but the absolute loss of some, if not all, educated agents. If the brain effect dominates the drain effect, the brain drain is beneficial for the source economy. They theoretically showed that this is likely to occur under two circumstances: (i) when in a developing country, that is, an economy close to the underdevelopment trap, the potential migration probability of highly skilled is low; (ii) when the economy has a high growth and migration probabilities take some intermediate values. (Beine, Docquier, & Rapoport, 2001).

Section 2: Channels through which brain drain affect source economies

A significant and recent contribution to brain drain studies has arisen from Boeri et al. (2012) who theoretically and empirically analysed the effect of this phenomenon both on the country of origin and on the destination country. Within this book, Doquier and Rapoport reviewed the main channels through which the human capital flight influence the sending economy. Here I propose their theoretical findings providing an additional channel of *temporary migration* that reflects the concept of *"reverse brain drain"*.[3]

1.2.1 The human capital channel

The human capital channel describes the already discussed mechanism by which the human capital formation derived from the expectation to emigrate can be either positive or negative for the source country. In line with the theories of endogenous growth, the presence of human capital is beneficial for the economy through a positive externality. At the same time, it can also be detrimental because the abundance of educated people negatively affects the return to schooling and this discourage individuals to invest (Docquier & Rapoport, 2012). In addition, they believe that the brain drain of strategic sectors can be further harmful because of the proportional nature of the positive externality: if a large portion of, e.g., health professional emigrate, the remaining are less

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[3] As the reader will notice soon, the difference among these channels is not so strict due to their interconnected nature. As a matter of fact, the division is helpful for a clear theoretical and a later empirical analysis.

subject to knowledge spillovers with a consequent enormous impact on the long-run growth.

1.2.2 The screening-selection channel

Commander et al. (2004) argue that BBD arises due to a market failure: foreign firms cannot correctly screen migrants to distinguish between high skilled workers from the less able. (Commander et. al., 2004). The rationale behind it derives from the concept of uncertainty of migration introduced by the third generation of scholars. The idea was that the probability to migrate, or from a different perspective, the probability to be selected by foreign firms, affects the motivation of an individual to continue with tertiary studies. With the assumption of perfect screening-selection, foreign government and firms would be able to operate a perfect discrimination between low skilled and highly skilled. This would largely increase the probability to emigrate for the educated and it would decrease it for the less educated with the consequence that BBD would not hold anymore. Notice that this view share some similarities with Stark et al. (1997), with the difference that it works without taking into consideration any migratory returns. Later, I will investigate the effect of those under the sub-section of "the return channel".

Nonetheless, the screening-selection channel does not have a large impact on the origin economy in a positive way (through a beneficial brain drain). Empirically, it is well documented that high-skilled migrants are more internationally mobile than low-skilled workers (Belot and Hatton, 2012, McKenzie and Rapoport, 2010, Grogger and Hanson, 2011)[4]. This implies that screening difficulties are already ameliorated by a self-selection mechanism.

1.2.3 The productivity channel

Since the 1990s', endogenous technological progress, that is, the ability to innovate and/or to adopt technologies, has been considered as a main factor that explains the long-run growth. In advanced countries, the R&D sector is the chief driver for technological and productivity improvement, whereas technology imitation or adoption

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[4] See also Borjas (1989) and his self-selection model for a theoretical survey of the matter.

is a characteristic of developing countries. The topic shares the importance of the role of human capital on the economic performance by the fact that the presence of highly specialised individuals (engineers and scientists) is strictly connected to R&D investments. The larger the size, the larger the increasing return to scale and its positive externality (Romer, 1990, Grossman and Helpman, 1991, Aghion Howitt, 1992). However, because of low levels of R&D in developing countries, innovation cannot be considered as a key of technological progress and it is more likely to assume that technology adoption plays a major role. In this sense, it is believed that *diaspora networks* have a significant contribution to the diffusion of foreign technologies in developing countries. Meyer and Brown (1991) and Meyer (2001) define *scientific diaspora networks* as an *"asset that can be mobilizied"* (Meyer, 2001). Their importance derives from the fact that expatriates still have some cultural or family connections with their motherland and therefore would tend to create links that work as a channel for knowledge transmission without any physical, permanent or temporary return (Meyer & Brown, 1999).

Diaspora networks are common for countries that have a big community of emigrants abroad such as India, China, Mexico, Philippines and South Africa. Indeed, many studies about the subject have been focused on these countries and they found that the knowledge diffusion along the diaspora channel has a positive influence on the total factor of productivity (TFP) (Agrawal et al., 2011, Kerr, 2008, Kaplan, D., 1997).

In brief, through the productivity channel, diaspora networks can even create a beneficial brain drain for developing countries thanks to an increasingly easiness of information sharing in a globalised world. On the other hand, for more advanced countries, the effect of a drain of scientists and innovators might be negative since the technological progress depends mainly on the R&D sector.

1.2.4 The institutional channel

A well-established *diaspora network* does not only transfer the technology expertise to its home country, but it works as an institutional bridge between two different cultures. Since overall good institutions are considered as a good factor in explaining wealth differences among countries (Acemoglu et. al, 2001), diaspora networks contribute to spill over their motherland a concept of a better functioning society.

Additionally, many studies demonstrate that diasporas help to improve international trade and favour the FDI in developing countries (Docquier & Rapoport, 2012). Rauch (2001) claims that *diaspora networks* are important to promote bilateral trade because: (i) they create internal trust and strong trade networks against a weak legal environment at home; (ii) they provide an exchange of market information between two different cultures. Kugler and Rapoport (2007) found that *diaspora networks* also increase the FDI thanks to a transfer of enhanced institutions and a reduction in bilateral transaction costs.

Once more, through the institutional channel, the brain drain may have a positive impact on the economy of less developed countries. Nevertheless, for the same reason, the effect is minimal or even null for advanced countries that have a sound institutional framework.

1.2.5 The transfer channel

Remittances have long been recognized as a form of economic contribution for the GNP of developing countries. In fact, for those that have a poor-functioning capital market and thus face a liquidity constraint, transfer of money play an important role as a source of income. However, despite its recognized direct beneficial effect deriving from an inflow of capital, its magnitude is ambiguous in case of high-skilled migration. Doquier & Rapoport (2012) found two possible theoretical approaches to remittances by skilled emigrants compared to low-skilled ones. From the one hand, educated workers may remit a larger amount of capital. This might occur because of three different reasons: (i) with an equal proportion of remittances to earnings, educated workers tend to have higher wages than less educated migrants and hence send larger quantities; (ii) remittances can be a form of repayment for families that have invested in high education; (iii) educated individuals are less likely to be illegal immigrants and therefore they will have a bank account that decreases financial costs of remittances. On the other hand, some factors could induce skilled workers to remit less. This is given by the fact that: (i) they tend to emigrate with their family and this means no need to send remittances; (ii) they often come from wealthier families that are less likely to need liquidity; (iii) they generally have fewer motivations to reunify with their family and this translates into lower remittances.

Whether the first or the second dominates is ambiguous *a priori*. Faini (2007) empirically showed that remittances decrease the higher the share of emigrants with tertiary education. This implies that a more selective policy would render remittances less effective and undermine an important source of liquidity for less developed countries.

1.2.6 The return channel

Temporary migration is another fundamental aspect to be taken into consideration in order to assess the impact of brain drain on the sending country. The common view is that returns positively affect the GDP because those who decide to come back bring financial resources as well as the social, cultural and technical experience accumulated abroad that leads to a rise in the domestic level of human capital. Obviously, its magnitude depends on pool of factors that, taken together, might at least partly offset the adverse effect of brain drain. The most important factors are the duration of the job abroad, the proportion returnees over those who stay and the skill composition of migrants. The latter has been studied by Duleep (1994), who defines returnees as "mistaken migrants". In fact, those who have not succeeded are more likely to come back to their country of origin if their expectations about future earnings is not met. Likewise, Borjas and Brastberg (1996) found that the skill selection of returning emigrants depends on the skill composition of immigrants at the first stage. If emigrants represent the highest skilled individuals among the origin population, the returnees will be the least skilled, and vice versa. If these authors perceive the return of low qualified migrants as a weak compensation of high-skilled migration, Stark et al. (1997) instead believe that this might create a BBD through the incentive mechanisms. As explained above, this occurs due to an inefficient screening-selection by employers.

Besides the theoretical divisions about the magnitude of the return effect among scholars, the empirical evidence leads to ambiguous results too. Many authors studied the behaviour of various countries showing that generally permanent migration is a wider phenomenon or that less successful workers are more likely to return (Solimano, 2002, Lindstrom and Massey, 1994, Reagan and Olsen, 2000 Bauer and Gang, 1998, Steiner and Velling, 1994, Borjas, 1989). On the other hand, fast growing countries such as India, China and the Asian Tigers, are increasingly adopting policies that favour the phenomenon of *reverse brain drain,* i.e. the most skilled move to developed countries

that are rapidly converging to advanced economies. They encourage students to pursue their tertiary or PhD studies abroad and then to return with the human capital acquired or to establish a scientific diaspora network, with all its beneficial effects explained above. The effect of this temporary migration policy has contributed to the positive economic performance of these countries (Saxenian, 2005, Chacko, 2007, Zweig, 2006, Lee & Kim, 2010).

Conclusion

The phenomenon of brain drain has been debated among academics since the foundations of Neoclassical Economics. There is no general consensus among scholars whether this can be positive for the source economy or detrimental. Some authors like Bhagwati, Hamada, Haque and Kim defend the latter position, or the so called *standard view*. Some others such as Mountford, Beine, Stark and Commander claim that brain drain can be beneficial for the country of origin under certain circumstances. Whatever the predominant effect, Doquier and Rapoport (2012) listed the main channels through which human capital flight affect the sending economy in either directions.

On the other side of the coin, *brain gain* is generally accepted by the majority of scholars as beneficial for the receiving economies because of its positive impact on growth.

Next chapter will describe both phenomena in quantitative terms within an international framework.

CHAPTER II: AN EMPIRICAL DESCRIPTION OF BRAIN DRAIN AND BRAIN GAIN FROM A GLOBAL PERSPECTIVE

The aim of this chapter is a quantitative description the phenomena of brain drain and brain gain. The introduction is an attempt to overcome the conceptual problem in the definition of skilled individuals. Section 1 gives an insight of the main migratory movements towards the OECD countries, evaluating countries for their attractiveness. Section 2 shows the migratory movements towards the OECD states and which typology of country is more subject to elevated high-skilled emigration rates. Finally section 3

makes a broader comparison among OECD states to see who are the best and the worst performers in the so called *"battle for brains"*.

Who are the skilled emigrants?

In order to assess the impact of *brain exchange* it is important to define skilled individuals. Indeed, there is no general consensus among scholars to characterise "skilled persons". A broad standard is to consider all those with a tertiary or superior level of education, that is, all those with *International Standard Classification of Education* (ISCED) level of 5A, 5B and 6. However, the nature of this group is very heterogeneous and this creates difficulties in measuring the precise contribution of "skills" in the economic performance of a country. Indeed, this definition varies from highly specialised scientists to just-graduated nurses. To overcome this conceptual problem, OECD tried to harmonise the classification of highly skilled persons through the Canberra Manual (OECD, 1995) and the Frascati Manual (OECD, 2002). The former gives a definition of *Human Resources in Science and Technology* (HRST) as either those who successfully completed education at the third level in a Science & Technology (S&T) field of study (HRSTE) or those employed in S&T where the above qualifications are normally required. (HRSTO) (OECD, Manual on the measurement of Human Resources Devoted to S&T-Canberra Manual, 1995). The latter defines the R&D personnel as "All persons employed directly on R&D [...], as well as those providing direct services such as R&D managers, administrators, and clerical staff." (OECD, 2002). Additionaly, high-skilled immigrants can be identified as STEM gradutes (i.e. science, technology, engineering, mathematics). The *International Standard Classification of Occupations (ISCO-088),* collocates STEM workers within the second and the third major groups, respectively called *Professionals* and *Technicians and Associate Professionals.* Indeed, Peri et al. (2014), show that these job fields are the main drivers of productivity growth in the U.S.

Other possible categories of persons that can fit the definition of "highly skilled" and that emerge by belonging to the top distribution of skills are researchers and academics. They both statistically fall under ISCED 6, i.e. they all have a Phd or other advanced research qualifications.

Througout the chapter, for simplicity, I will use the general definition of high-skilled individuals as those who have attained at least a tertiary education, nevertheless, the eterogeneity of this group has to be kept in mind.

Section 1: Global stocks of highly skilled immigration in OECD countries

This section will show the general trends of highly skilled immigration for the OECD countries. The analysis is based on the *Database on Immigrants in OECD countries* (DIOC), built on the most recent wave of population censuses and population registers or labour force surveys when needed.

Based on this data set, the stock of foreign-born individuals with at least a tertiary education in 2010 is estimated to be at about 32 million.

Table 1. Immigrants with tertiary education in OECD countries, 2010[5]

Host Country	Total stock of immigrants[6]	Highly skilled			
		Stock	Percentage of HS over total immigrants	Percentage of HS over OECD HS[7]	Percentage of HS over total population [8]
Australia	4973.1	1959.40	39.4	6.13	8.77
Austria	1151.8	213.08	18.5	0.67	2.54
Belgium	1327.6	358.45	27	1.12	3.24
Canada	6726.3	3504.40	52.1	10.96	10.16
Chile	208.4	76.07	36.5	0.24	0.44
Czech Republic	674.3	130.14	19.3	0.41	1.24
Denmark	478.1	141.04	29.5	0.44	2.53
Estonia	194.5	76.83	39.5	0.24	5.76
Finland	220.5	48.07	21.8	0.15	0.89
France	6806.7	1606.38	23.6	5.02	2.54
Germany	10363	2031.15	19.6	6.35	2.48
Greece	1216.4	211.65	17.4	0.66	1.90
Hungary	361.8	99.49	27.5	0.31	1.00
Iceland	22.5	6.55	29.1	0.02	2.05
Ireland	672.9	263.78	39.2	0.82	5.77
Israel	1718.8	780.33	45.4	2.44	10.05
Italy	**4712.4**	**523.08**	**11.1**	**1.64**	**0.86**

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[5] Stock of foreign-born individuals in 15+ aged population in thousand.
[6] Total stock of immigrants in the host country. This includes low skilled (ISCED 0, 1, 2), medium skilled (ISCED 3, 4) and highly skilled (ISCED 5A, 5B, 6).
[7] Percentage of individuals who attained tertiary education in a given country relative to the total stock of high-skilled immigrants in all OECD countries.
[8] Percentage of foreign-born individuals with a tertiary education relative to the host country population.

Japan	1181.1	413.38	35	1.29	0.32
Luxembourg	187.8	57.47	30.6	0.18	11.09
Mexico	422.6	114.10	27	0.36	0.10
Netherlands	1524.4	396.34	26	1.24	2.37
New Zealand	1125.7	423.26	37.6	1.32	9.61
Norway	510.7	177.72	34.8	0.56	3.59
Poland	570.4	102.10	17.9	0.32	0.27
Portugal	806.5	181.46	22.5	0.57	1.72
Slovak Republic	135.6	24.95	18.4	0.08	0.46
Slovenia	219.1	23.22	10.6	0.07	1.13
Spain	5100.9	1203.81	23.6	3.76	2.61
Sweden	1208.6	350.49	29	1.10	3.71
Switzerland	1772.8	554.89	31.3	1.73	7.01
Turkey	702.1	136.21	19.4	0.43	0.18
United Kingdom	7409.3	3452.73	46.6	10.79	5.46
United States	40861.9	12381.15	30.3	38.71	3.97
OECD	**105568.7**	**31987.32**	**30.3**	**100.00**	**2.57**

Source: DIOC 2010/11. Own calculations of shares

At a first sight of **Table 1**, it can be noticed that in absolute terms, the countries that are generally identified as the ones with the highest total immigration amounts are also the ones with HS immigration in absolute numbers (Australia, Canada, France, Germany, Spain and UK) with the only USA receiving a 39% of the most talented workers worldwide. Indeed, the correlation coefficient between the total stock of immigrants in a given state and the stock of the highly skilled is 98%. The only exception in the top immigrants' destinations is Italy, with a lower-middle level of HS foreign-born individuals.

In relative terms, countries that receive the largest share of skilled migrants are: Australia, Canada, Estonia, Ireland, Israel, New Zealand and the UK. Australia, Canada and New Zealand are countries which have always been pursuing a *point-based system*, recently followed by the UK. This system is an "immigrant driven" policy that allows these countries to select individuals on the basis of strict criteria such as the education, the work experience, language proficiency and age. Nevertheless the candidate does not need an offer job to apply for it. (Boeri, Brücker, Docquier, & Rapoport, 2012) This has to be distinguished from a *visa system*, used in the USA, which is typically "employer driven", i.e. potential workers have to be *ex ante* accepted from their employers after passing a strict "labour market test".

As far as the other relative best performers are concerned, Estonia mostly attracts immigrants from other former Soviet Union countries, which generally have a larger share of high skilled individuals, but also emigrants, respect to other European countries. (Hazans & Philips, 2008). In the last years, both Ireland and Israel have experienced a rapid expansion in of the tertiary sector, and this led both countries to successfully adapt selective policies in order to reduce the shortage of highly qualified workers. (Quinn & Gusciute, 2013).

According to **Table 1**, the countries with the lowest share of highly skilled immigrants in 2010 are the high-income economies (Italy, 11.1%, Austria, 18.5%, Germany, 19.6%) and middle-income such as Slovenia (10.6%), Poland (17.9%), Greece (17.4%) and Turkey (19.4%). Not surprisingly, these states do not implement or do not have an effective skill-selective immigration policy. In addition, some countries like Italy, Greece and Germany (but also France and Spain) are subject to elevated migrant flows that overcome a possible growth of high skilled migrants. Indeed a better assessment of this last point can be carried out by comparing 2010 immigration stocks with data from 2001.

Table 2 shows the changes in international migrations stocks between 2001/01 and 2010/11. Firstly it can be noticed that most OECD countries, with the only exception of Estonia, Israel, Poland and Turkey, experienced an increase in the absolute level of foreign-born workers by an average of 37%. However, what is more relevant for our analysis is to consider the growth of immigrants that hold a level of tertiary education or above. Within this framework of time, OECD countries reached an unprecedented growth of almost 70%. It is interesting to notice that states that more than doubled their number of high-skilled foreign-born individuals are generally not those which already had an elevated presence of them in 2000/01. Indeed, these are: Spain (+198%), Chile (+141%), Czech Republic (+132%), Finland (+126%), New Zealand (+118%), Italy (+112%), Luxembourg (+104%) and Austria (+104%). On the other hand, among nations that attracted talents in the highest absolute number in 2000/01[9], only the United Kingdom (+120%), Germany (+117%) and Australia (+97%) seem to have kept the path. Countries that performed the lowest level of high-skilled immigration growth are: Estonia (+1.66%), Israel (+10%), Slovenia (+16%), Poland (+16%), Japan (+20%), Greece

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[9] This includes countries with a stock highly skilled migrants in 2000/01 of around 100,000 units or above.

(+33%) and Mexico (+35%). Turkey is the only country with a negative growth rate, yet these data do not take into account a high rate of qualified returnees that can possibly ameliorate this result. (İçduygu et al., 2013). In 2010/11 the United States was still the first destination for top educated migrants, nevertheless it lost it in its share among OECD members by four percentage points, from 43% in 2000/01 to 39% in 2000/01. In addition, it also experienced a slower growth in skilled migration than the OECD average (+51%).

Table 2 also shows how OECD 32's skill-selectivity has mutated in the first ten years of the 21st century. The most immediate result is a general shift towards a more skilled composition of immigrants. Indeed, on average, the skill composition of OECD countries passed from a predominance of those with a basic or null education in 2000/01 (low-skilled, 41.5%, medium-skilled, 33.8%, high-skilled, 24.7%) to a substantial parity in 2010/11 (33.8%, 35.9%, 30.3%)[10]. In fact, the greatest change, on average, was the loss of low-skilled (-7.7%) and a gain in high-skilled (+5.6%). Despite this overall increase in educated immigrants respect to uneducated, some countries have raised their selectivity more than others. This is the case of Chile (+17.1%), Canada (+14.1%), Australia (+13.6%) and the United Kingdom (+11.8%). Not surprisingly, with the exception of Chile, these nations see the presence of a *point-based system* in accepting migrants' applications. The only absent is New Zealand, which however performed above the average with a +6.6%.

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[10] See Table A1 for more information about single countries' skills composition

Table 2. Stock of immigrants in OECD countries in 2000/01 and 2010/11

Country	2000/01			2010/11			Growth HS (%)[11]	Growth shares[12]		
	Total stock[13]	Total HS stock	HS share (%)	Total stock	Total HS stock	HS share (%)		Low-skilled	Medium-Skilled	Highly Skilled
AUS	3860.2	995.93	25.8	4973.1	1959.40	39.4	96.74	-19.1	5.7	13.6
AUT	923.7	104.37	11.3	1151.8	213.08	18.5	104.14	-16.2	9	7.2
BEL	1019.3	234.43	23	1327.6	358.45	27	52.90	-9.4	5.3	4
CAN	5355.2	2034.97	38	6726.3	3504.40	52.1	72.21	-12.4	-1.7	14.1
CHE	1454.2	344.64	23.7	1772.8	554.89	31.3	61.00	-10.7	3.1	7.6
CHL	162.6	31.54	19.4	208.4	76.07	36.5	141.14	-19.2	2.1	17.1
CZE	437	55.93	12.8	674.3	130.14	19.3	132.66	-9.6	3	6.5
DEU	6668.2	933.54	14	10363	2031.15	19.6	117.57	-7.7	2	5.6
DNK	319.3	76.31	23.9	478.1	141.04	29.5	84.82	-4.2	-1.4	5.6
ESP	1914.9	404.04	21.1	5100.9	1203.81	23.6	197.94	-9.7	7.3	2.5
EST	243	75.57	31.1	194.5	76.83	39.5	1.66	-11.6	3.1	8.4
FIN	112.4	21.24	18.9	220.5	48.07	21.8	126.27	-1.5	-1.4	2.9
FRA	5600.2	1013.63	18.1	6806.7	1606.38	23.6	58.48	-7.3	1.7	5.5
GBR	4503.5	1567.21	34.8	7409.3	3452.73	46.6	120.31	-11.5	-0.2	11.8
GRC	999.9	158.98	15.9	1216.4	211.65	17.4	33.13	-1.5	0.1	1.5
HUN	275.5	54.55	19.8	361.8	99.50	27.5	82.40	-17.7	10	7.7
IRL	333	136.86	41.1	672.9	263.78	39.2	92.73	-10	11.9	-1.9
ISR	1771	708.4	40	1718.8	780.34	45.4	10.15	-7.1	1.7	5.4

[11] Percentage growth of foreign-born individuals with tertiary education between 2001/01 and 2010/11.

[12] Growth in percentage points of highly skilled individual shares between 2000/01 and 2010/11

[13] Total stock of immigrants in the host country. This includes low skilled (ISCED 0, 1, 2), medium skilled (ISCED 3, 4) and highly skilled (ISCED 5A, 5B, 6).

ITA	**2020.9**	**246.55**	**12.2**	**4712.4**	**523.08**	**11.1**	**112.16**	**-6.7**	**7.8**	**-1.1**
JPN	1142.4	342.72	30	1181.1	413.39	35	20.62	-14.5	9.4	5
LUX	129.8	28.16	21.7	187.8	57.47	30.6	104.02	3	-11.9	8.9
MEX	241.5	84.04	34.8	422.6	114.10	27	35.77	2.9	4.8	-7.8
NLD	1424.7	273.54	19.2	1524.4	396.34	26	44.89	-9.1	2.1	6.8
NOR	305.9	93.23	30.5	510.7	177.72	34.8	90.49	16.7	-21	4.3
NZL	624.1	193.47	31	1125.7	423.26	37.6	118.77	11.5	-18.2	6.6
POL	737.7	87.78	11.9	570.4	102.10	17.9	16.31	-10.1	4.1	6
PRT	585.9	113.07	19.3	806.5	181.46	22.5	60.47	-7	3.8	3.2
SVK	113.2	17.66	15.6	135.6	24.95	18.4	41.29	21.2	-23.9	2.8
SVN	164.5	18.42	11.2	219.1	23.22	10.6	26.06	2.4	-1.9	-0.6
SWE	933.8	226.91	24.3	1208.6	350.49	29	54.46	-2.5	-2.2	4.7
TUR	1130.6	171.85	15.2	702.1	136.21	19.4	-20.74	30.3	-0.2	4.2
USA	31389.5	8192.66	26.1	40861.9	12381.16	30.3	51.12	-7.1	2.8	4.2
OECD	**76897.6**	**18993.71**	**24.7**	**105546.2**	**31980.50**	**30.3**	**68.37**	**-7.7**	**2.1**	**5.6**

Source: DIOC 2000/01 and DIOC 2010/11. Own calculation of shares.

While most OECD nations saw a rise in the share of immigrants with a tertiary education, Mexico (-7.8%), Ireland (-1.9%), Italy (-1.1%) and Slovenia (-0.6%) had a decline. This can be easily seen from **Figure 1**, where countries with a positive growth are located above the diagonal and those with a negative one are below, while the vertical distance from the line represents the growth rate itself.

Figure 1. Share of tertiary educated among foreign-born individuals in 2000/01 and in 2010/11
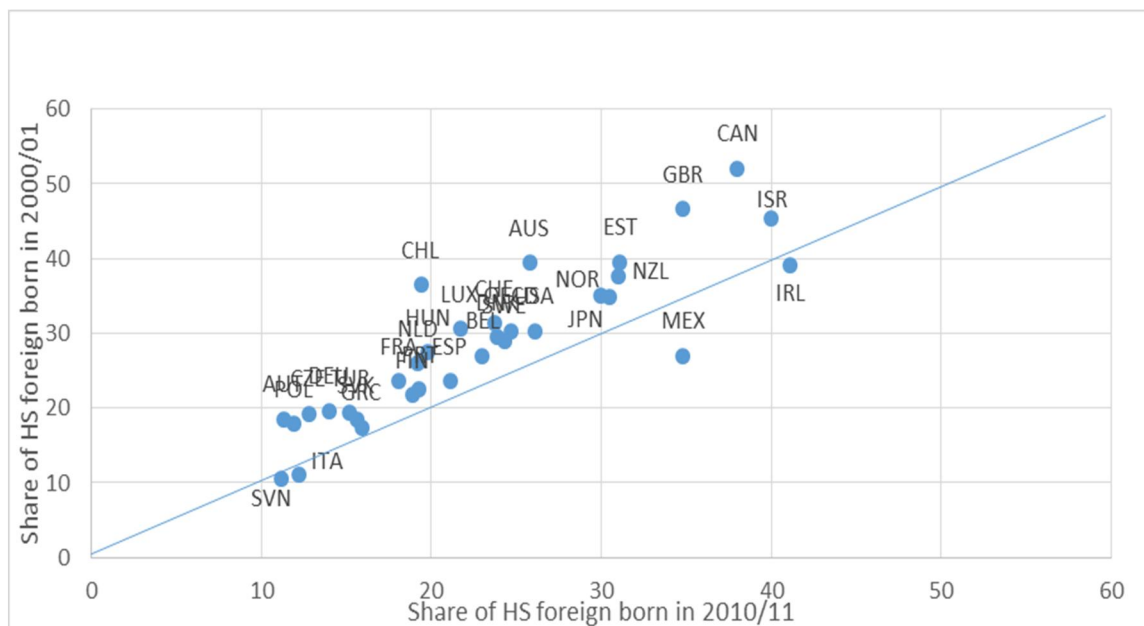
Sources: DIOC 2000/01, DIOC 2010/11

Summarising, from **Table 2** we can derive three categories of countries as a matter of interest: (i) those at the top of the increment in both the level of high-skilled migrants and their share in the skill-composition, (ii) those at the bottom of the change in both the level of high-skilled migrants and their share, (iii) those who had a high growth rate, but performed poorly in the other, in either one between the level or the share of high-skilled migrants. Australia, Chile, the United Kingdom and Luxembourg belong to the first category. It is not surprising to see that these nations also experienced a decrease in their low and middle-skilled shares. In the second category we find Greece, Mexico and Slovenia. Not only did they not have a considerable improvement in their top educated foreign-born workers, but they also had elevated shares and levels of their lower-middle

skilled immigrants. The third category sees the presence of Italy, Ireland, Spain and Estonia. Those countries, apart from Estonia, experienced a very high increase in their stock of tertiary-educated immigrants, yet an as large or even a larger inflow of low and middle skilled individuals pushed their HS share growth very low or negative. In this sense, these countries managed to attract foreign talents up to doubling or also tripling their precedent skilled stock of 2000/01 but so did the unskilled one: Italy and Ireland had respectively +112% and +92% in HS but also a +136% and +108% in lower and middle educated. Spain did not have the same overcome of lower qualified workers, but its growth of +158% was almost as high as a +197%% in HS to push its share growth at only +2.5%.

Section 2: Highly skilled emigration towards OECD countries

2.2.1: Global stocks of highly skilled emigration towards OECD countries

In order to analyse the phenomenon of brain drain, it is fundamental to understand which the main regions of origin of talents all over the world are. With the same reference to the *Database for Immigrants in OECD countries,* **Table 3** shows the stock of foreign-born individuals by region in 2001/01 and 2010/11. In 2010/11, Europe was the main source of emigrants who moved to OECD countries.

Table 3. Stock of emigrants (15+) by towards OECD countries in 2000/01 and 2010/11 by level of education

Region of origin	2000/01				2010/11			
	Stock	LS	MS	HS	Stock	LS	MS	HS
Africa	7160.6	3200.6	2090.1	1705.4	10688.6	4320.1	3216.3	3060.6
Asia	16631.3	4803.8	5173.8	6110	24933.7	5769.4	7668.5	10914.9
Europe	30584.3	12080.8	10628.9	6767.1	38548	12303.7	14565.3	10887.4
Northern America	1962.3	365.5	699.8	841.6	2352.2	374	782.9	1159.9
Oceania	1111	295.4	429.4	305.5	1388.5	292.5	552.4	465.3
Latin America	19178.8	10232.5	6156.6	2680.3	27364.9	11951.2	10379.7	4929.1
TOTAL	76897.6	31060.9	25245.7	18449	105546.2	35044	37190.5	31442.6

Source: DIOC 2000/01 and DIOC 2010/11

At the same time, it also carried the largest absolute number of low-skilled and middle-skilled persons, both 35.11% and 39.16% of the global stock. While Europe used also to provide the greatest migrants' stock in 2001/01, it lost its top position in 2010/11 in favour of Asia. The latter saw its highly skilled expatriates increasing by 4.805 million, whereas Europe had its level increased by 4.120. Nevertheless, in relative terms, Latin America experienced the highest growth rate of its share of global immigrants (+3.52 percentage points) between 2001/01 and 2010/11, while Europe saw it decreasing by 2 percentage points.[14]

Figure 2 shows the share of high-skilled emigrants from the top three non-OECD countries for each region, respect to the global number of high-skilled emigrants from non-OECD countries in 2010/1. By the purpose of the analysis, Oceania and North America have not been considered because of the low or null presence of non-OECD member states.

Figure 2. Share of HS emigrants by the top three non-OECD contributors per region
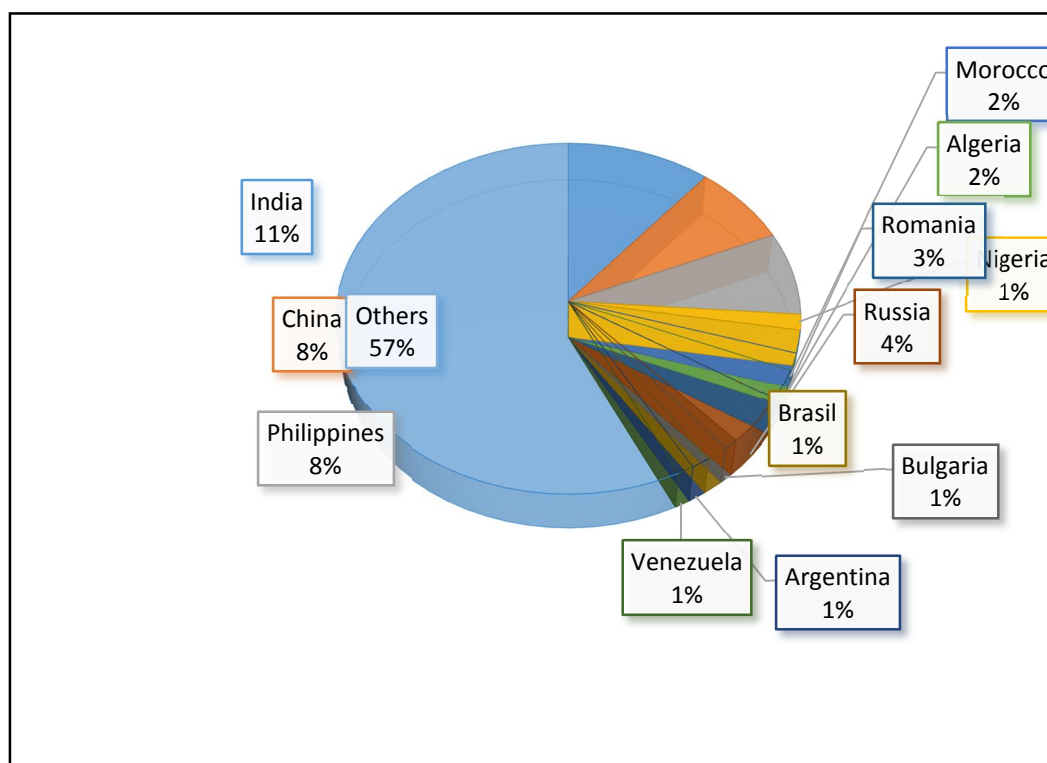
Source: DIOC 2010/11

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[14] See **Table 2A** in the appendix.

It is astonishing that only twelve countries are contributing for around 43% of the world top educated migration. Among these, it is clear that Asia is the main source of talents with the only India (2.2 million), China (1.5 million) and Philippines (1.5 million) accounting for one fifth of tertiary educated emigrants towards the OECD area. (Arslan et al., 2014). As far as a time comparison is concerned, in a lapse of time of ten years these three nations have doubled their level of emigration, with the only India increasing by more than one million. Since the purpose of Figure 2 is to present the percentage of emigrants for non-member states with the larger skilled emigration, some countries are not taken into account. Among the 57% considered as "others", there are nations such as Indonesia or Vietnam, which have an absolute level of emigration greater than other European or Latin American non-OECD countries.

2.2.2: Emigrations rates from non-OECD countries

Although it is important to understand which countries are the main contributors to the increase of the global level of high-skilled migratory movements, it is also essential to focus the analysis on relative terms. In order to do so, the most relevant tool to use is the emigration rate. Emigration rates are calculate so that:

$$E_{HS} = \frac{M_{HS}}{N_{HS}}$$

Where E_{HS} is the emigration rate, M_{HS} is total number of highly skilled who decided to emigrate and N_{HS} the level of high-skilled natives who remained in the home country. This rate is extremely important because it allows a quantification of bran drain: the closer it is to one, the lower the residual educated population, with all the consequences on the economy as stated in chapter one.

Table 4 reports the top ten countries in both total and tertiary-level emigration rate. For the calculation of the highly skilled one, the *Barro-Lee dataset* (2013) has been used in order to obtain the amount of top educated natives, whereas the *Database on Immigrants in OECD Countries* was the source of emigrant shares.

Table 4. Top ten emigration rates of highly skilled in non-OECD countries

Country	2010/11		2001/01	
	Total emigration rate	HS emigration rate	Total emigration rate	HS emigration rate
Guyana	39.9	93	37	99.3
Haiti	10.7	75.1	8.9	70.7
Trinidad and Tobago	23.2	68.2	22.2	72.4
Barbados	27.5	66.2	29.5	91
Jamaica	32.7	48.1	31.3	47.1
Tonga	42.3	48.1	39.5	42.6
Mauritius	12.3	43.8	9.4	53.1
Zimbabwe	2.2	43.6	1.1	30.1
Malta	23.1	36.5	23.9	31
Fiji	22.2	34.4	18.1	31.4

Sources: DIOC 2000/01, DIOC 2010/11, Barro-Lee dataset (2013); own calculations

The largest majority of these countries have a small area extension, eight out of ten have a population below two million and eight tenth are islands. Additionally, most of them share a high proximity to much larger economies such as the USA and Australia. The only exception here in most cases is Zimbabwe, with a population above ten million and a larger surface compared to the other states present in Table 4. Unsurprisingly, the latter is the only one with a very low total emigration rate. This results from multiple causes such as a high distance from most developed states, a very low share of skilled population and a consequent elevated share of tertiary educated individuals in the skill distribution of emigrants (almost 60%).

By the nature of these small states, it is straightforward to comprehend these elevated emigration rates: the vicinity of a big economy and/or poverty work as a push-pull factor. Therefore, the result of taking only into account countries with a population larger than two million is that African countries have the largest brain drain rates, with an average of 9.6%.

Section 3: International competition for attracting talents

Until now, the Brain Drain phenomenon has been presented with the only reference to non-OECD countries, used a broad proxy for LDCs. Additionally, section 1 has shown a comparison among OECD states to see who gains the most, by high-skilled immigration in absolute and relative terms, and who is lagging behind. However, in order to evaluate their performances in terms of net gain or net loss of talents, it useful to look at both emigration and immigration of OECD countries. The reference of this section is based on the "*Battle for Brains*" concept by Boeri et al. (2012). They use data from 2001 to see countries' accomplishments in attracting talents and preventing brain drain. In doing so, they analyse intra-OECD high-skilled migration, i.e. the number of migrants a country receive from other OECD members as well as the number of emigrants from it. Their conclusion was that most OECD nations experienced a negative balance between the inflows of skilled population and the outflows.

A similar investigation to Boeri et al. has been made using data from DIOC 2010/11 compared to that of 2000/01. **Table 5** shows the estimates of these migratory stocks.

Table 5. Immigrants and emigrants stocks (15+) in OECD countries in 2000/01 and 2010/11 (thousands)

Code	2010/11			2000/01			Change[17]
	Immigrants[15]	Emigrants[16]	Difference	Immigrants	Emigrants	Difference	
AUS	1959.40	178.2	1839.55	995.93	125.1	870.83	111%
AUT	213.08	142.6	29.39	104.37	106.9	-2.53	1262%
BEL	358.45	168.9	203.40	234.43	110.5	123.93	64%
CAN	3504.40	561.6	2956.72	2034.97	423.03	1611.94	83%
CHE	554.89	156.7	411.20	344.64	104.3	240.34	71%
CHL	76.07	109.2	-32.04	31.54	62.9	-31.36	-2%
CZE	130.14	117.9	36.38	55.93	61.7	-5.77	730%
DEU	2031.15	1224.3	823.41	933.54	865.42	68.12	1109%
DNK	141.04	80.1	70.20	76.31	53.8	22.51	212%
ESP	1203.81	228.7	988.30	404.04	136.5	267.54	269%

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[15] Stock of immigrants (15+) with a tertiary education to OECD countries (thousand)

[16] Stock of emigrants (15+) with a tertiary education from OECD countries towards other OECD states (thousands)

[17] Change in the differences between 2000/01 and 2010/11. (percentage)

EST	76.83	26.7	55.54	75.57	11.6	63.97	-13%
FIN	48.07	82.1	-23.80	21.24	61.2	-39.96	40%
FRA	1606.38	619.1	1025.23	1013.63	377.43	636.2	61%
GBR	3452.73	1473.7	1967.61	1567.21	1082.3	484.91	306%
GRC	211.65	144.3	82.89	158.98	104.5	54.48	52%
HUN	99.50	159.5	-42.73	54.55	176.98	-122.43	65%
IRL	263.78	273.8	-1.96	136.86	96.7	40.16	-105%
ISR	780.34	115.5	674.44	708.4	69.7	638.7	6%
ITA	**523.08**	**432.9**	**113.05**	**246.55**	**273.5**	**-26.95**	**519%**
JPN	413.39	364.1	65.44	342.72	277.15	65.57	0%
LUX	57.47	17.3	45.90	28.16	7.4	20.76	121%
MEX	114.10	885.2	-769.52	84.04	474.97	-390.93	-97%
NLD	396.34	282.1	141.91	273.54	187.4	86.14	65%
NOR	177.72	55.1	128.03	93.23	39.4	53.83	138%
NZL	423.26	174.8	249.73	193.47	109.5	83.97	197%
POL	102.10	1007.6	-878.53	87.78	467.24	-379.46	-132%
PRT	181.46	162	30.24	113.07	78	35.07	-14%
SVK	24.95	122.7	-82.29	17.66	46.6	-28.94	-184%
SVN	23.22	19.7	9.75	18.42	9.1	9.32	5%
SWE	350.49	119.5	242.53	226.91	74.8	152.11	59%
TUR	136.21	267.7	-110.66	171.85	143.6	28.25	-492%
USA	12381.16	598.2	11799.84	8192.66	418.22	7774.44	52%
OECD	**31980.5**	**10371.8**	**22049.15**	**19042.2**	**6637.44**	**12404.76**	**78%**

Sources: DIOC 2000/01, DIOC 2010/11

Differently from the authors, I did not only take into consideration intra-OECD migration but also foreign-born population from extra-OECD countries.[18] This leads to very different results in particular for territories subjected to elevated levels of high skilled immigration from developing countries in 2001.

Concerning the most recent stocks, it can be observed that the majority of states are net receivers of top educated individuals. The only exceptions are: Poland (-878.53), Mexico (-769), Turkey (-110), Slovak Republic (-82.29), Chile (-32.04) and Estonia (-23.8). On the other extreme, the highest positive balance belong to nations such as: the USA (+11799.4), Canada (+2956.72), the United Kingdom (+1967.61), France (+1025.23), Spain (+988.30) Germany (+823.41). As stated before, it is not surprising to

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[18] As far as the emigration estimations are concerned, I did not consider inter-OECD migration due to the lack of data. Nonetheless, including non-OECD countries into the analysis should not deeply change these results since the destinations countries are mostly OECD member states.

see that countries with a skill-selective policies are the main three pole of attractions that can also overcome possible outflow of qualified workers. Moreover, they also have relatively lower mobility of best educated compared to other OECD countries. Nonetheless, what is also particularly important is that European large countries such as the UK, Germany and France are managing to considerably rise their level of high-skilled foreign-born individuals despite being respectively the first, the second and the fifth among those with the highest amount of talents outflows. An exception is Spain, which has a lower skilled emigration. It is worth mentioning that Switzerland, despite its smaller size, is also one of the best performers among net receivers.

Observing the stocks over a period of time of ten years, we can see how countries have achieved a better or a worse position in their "brains balance". The most appropriate way is to look at the percentage change between 2000/01 and 2010/11 in the difference between immigrants and emigrants. An extremely high growth was a particularity of German-speaking countries: Austria (+1262%) and Germany (+1109%). Those are followed by Czech Republic (+730%) and Italy (+519%). The latter, as well as Austria, thanks to their *exploit* are the only three countries to pass from a negative balance to become net receivers of highly skilled labour. On the other hand, among OECD-32, those with the largest amount of brain drain in 2001/01 have even worsen their situation: Poland increased its negative net balance by 132% and Mexico by 97%. The only country that experienced such a high decrease to pass from being a net receiver to a net sender is Turkey with change of -492%.

Conclusions

A global analysis of highly skilled migratory movements allowed us to make a comparison among countries. Indeed, this descriptive chapter has shown how some states are subject to very high levels of human capital flight, even within OECD area, and how others benefit from immigrations of talents. In addition, some OECD countries seem to offset very large outflows of their best educated individuals with even greater foreigner inflows. Since the aim of this thesis is to move from a global perspective of the phenomenon to the local case of Italy, next chapter will investigate the case of the latter, within the international framework.

CHAPTER III: THE ROLE OF ITALY UNDER THE BRAIN DRAIN/BRAIN GAIN DUALISM

So far, the analysis has been focused on the theoretical foundations of brain drain and on an empirical description of the issue as well as of the brain gain phenomenon. This chapter will stress out the Italian situation within the dualistic vision *brain drain/brain gain* to see the role of the nation compared to other countries.

Section 1 will be an attempt to give Italy a collocation within countries that typically experience brain drain and "brain gainers", based on the information provided in chapter 2. Eventually it will be seen that it cannot be considered as a full brain drain country but it is also lagging behind in the competition of attracting talents. Section 2 will analyse the *push-pull factors* as the main determinants of this Italian situation. Section 3 is an investigation of the consequences of being still subject to human capital flight (and how this works through the channels explained in chapter 1) and not being one of the pole of attraction.

Section 1: Is Italy subject to brain drain or brain gain?

Before answering to the question it has to be noticed that this section, as well as the entire chapter, does not focus on a single issue between brain drain and brain gain. Yet it tries to hold a dualistic viewpoint, to understand the Italian performance in attracting and sending top educated individuals.

3.1.1: Battle for brains

In 2001/11, Italy was 10th in the ranking of OECD countries with the highest number foreign-born persons with a tertiary education. However, in absolute terms, this is well below the level of those with a selective immigration policy (USA, Canada, UK and Australia). If this comes with no surprise, it is interesting to see that also other European states with similar characteristics to Italy experienced larger educated migratory inflows. This is the case for Germany, France and Spain, territories usually

subject to elevated immigration. Despite having a null or not totally effective skills-oriented immigration policy, these countries reached a number of HS foreigners at least twice as much as Italy suggesting that the latter does not follow a similar pattern in attracting talents. This picture becomes even clearer taking the population factor into consideration. In estimating the share of foreign-born individuals with high education relative to the total host country population, Italy has 0.86%, slightly below the 10th percentile. All other countries with a similar size of population (France, UK, Germany and Spain) are all above the average, with a share of at least 2.48% (Germany). The only OECD state with a comparable size and a lower skilled foreigner share than Italy is Poland (0.27%).

The fact that Italy is the only destination that figures in the top countries for immigration but not for the highly skilled, brings about another important aspect to take into account in assessing the states' performances: the skill compositions of foreign-born individuals. With a share of those with ISCED 5+ of just 11%, it is the penultimate among OECD-32, followed only by Slovenia. Making a comparison over a period of ten years, from 2000/01 to 2010/11 it was even one of the fewest that saw this share decreasing, from 12.2% to 11.1%. This occurred despite its growth of general migration, making the country one of the least skills-oriented member state.

Although the data from 2010/11 show that Italy is lagging behind other European nations, if we observe the trends over time, there are some signals that suggest its catching-up process. The most striking one is a large positive change in its "brain balance". In fact, between 2000/01 and 2010/11, it experienced a reduction of HS emigrants by 75% and a rise of the immigrants with the same level of education by 112%. This made Italy be among the top four countries with the largest increase in balance (+519%) and one of the few that passed from being a net sender to a net receiver. Nevertheless, as stated before, despite improving its performance in absolute levels, the skills composition lowered even further. This creates some doubts about the sustainability of future brain balance growth.

3.1.2: The emigration of Italian talents

The other important aspect to consider is the brain drain itself, if this occurs in the Italian peninsula and how its magnitude is related to other states. Again, the quantitative

variable to measure brain drain is the high-skilled emigration rate (the amount of skilled natives living abroad divided by the number of HS remaining at their home country). As shown in chapter 2, countries with the highest HS emigration rate (above 30%) are usually small islands with a population size generally lower than two million. Taking into account larger territories, the African continent is the top list for the emigration rates of well educated, with an average of 9.6%. In 2010/11, the Italian emigration rate of persons with ISCED 5+ was 8.4%. Certainly this datum is well below the rates of the top 10 relative senders but also below the African average. Indeed it can be safely claimed that the European state should not be placed among developing countries, subject to high outmigration rates. Nonetheless, in light of different considerations, the picture might change.

Figure 3 shows OECD-32 emigration rates in an ascending order. It can be observed that Italy is slightly below the average. Yet, for a true assessment of this result, the population factor should be taken again into account.

Figure 3. Emigration rates in OECD countries in 2010/11 (percentage)
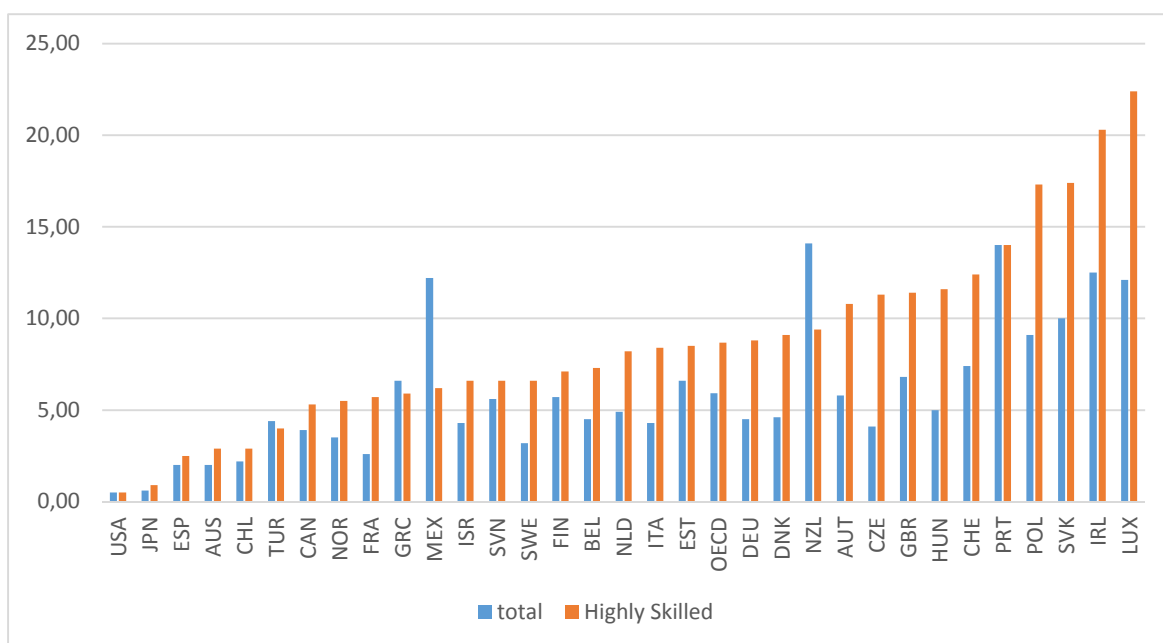
Sources: DIOC 2010/11, Barro-Lee dataset (2013).

As already stated, smaller countries tend to have, on average, a greater relative skilled mobility. This can be seen from the graph above, where the majority of states with

a number of inhabitants lower than ten million is above the average. Excluding the nations below this benchmark would shift Italy above the OECD average. In this case, the only members with a higher rate would be Germany (8.8%), the UK (11.4%), Portugal (14%) and Poland (17.9%). Again, it would be also useful to compare Italy with those with a similar population size. The result is that only Germany, the UK and Poland have higher HS emigration rates.

Summarising, it is difficult to assess whether Italy is a brain drain or a brain gain country. From the information provided above, we can state that Italy is far from being a developing country with very high emigration rates. The latter, on the other hand, seem relatively high in comparison with countries with similar characteristics, with the only exception of Germany, the UK and Poland. The first two, however, have managed to supply this shortcomings by attracting large amounts of highly educated foreigners.

In conclusion it can be stated that brain drain is a phenomenon relatively present and relevant in Italy, despite not as large as in other territories. Moreover, it is also one of the few big European economies that is losing the "battle for brains". This particular situation makes Italy a special case that deserves to be analysed.

Section 2: The causes of the Italian situation

In chapter 1 we have seen that the migratory drivers work on the basis of a *push-pull mechanism*: top educated workers are motivated by sounder economic and environmental characteristics of the destination country (*pull-factor*) and by a poorer situation in their home country (*push-factor*). In this section, the same mechanism is applied embracing a dualistic vision, due to the particularity of Italy. The *push-factor* will be referred to those characteristics that do not allow Italy to compete at attracting talents *and* that incentivise the emigration of the highly skilled, while the *pull-factor* works in the same direction as described before. These factors can be reduced at two types: economic and institutional.

3.2.1: Economic factors: skill premium and unemployment

One of the most important economic variable for comparing the desirability of qualified individuals among countries is the *skill premium*. It is defined as the ratio of the

Figure 4. Relative earnings from employment among 25-64 year-olds, by level of educational attainment (2009 or latest available year)
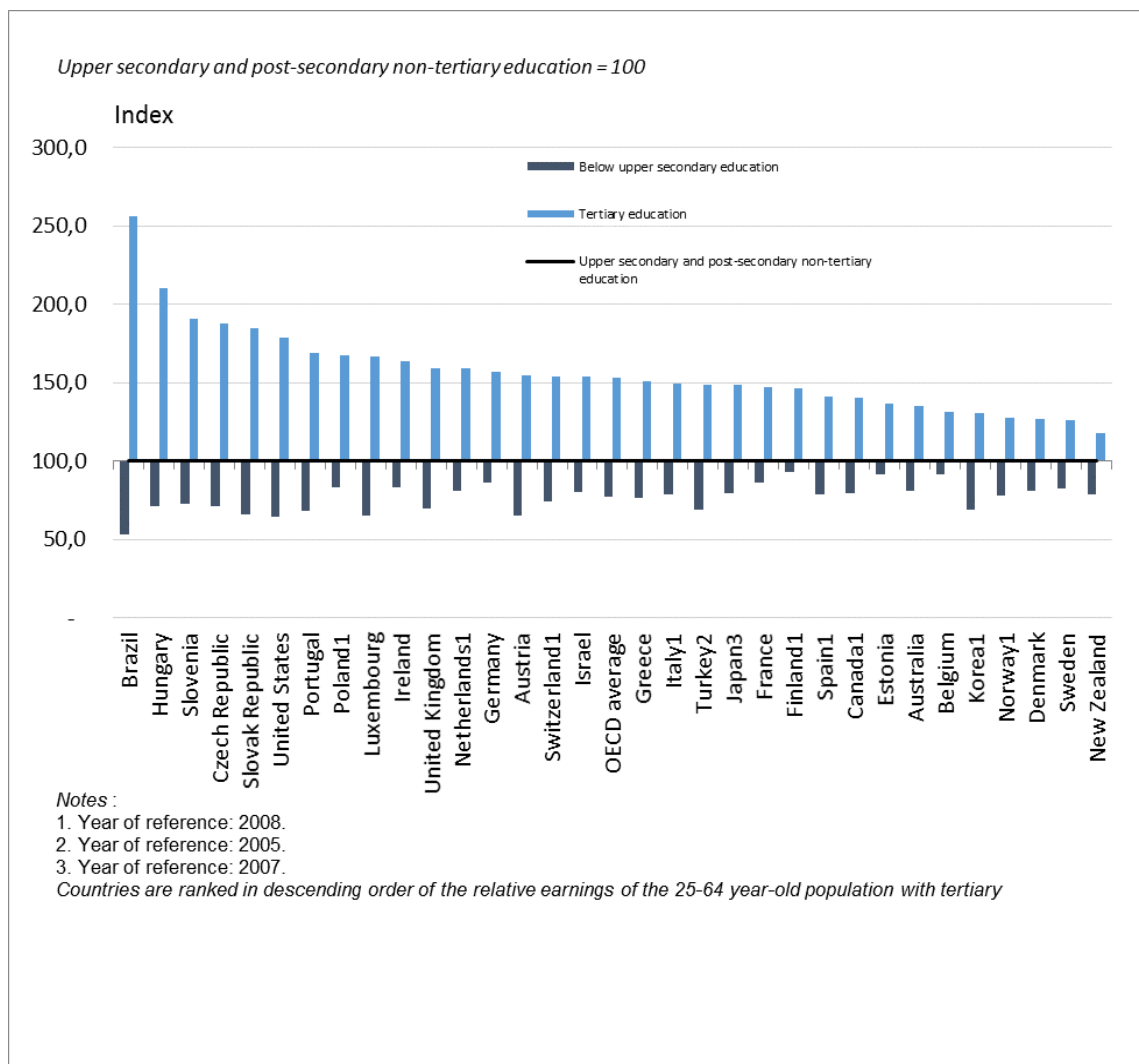
Source: OECD, 2012

average wage of the highly skilled over the average wage of the low skilled. Its relevance lies on the fact that likely emigrants take into account, among other things, the valorisation of graduates' potentiality abroad. **Figure 4** shows the *skill premia* in 2010 for OECD countries. In 2010, in Italy, the highly skilled workers earned on average 50% more than those without a tertiary education. The Italian position is below the USA, the UK, Germany and Switzerland than together count as more than 50% of the total Italian emigration stock of skilled individuals. On the other hand, other three main destination countries that count as 30%, (Canada, France and Spain) have lower wage premia. This involves that some other factors might work as incentives for Italian graduates. Indeed, this is the case of unemployment, as explained in chapter 1. More specifically, **Table 6** reports the unemployment rates that individuals with a tertiary education with an Italian

nationality faced both in in Italy and abroad. The countries listed are the top ten destinations for HS Italian expatriates. Unfortunately, the only available data are from 2000/01, therefore it has to be kept in mind that some changes might have occurred, especially in light of the Great Recession. Despite all, what is noticeable in Table 5 is that Italy has one of the highest HS unemployment rate. It clearly shows that, all other things being equal, an Italian in 2000 was more likely to find a job in these nations than in its home country. In facing a decision to migrate or to stay, the higher employments abroad could easily push workers to opt for the first choice.

Tab1e 6. Unemployment rates of Italians (25-65) with a tertiary education [20]

| Host country	Unemployment rate
Australia	2.68%
Austria	2.16%
Belgium	6.14%
Canada	2.58%
France	2.88%
Germany	*4.00%*[19]
Spain	7.45%
Switzerland	2.88%
United Kingdom	3.85%
USA	1.79%
Italy	**5.90%**

Sources: DIOC 2001/11; OECD 2015. Own calculations

The relativity and duality of the Italian situation can be observed thanks to the Italian unemployment rate itself. Being 5.9% one of the most elevated, it falls under the category of *push-factors*. On the other hand, the same value can become a *pull-factor* for highly skilled individuals living in a country with greater difficulties at finding a job. **Figure 5** pictures exactly the aforementioned situation, showing the unemployment rates for graduates in Italy compared to the same rate in their country of origin. Notice that in order to be more accurate, emigrants HS unemployment rates have been used rather than the Italian one. In addition, the countries selected are the top ten states with the highest

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[19] Due to the lack of data for Germany, the rate has been substituted with the total unemployment rate of highly skilled workers (natives and foreign-born). The missing datum is not expected to have a value too distant from 4%. Source: OECD 2015

[20] Total unemployment of Italians (25-64) with a tertiary education over the total labour force with the same nationality residing in a given country.

Figure 5. Unemployment rates of foreign-born individuals (25-64) with a tertiary education in Italy and in their country of origin
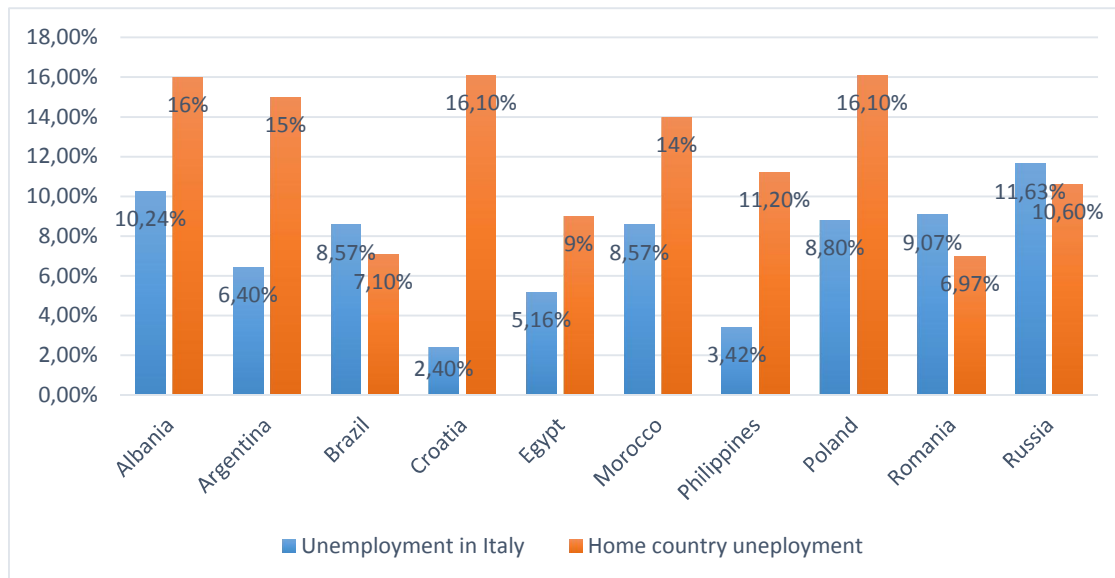
Sources: DIOC 2000/01; World Development Indicators 2015. Own calculations of foreign-born unemployment rates.

presence of their natives in Italy with a GDP per capita below 8000$. This directly excludes workers from the UK, the USA, France and Germany from the top ten list of total stocks. The rationale behind it is that LDC migrants are more likely affected by economic differentials in their decision to move abroad. On average, the unemployment rate in their source country is larger than the one they would face in the Mediterranean state. Indeed, this is particularly evident for Argentineans, Croatians, Filipinos, Moroccans and Polishes. These large gaps can partly explain the migratory movements for seven tenth of this list, with the only exception of Brazil, Romania and Russia.[21]

If wage differences and unemployment are two of the main economic determinants in explaining migration flows, on the other hand it is important to stress out the role of the national labour market and how it is structured.

3.2.2: Economic factors: the Italian labour market structure

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[21] Figure 5 leads also to another interesting topic that is not developed in this thesis. Indeed, in 2001 most of the immigrants in Italy with a tertiary education had a higher unemployment rate respect to Italians in Italy with the same education level (5.9%). This, at least for the most advanced sectors, clearly goes against the populist concept of "*immigrants are stealing our jobs*".

As mentioned earlier, Italy is one the OECD countries with the lowest share of graduates among its immigrants. The reasons have to be found in its market structure that privileges lower-skilled workers. More specifically, Faini and Sapir (2005) individualise the Italian structural problem in an *obsolete specialisation model*. They claim that Italy has always had a higher comparative advantage respect to other industrialised countries in sectors that require a low human capital intensity. While this was considered as one of the main driver of the high Italian growth until the 1980s, afterwards it has become a factor of decline with the rising of Asian markets. Indeed, they show that, among the most developed countries, Italy was the only state that did not follow a pattern of convergence towards a general increase in human capital intensity in strategic sectors. Their explanation of this phenomenon lies on the Italian labour market structure and that can be summarised in this way: (i) Italy has always historically been one of the economy with the lowest accumulation of human capital and this created a relatively smaller supply of highly skilled individuals. (ii) The low supply of qualified workers has led the economy to respond with a specialisation in manufacturing sectors, which typically do not require human capital intensity. (iii) A low demand of HS workers pushes the education system to further decrease its supply of talents. Therefore, according to the authors, the Italian structural problem resides in this vicious circle, which can be defined as "Faini's Trap".

In a similar reasoning, we can extend Faini's Trap including the migratory movements. **Figure 6** shows a simplification of how the Italian specialisation model influences directly the Italian competitiveness in attracting qualified individuals and it disincentives graduates to remain in Italy.

Figure 6. "Faini's Trap" revised
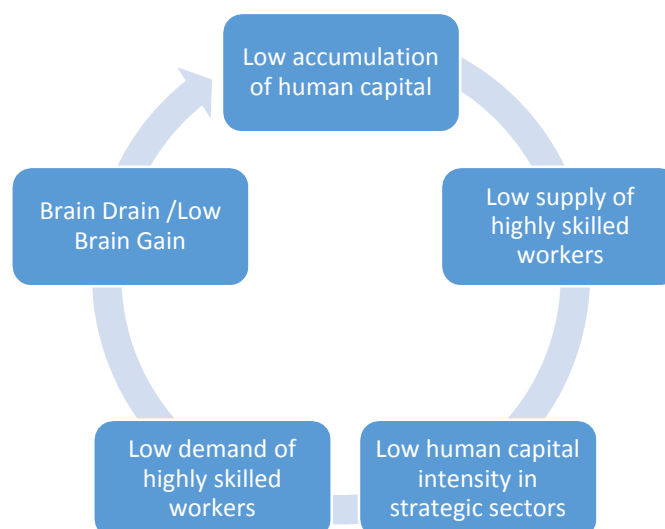
Another important feature that is not openly captured in Figure 6 is that the low propensity to invest in R&D sector by Italian firms is a reflection of the sectorial structure of the Italian economy that tends to be mainly organised in SMEs, which are well recognised to have a low human capital intensity (Faini & Sapir, 2005). As it will be explained later, this can have other indirect consequences on Italy through *the productivity channel*.

3.2.3: Institutional factors

Among the migratory determinants, the institutional framework of a country plays a fundamental role in pushing/pulling potential emigrants. In order to empirically show the case of Italy, the main source used was the *World Governance Indicators (WGI)* which is divided into five voices. These are: Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law and Control of Corruption. Each indicator is a measure of a specific institutional quality of a country. Together, they quantify the *governance* of a nation, which Kaufmann et al. (2010) define as:

> the traditions and institutions by which authority in a country is exercised. This includes (a) the process by which governments are selected, monitored and replaced; (b) the capacity of the government to effectively formulate and implement sound policies; and (c) the respect of citizens and the state for the institutions that govern economic and social interactions among them. (Kaufmann et al., 2010).

As far as the Italian economy is concerned, the (un)soundness of its governance can be another explanation of its low performance in the *battle for brains* and its relativily high brain drain . Coherently with this assumption, **Figure 7** shows that this is exactly the case. The figure reports the total averages of indicator percentiles, which rank each country from 0 to 100. Italy is found to be almost exactly in a median position, with an average of 67.43. On its left there are 9/10 of the top ten source states of highly skilled immigrants with a GDP per capita lower than 8000. On the right, the top ten destinations of Italian graduates, plus Poland, the only exception so far. If we look more specifically at the *Rule*

Figure 7. Average of WGI percentiles in ascending order (from 0 to 100) in 2010
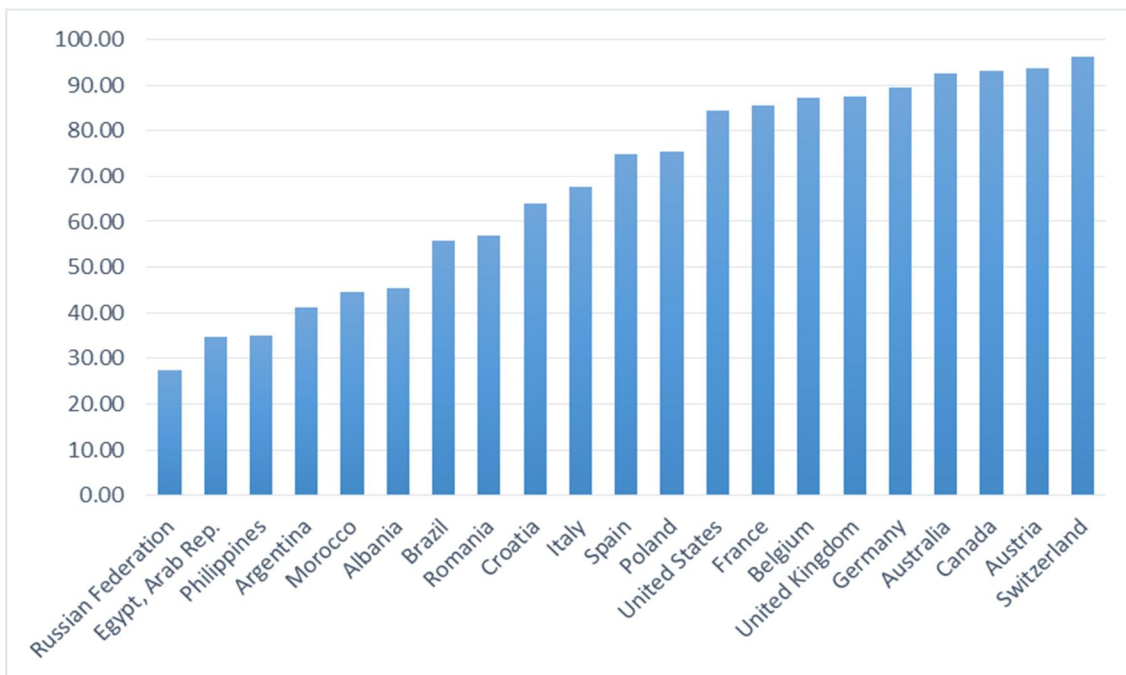
Source: WGI 2015

of Law indicator, the voice that majorly concerns immigration legislation, it results that the order does not change.[22]

Section 3: A theoretical assessment of brain drain/low brain gain impact on Italy through the use of channels

After showing that Italy is struggling between the lack of attractiveness and its emigration of the top educated and the main causes of this situation, in this section I will investigate, at least theoretically, on how the Italian economy is affected by brain drain/low brain gain. To do so, I will refer to the channels of transmission introduced in chapter1

The first voice presented is *the human capital channel* through which the economy is affected by a lessening of the positive externality. Doquier and Rapoport (2012) state that highly skilled emigration is particularly harmful with sectorial drain. To test the last point, I used the *Database on Immigrants in OECD Countries* (2000/01) that allows a sub-aggregation of data by detailed occupations. Similar data for national employment

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[22] For further details about single indicators, see Table 3A in the appendix.

have been retrieved from Eurostat (2009). The only limit with these two sources are that 2000/01 will be the most recent year of reference. In addition, in DIOC 2000/01 data for the United States, Germany and the Netherlands are missing. This is not a negligible issue since the USA counted as almost exactly 1/3 of Italian skilled expatriates in 2000. Therefore, in order to supply data from the USA, I integrated the information provided by the *National Science Foundations* through the platform *SESTAT (Scientists and Engineers Statistical Data System)*, that offers statistics of technical foreign labour force by country of origin. Data show that within the stock of Italians employed abroad with a tertiary level of education, those who work in a STEM sector (ISCO-88, categories 2 and 3) are around 20% of the total working population. On the other hand the national share of the same typology of workers is 10%. This implies that in proportion, the deprivation of talents regards in elevated amounts technicians, scientists, engineers and academics, who are believed to generate the highest *knowledge spillovers*.

The last point is directly connected to another channel: *the productivity channel*. In fact, the removal of STEM workers from the R&D sector not only diminishes the effects of the positive knowledge spillover, but it indirectly affects the long-run growth through a reduction of technology effectiveness. In 2009, the Italian R&D intensity, measured as the total expenditure on R&D as a share of GDP, was 1.27% while the EU average was 1.90%. Nonetheless highest gap can be found in the industrial R&D, measured with the business R&D intensity: Italy saw a 0.64% against a European average of 1.27%. The European Commission (2011) attributed these large difference to the disinterest in modernising the public research system and to the difficulty to realise growth and innovation within the industrial system, particularly with regard to the most high-tech sectors (European Commission, 2011). This is consistent with Faini and Sapir's conclusion about low human capital intensity in strategic sectors and how this is a cause/consequence of the Italian loss in competitiveness. Although from a theoretical point of view brain drain and a low brain gain can exacerbate the aforementioned situation, a further empirical analysis should be carried out, in order to quantify its contribution to R&D low levels.

Some LDCs with scarce R&D investment levels managed to ameliorate their loss of skilled emigrants with strong *diaspora networks*. Not only they affect the source economy through the *productive channel,* but they also work as an institutional bridge

between two countries (*institutional channel*). Some attempts to produce networks have been also tried in Italy. DAVINCI, an Internet database for Italian researchers abroad, created in 2006 by the Minister of Foreign Affairs, was conceived as a platform to exchange information and competences. However, its use was limited, since only 1357 among scientists and technicians have participated and no joint projects have been developed out of it. Some other similar, but smaller network attempts ("Urania" and another project in Friuli Venezia Giulia) have all ended up in a total fail because of the scarce participation and the low effort in coordinating policies of knowledge integration (Milio et al., 2012).

Another important vehicle is the *return channel*. There is no theoretical and empirical consensus among economists whether temporary migration positively or negatively affect the origin economy. On the one hand, returnees might bring better institutions and knowledge *know-hows*. On the other hand, those who return might be the least motivated graduates. Insofar in Italy a survey study conducted by CENSIS in 2002 showed that the main driver mobility for researchers is the possibility to work in advanced projects, more than wage attractiveness. By extension, since Italy offers scarce opportunities to be employed in top research, returnees are more likely motivated by familiar and personal reasons (CENSIS, 2002).

A more direct contribution from expatriates comes from remittances (*transfer channel*). Obviously this is a general feature, shared with lower and middle skilled migration. While it used to be a fundamental source of income during the *Giolittian* industrial take-off, nowadays it is more relevant in developing countries. In most advanced states its role in GDP growth is small or even negative, as in the case of Italy. In fact, a recent research from Eurostat shows that in 2013 Italy experienced the second largest outflow of personal money transfers in EU, with a deficit of -4.7 billion (Eurostat 2015).

Finally, the last channel to consider is the *screening-selection channel*. All screening selective models reviewed in chapter 1 show that a beneficial brain drain might arise thank to the presence of imperfect information. However this market failure is adjusted both through a selective policy for the country of destination and through a self-selective process by potential emigrants. It has already been proven that the skill composition of Italian out-migrants is more highly skilled oriented and additionally,

within those with a tertiary education, a very large portion works in HRST. Instead, to test the first point we can observe **Figure 7**. It shows the top ten countries which host the highest number of Italian emigrants with a tertiary level. The first three, that count as almost 50% of the total HS population are countries which adopt a highly selective policy. In particular, the United States alone share 23.76%. Its importance comes from the fact that specifically, the US adopt an "employer driven" skilled immigration policy. Not only is this system skilled oriented as for the UK, Canada and Australia, but it is directly the employer that screens foreign workers on the basis of his/her qualifications. From this we can deduct that, at least for half of the Italian population abroad, the screening-selection channel does not ameliorate the negative effects of brain drain.

Figure 7. Amount of Italian HS emigrants in the top ten destination countries in 2010
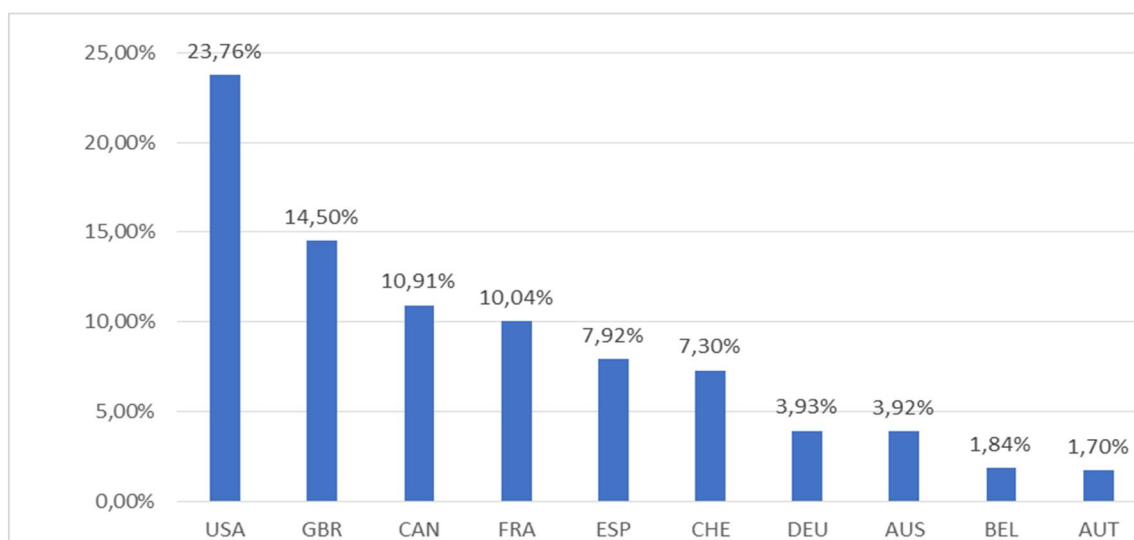
Source: DIOC 2010/11

CONCLUSIONS

In movie terms, the playing role of Italy within an international context would only be a "background actor", who succeeded at being casted, but with a minor role. On the one hand, the Mediterranean country does not manage to compete in the worldwide "battle" for attracting the brightest minds against "protagonists" such as the USA, the UK and Canada. On the other hand, it is not subject to dramatic human capital flight, typical of small developing countries. In addition, the balance between highly skilled immigrants and emigrants is positive. Nevertheless, brain drain seems to be quantitatively more relevant in respect to economies with analogous characteristics (Germany, France and Spain). In fact, the emigration rates in OECD comparable members are higher. Yet, the latter seem to offset very large outflows of their best educated individuals with even greater foreigner inflows. This not only brought about a positive brain drain balance, but it also pushed their composition of immigrants towards a more skilled distribution.

It has been shown that in qualitative terms, the high drain of scientists, engineers and technicians, workers who provide the highest support to growth, and the already scarce level of national human capital, can have a particularly detrimental impact. In fact, from a theoretical point of view, the channels of transmissions do not ameliorate the negative effects through a beneficial brain drain. It follows that the fluid concept of "brain exchange" seems difficult to be applied to the Italian case. Eventually, the dualistic *standard view* approach of *brain drain/brain* is more suitable for the European country.

Following the double nature of Italy, I have shown that the institutional framework and the economic factors such as the *wage premium* and *unemployment,* play an essential role in explaining its particular situation. Those values are worthy enough to attract foreigners from middle lower economies, but, at the same time, relatively small so that they push highly skilled Italian to emigrate and they prevent a leap of quality in the global competition for attracting talents.

An interesting finding was that the sectorial low human capital intensity does not only contribute to increase the impact of brain drain, but it is also its own cause. In fact, this self-fulfilling mechanism works both as a *push factor* for Italian ingenious minds and as an (anti) *pull-factor* that discourage the best educated individuals to migrate to Italy.

The main findings in this thesis suggest that the comprehension of the dualism *brain drain/brain gain* is fundamental for policymakers because of it deep connection with the education system. A correct understanding means an efficient and proper use of resources that could work as stimulus for the Italian economy which is struggling between its own structural problems and a faster competitive world.

BIBLIOGRAPHY

Acemoglu, D., Johnson, S., & Robinson, J. A. (2001). The colonial origin of comparative development: an empirical investigation. *American Economic Review*, 91, 1369-1401.

Aghion, P., & Howitt, P. (1992). A Model of Growth Through Creative Destruction. *Econometrica*, Vol. 60, No. 2, 323-351.

Agrawal, A., Kapur, D., McHale, J., & Oettl, A. (2011). Brain drain or brain bank? The impact of skilled emigration on poor-country innovation. *Journal of Urban Economics*, 69, 43-55.

Arslan, C., Dumont, J.-C., Kone, Z., Moullan, Y., & Xenogiani, T. (2014). A New Profile of Migrants in the Aftermath of the Recent Economic Crisis. *OECD Social, Employment and Migration Working Papers*, No. 160, OECD Publishing.

Barro, R. J., & Lee, J. W. (September 2013). A new data set of educational attainment in the world, 1950–2010. *Journal of Development Economics*, Volume 104, pages 184-198.

Barro, R. J., & Sala-I-Martin, X. (1995). *Economic Growth.* New York: McGraw-Hill.

Becker, G. (1964). *Human Capital: A theoretical and empirical analysis with special reference to Education.* Chicago: The University of Chicago Press.

Beine, M., Docquier, F., & Rapoport, H. (2001). Brain drain and economic growth: theory and evidence. *Journal of Development Economics*, Vol. 64, 275-289.

Beltrame, L. (2007). *Realtà e retorica del brain drain in Italia. Stime statistiche, definizioni pubbliche.* Trento: Università degli studi di Trento.

Bhagwati, J. N., & Hamada, K. (1974). The brain drain, international integration of markets for professionals and unemployment. *Journal of Development Economics*, 1, n. 1, 19-42.

Boeri, T., Brücker, H., Docquier, F., & Rapoport, H. (2012). *Brain Drain and Brain Gain: The Global Competition to attract High-Skilled Migrants.* Oxford University Press.

Borjas, G. J. (1989). Economic Theory and International Migration. *International Migration Review*, Vol. 23, No. 3, Special Silver Anniversary Issue: International Migration an Assessment for the 90's, pp. 457-485.

Borjas, G. J., & Bratsberg, B. (1996). Who leaves? The outmigration of the foreign-born. *Review of Economics and Statistics*, 165-176.

CENSIS. (2002). *Un capitale intellettuale da valorizzare: indagine conoscitiva sul fenomeno della fuga dei cervelli.* Roma: Fondazione Cassa di Risparmio Venezia.

Chacko, E. (2007). From brain drain to brain gain: reverse migration to Bangalore and Hyderabad, India's globalizing high tech cities. *GeoJournal*.

Cheng, L., & Yang, P. Q. (1998). Global Interaction, Global Inequality, and Migration of the Highly Trained to the United States. *International Migration Review*, Vol 3, No. 3, 626-653.

Commander, S., Kangasniemi, M., & Winters, A. L. (2004). The Brain Drain: Curse or Boon? A Survey of the Literature. In R. E. Winters, *Challenges to Globalization: Analyzing the Economics.* University of Chicago Press, Chapter 7.

Docquier, F., & Rapoport, H. (2012). Theory, Evidence, and Implications. In T. Boeri, H. Brücker, F. Docquier, & H. Rapoport, *Brain Drain and Brain Gain: The Global Competition to Attract High-Skilled Migrants.* Oxford University Press.

Duleep, H. (1994). Social security and the emigration of immigrants. *Social Security Bulletin*, 57, 37-52.

Encyclopedia Britannica. (2006).

Esposito, A., & Avila, M. (2013, January 25). *Europeans fill jobs void in Chile's thriving economy.* Retrieved from Reuters: http://www.reuters.com/article/2013/01/25/us-chile-immigration-idUSBRE90O17G20130125

European Commission. (2011). *Innovation Union Competitiveness report 2011.* Research and Innovation.

Eurostat. (2015, January 09). *Amounts sent abroad by EU residents dropped.* Retrieved from Eurostat news release: http://ec.europa.eu/eurostat/documents/2995521/6457244/2-09012015-AP-EN.pdf/18f662ac-8b70-4254-a45b-10b78613a5a4

Faini, R. (2003). The brain drain: an unmitigated blessing? UNU-WIDER Discussion Paper No 2003/64, September.

Faini, R. (2007). Remittances, and the brain drain: do more skilled migrants remit more? *The World Bank Economic Review*, 21, n. 2, 177-191.

Faini, R., & Sapir, A. (2005). Un modello obsoleto? Crescita e specializzazione dell'economia italiana. In Boeri et al., *Oltre il declino.* Bologna: il Mulino.

Ferro, A. (2006). Desired mobility or satisfied immobility? Migratory aspirations among knowledge workers. *Journal of Education and Work*, 19:2, 171-200.

Grossman, G., & Helpman, E. (1991). *Innovation and Growth in the Global Economy.* Cambridge: MIT Press.

Hamada, K., & Bhagwati, J. N. (1975). Domestic distortions, imperfect information and the brain drain. *Journal of Develepment Economics*, pp. 2, n. 3, 265-80.

Harris, J. R., & Todaro, M. (1970). Migration, unemployment and development: a two-sector analysis. American Economic Review 60.

Hazans, M., & Philips, K. (2008). The Post-Enlargement Migration Experience in the Baltic Labor Market. *IZA Discussion Paper 5878*, 24.

Hicks, J. R. (1932). *The Theory of Wages.* New York: MacMillan.

Holzer, H. J. (2011). Immigration Policy and Less Skilled Workers in the United States. *Migration Policy Institute.*

Hunger, U. (2002). *The "Brain Gain" Hypothesis: Third-World Elites in Industrialized Countries and Socioeconomic Development in their Home Country.* University of California, San Diego: The Center for Comparative Immigration Studies.

İçduygu, A., Göker, Z. G., Tokuzlu, L. B., & Elitok, S. P. (2013). *MCP Migration Profile: TURKEY.* MCP-Migration Policy Center.

JJ Lee, D. K. (2010). Brain gain or brain circulation? US doctoral recipients returning to South Korea. *Higher Education*.

Kaufmann, D., Kraay, A., & Mastruzzi, M. (September 2010). The Worldwide Governance Indicators: Methodology and Analytical Issues. *World Bank Policy Research Working Paper No. 5430 ,* 4.

Kerr, W. (2008). Ethnic scientific communities and international technology diffusion. *The Review of Economics and Statistics ,* 90 (3), 518–537.

Kugler, M., & Rapoport, H. (2007). International labour and capital flows: Substitutes or complements? *Economics Letters*, Vol. 92, No. 2, 155–162.

Lindstrom, D. P., & Massey, D. S. (1994). Selective Emigration, Cohort Quality, and Models of Immigrant Assimilation. *Social Science Research*, Vol. 23, pp. 315–349.

Lucas, R. E. (1988). On the Mechanics of Economic Development. *Journal of Monetary Economics*, 22, 3-42.

Mahroum, S. (1999b). *Highly Skilled Globetrotters: the International Migration of Human Capital.* Paris: OECD/DSTI.

Mankiw, N., Romer, D., & Weil, D. (1992). A contribution to the empirics of economic growth. *Q. J. Economics*, 107, 407-437.

Meyer, J.-B. (2001). Network Approach versus Brain Drain: Lessons from the Diaspora. *International Migration*, 39, 91-110.

Meyer, J.-B., & Brown, M. (1999). *Scientific Diasporas: A New Apporach to the Brain Drain.* Budapest: World Conference on Science, MOST Discussion Paper Series, UNESCO - ICSU.

Mincer, J. (1958). *Investment in Human Capital and Personal Income Distribution.* Journal of Political Economy.

Moguerou, P. (2006). *The brain drain of Ph.D.s from Europe to the United States: What we know and what we would like to know.* San Dominico de Fiesole: European University Institute.

Mountford, A. (1997). Can a brain drain be good for growth in the source economy? *Journal of Development Economics*, Vol. 53, 287-303.

National Science Fundations. (2003). Retrieved from SESTAT data tool: http://ncsesdata.nsf.gov/metadataexplorer/metadataexplorer.html?tab=survey&srvy=PSE10&sas=CTZUSIN

Nifo, A., & Vecchione, G. (2014). *Do Institutions Play a Role in Skilled Migration? The Case of Italy.* Regional Studies, Vol. 48, No. 10.

OECD. (1995). *Manual on the measurement of Human Resources Devoted to S&T-Canberra Manual.* Paris: OCDE/GD(95) 77.

OECD. (2001). *International Mobility of the Highly Skilled.* Paris: OECD.

OECD. (2002). *Proposed Standard Practice for Surveys on Research and Experimental Development - Frascati Manual.* Paris: OECD.

OECD. (2015). Retrieved from Unemployment rates by education level (indicator): DOI: 10.1787/6183d527-en

Peri, G., Shih, K., & Sparber, C. (forthcoming). STEM Workers, H1B Visas and Productivity in US Cities. *Journal of Labor Economics*.

Quinn, E., & Gusciute, E. (2013, September 06). Attracting Highly Qualified and Qualified Third-Country Nationals: Ireland. *Economic and Social Research Institute*.

Rapaport, H. (2002). *Who is afraid of the brain drain? Human capital flight and growth in developing countries*. Stanford: Stanford Institute for Economic Policy Reasearch.

Rauch, J. (2001). Business and social networks in international trade. *Journal of International Economics*, 48 (1), 7-35.

Reagan, P., & Olsen, R. (2000). You can go home again: evidence from longitudinal data. *Demography*, 37, 339-350.

Reversing the Brain Drain: The Case for Utilising South Africa's Unique Intellectual Diaspora. (1997). *Science, Technology & Society*, Vol. 2, 387-407.

Romer, P. M. (1986). Increasing Returns and Long-Run Growth. *Journal of Political Economy*, 94, n. 5, 1002-1036.

Romer, P. M. (1990). Endogenous technical change. *Journal of Political Economy*, 97, n. 5, pt. 2, S71-S102.

Saxenian, A. (2005). From brain drain to brain circulation: Transnational communities and regional upgrading in India and China. *Studies in comparative international development*.

Solimano, A. (2001). *International migration and the global economic order*. Washington: Policy Reasearch Working Paper n. 2720, The World Bank.

Stark, O., Helmenstein, C., & Prskawetz, A. (1997). A brain gain with a brain drain. *Economics Letters*, 55, 227-234.

Steiner, V., & Velling, J. (1994). Re-migration behaviour and expected duration of stay of guest workers in Germany. In G. Steinmann, & R. Ulrich, *The Economic Consequences of Immigration to Germany,*. Heidelberg: Physica-Verlag.

T., B., & Gang, I. (1998). Temporary migrants from Egypt: how long do stay abroad? *Institute for the Study of Labour*, Bonn University, D.P n. 3.

Vinokur, A. (2006). Brain migration revisited. In T. &. Francis, *Globalisation Societies and Education* (pp. 7–24). Paris: Routledge.

World Bank. (2015). *World Development Indicators*. Retrieved from World Bank: http://data.worldbank.org/indicator/SL.UEM.TOTL.ZS?page=2

World Bank. (2015). *Worldwide Governance Indicators.* Retrieved from World Bank: http://info.worldbank.org/governance/wgi/index.aspx#reports

Zweig, D. (2006). Learning to compete: China's efforts to encourage a "reverse brain drain". *Competing for global talent.*

APPENDIX

Table 1A – Skill composition of foreign-born individuals in OECD countries (15+)

Country	2000/01			2010/11		
	LS Share (%)[23]	MS share (%)[24]	HS share (%)[25]	LS Share (%)	MS share (%)	HS share (%)
AUS	41.3	32.8	25.8	22.2	38.5	39.4
AUT	49.4	39.3	11.3	33.2	48.3	18.5
BEL	53.3	23.8	23.0	43.9	29.1	27.0
CAN	30.1	31.9	38.0	17.7	30.2	52.1
CHE	41.6	34.7	23.7	30.9	37.8	31.3
CHL	29.8	50.8	19.4	10.6	52.9	36.5
CZE	38.6	48.7	12.8	29.0	51.7	19.3
DEU	46.5	39.6	14.0	38.8	41.6	19.6
DNK	36.9	39.2	23.9	32.7	37.8	29.5
ESP	56.3	22.5	21.1	46.6	29.8	23.6
EST	29.8	39.2	31.1	18.2	42.3	39.5
FIN	52.6	28.5	18.9	51.1	27.1	21.8
FRA	54.8	27.2	18.1	47.5	28.9	23.6
GBR	40.6	24.5	34.8	29.1	24.3	46.6
GRC	42.7	41.4	15.9	41.2	41.5	17.4
HUN	41.1	39.1	19.8	23.4	49.1	27.5
IRL	29.6	29.3	41.1	19.6	41.2	39.2
ISR	30.2	29.8	40.0	23.1	31.5	45.4
ITA	54.3	33.5	12.2	47.6	41.3	11.1
JPN	25.9	44.2	30.0	11.4	53.6	35.0
LUX	36.7	41.6	21.7	39.7	29.7	30.6
MEX	39.0	26.2	34.8	41.9	31.0	27.0
NLD	49.2	31.7	19.2	40.1	33.8	26.0
NOR	18.3	51.2	30.5	35.0	30.2	34.8
NZL	18.7	50.4	31.0	30.2	32.2	37.6
POL	47.9	40.3	11.9	37.8	44.4	17.9
PRT	54.8	25.9	19.3	47.8	29.7	22.5
SVK	29.3	55.0	15.6	50.5	31.1	18.4
SVN	37.9	50.9	11.2	40.3	49.0	10.6
SWE	29.5	46.2	24.3	27.0	44.0	29.0
TUR	19.3	31.2	15.2	49.6	31.0	19.4
USA	39.2	34.7	26.1	32.1	37.5	30.3
OECD	**41.5**	**33.8**	**24.7**	**33.8**	**35.9**	**30.3**

Source: DIOC 2000/01, DIOC 2010/2011. Own calculation of shares

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[23] Individuals with ISCED 0, 1, 2
[24] Individuals with ISCED 3, 4
[25] Individuals with ISCED 5A, 5B, 6

Table 2A. Shares of emigrants by level of education.

Region of origin	2000/01			2010/11		
	LS	MS	HS	LS	MS	HS
Africa	10.30%	8.28%	9.24%	12.33%	8.65%	9.73%
Asia	15.47%	20.49%	33.12%	16.46%	20.62%	34.71%
Europe	38.89%	42.10%	36.68%	35.11%	39.16%	34.63%
Northern America	1.18%	2.77%	4.56%	1.07%	2.11%	3.69%
Oceania	0.95%	1.70%	1.70%	1.32%	0.83%	1.49%
Latin America	32.94%	24.39%	24.39%	25.93%	34.10%	27.91%

Sources: DIOC 2010/11, DIOC 2000/01. Own calculation of shares

Table 3A. Worldwide Governance Indicators by countries in 2010. Percentile Rank (0 to 100)

Country	Voice and Accountability	Political Stability and Absence of Violence/Terrorism	Government Effectiveness	Regulatory Quality	Rule of Law	Control of Corruption	Average WGI
Switzerland	99.5	92	98.1	94.7	95.3	96.7	96.05
Austria	95.3	89.2	97.1	92.3	96.2	92.4	93.75
Canada	93.8	79.2	96.2	96.2	96.7	96.2	93.05
Australia	94.8	77.8	95.7	96.7	94.8	95.2	92.50
Germany	92.4	72.6	92.3	93.8	91.5	93.3	89.32
United Kingdom	91.9	57.5	91.9	97.6	94.3	91	87.37
Belgium	94.3	72.2	92.8	85.6	88.6	90.5	87.33
France	88.6	69.3	89	86.6	90.5	89	85.50
United States	85.3	60.4	91.4	91.4	92.4	86.2	84.52
Poland	79.6	83	71.3	79.9	68.2	70	75.33
Spain	84.8	34.9	79.4	84.2	84.4	81.4	74.85
Italy	**75.8**	**63.2**	**67**	**77.5**	**63**	**58.1**	**67.43**
Croatia	60.2	66	70.3	69.9	60.2	57.6	64.03
Romania	59.7	53.8	46.4	73.7	56.4	51.9	56.98
Brazil	64.9	47.2	53.6	55	55	58.6	55.72
Albania	53.6	39.6	45.5	56.9	40.8	36.7	45.52
Morocco	28.9	33	50.7	51.2	50.2	53.3	44.55
Argentina	57.3	42.9	48.3	24.4	32.2	42.4	41.25
Philippines	48.3	5.2	55.5	45	33.6	22.4	35.00
Egypt, Arab Rep.	13.7	19.3	43.1	46.9	51.2	34.3	34.75
Russian Federation	25.1	18.9	39.7	40.2	26.1	14.3	27.38

Source: WGI 2015

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