

Heterogeneity in returns to schooling and Mobility of Students

Elise S. Brezis*

Abstract

Globalization has led to a vast flow of migration of workers but also of students. The purpose of this paper is to analyze the migration of individuals encompassing decisions already at the level of education. We present a “unified brain” drain model that incorporates the decisions of an individual related to migration vis-à-vis both education and work. In the empirical part, this paper addresses international flows of migration within the EU, and presents strong evidence of concentration of students in countries with high-quality education.

Keywords: Brain drain; Globalization, Higher education; Human capital; Mobility.

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* *Director, Azrieli Center for Economic Policy (ACEP), Bar-Ilan University, Israel.*
E-mail: elise.brezis@biu.ac.il

I. Introduction

In the past decade, mobility of young people has grown rapidly, and interestingly this flow is not homogenous. On one hand is the flow of individuals who are already skilled and who emigrate to work. On the other hand, are young individuals moving to acquire education, and this flow is growing rapidly this last decade. In 2010, the flow of individuals who obtain education outside their country of citizenship was nearly five times what it was in 1980. Moreover, according to OECD data, the mobility of students has significantly increased in the past four decades, from 250,000 in 1965 to approximately 3.7 million in 2011. The analysis of human capital flows should therefore focus not only on the decision on where to work but also on the decision where to study, since globalization permits a more general set of decision choices.

The purpose of this paper is to analyze the mobility of individuals encompassing decisions already at the level of education. In order to do so, we present a “unified brain-drain” model, which combines the two migration decisions into a unique model. We develop a simple two-step model that describes the decisions of an individual vis-à-vis education and migration. In the first step, individuals decide where to study (i.e., in country of origin or in a foreign country), and in the second step, they decide where to work.

The main reason for having a unified model is that investment in human capital cannot be disjoined from the decision about work. Our model will put the emphasis on the costs of migration as one of the main element in choosing the optimal decision. In fact, we focus on two types of costs: The first one is a spatial element: costs are a function of geography, and the second element is psychological.

We assume that costs of migration are different at the various stages of life and that psychological costs increase with age. Our main result is that when costs of moving are greater after graduation, then under plausible assumptions, the usual brain drain strategy is sub-optimal. In the past, mobility of students was not a possibility and students were learning in their own country. Globalization today is opening this type of migration at least for students from OECD countries, and in the future, probably from the whole world. Therefore it is important to notice that brain drain which was the optimal solution for individuals of countries without the possibility of higher education abroad, will give place to the strategy we stress in our model: The strategy of migrating as students. This paper shows that individuals choose to migrate to countries with high level of quality in higher education.

In other words, this model allows us to pinpoint the optimal decision of young individuals, as well as to analyze the effects of geography, wages and quality of education on the decision making of students. We show that one of the main variables affecting the decision about the country of migration is its quality of

education, a variable which has not been stressed enough in the literature. The second element is geography, since it affects the psychological costs (see Brezis and Verdier, 2014).

The second part of the paper is empirical. We check whether quality of higher education affects the probability of migration. Our first main result is that indeed quality of higher education, and not high wages is the main element affecting migration. The second main result is that there is a concentration effect. We find that not only does high education quality affect migration, but the movement of students is concentrated towards the top five countries.

The paper is organized as follows: In the next section, we present a short overview of the literature. In section III we develop the model of migration. In the fourth section we present the data, and explain the methodology. In the fifth section, we present the empirical results, and section six concludes.

II. Facts and Related Literature

We present in brief the literature on student migration, as well as that related to migration of skilled workers.

1. Migration of Students

The literature on student flow is not large, and is mainly empirical. The studies in this field mainly outline the elements affecting the costs and benefits of students' migration (see Kyung, 1996; Bessey, 2006; and Agasisti and Dal Bianco, 2007). Heaton and Throsby (1998) focuses on the determinants of flows of students, using also a cost-benefits framework.¹

The literature has stressed that wage level is one of the main elements affecting the decision to migrate as a student. On one hand, Mac and Moncur (2001) found that higher wages in the country of origin positively affect the rate of out-migration. It is so, because agents with higher income can bear the costs of migration more easily and have better possibilities to invest in high quality of education.

On the other hand, wage differences between the host country and the country of origin are also used to explain the patterns of migration. These studies show that flows of students are from low-wage to high-wage countries because students are motivated by the wish to exploit the opportunity to acquire employment in the country wherein they acquired their education (see Rosenzweig, 2006).

There is also a literature which focuses on the macro effects of migration. Papatista (2005) argued that studying overseas enhance the social and cultural development of migrants and therefore leads to human capital gains. Moreover, she

¹ See also Altbach, 1998.

stresses that migration could be a political means to foster technological transfers and economic integration of Europe.

Some scholars emphasize also the negative effects of migration on the stock of human capital. Poutvaara (2004) argued that while migration fosters private investment in human capital, it will lead to a reduction of public investment in education, due to free riding.

Following this line of reasoning, Mechtenberg and Strausz (2008) underlined the tradeoff facing government, i.e., competition versus free riding. On one hand, a central planner may decide to invest in quality of higher education in order to attract foreign students, and due to more competition, increases the amount of investment. On the other hand, the central planner might encourage local students to obtain education overseas free of charge. This free-riding on the account of another country reduces the total amount of investment in higher education.

The literature regarding mixing decisions of working and learning is seldom. Kwok and Leland (1982), develop a multiple equilibria model of migration based on asymmetric information, wherein students prefer to remain in the country where they attended university, due to a lack of information on the "value" of their degrees. So due to signaling, good students find it more valuable to remain in the host study countries to work. In consequence, students with less "internal information", i.e., those with lower abilities, will be those who decide to return to their countries of origin.

There are also studies on the effects of migration on the social environment as more migration will lead to a reduction in cultural differences over time (see Putvaara, 2004 and Mechtenberg and Strausz, 2008). We now turn to the literature on the migration of workers.

2. Migration of workers

In contrast to the literature on student migration, the literature on workers' migration is vast. From Sjaastad (1962) on, the optimal behavior of migrants has been found to be a function of income differences and migration costs.² The main elements that have been emphasized are those affecting migration costs, as for instance, geographical distance, family size, and previous migration.³ This literature did not focus on skilled workers.

The literature on the migration of skilled workers is coined the "brain drain" literature, and it emphasizes the negative effects of the flight of skilled workers on

² See Borjas (1987, 1989) and Chiswick (1999). The seminal work of Harris and Todaro (1970) adds to previous work the possibility of unemployment, and therefore focuses on the net expected present value as the element that explains migration.

³ As well as income, age, and distance. The main empirical papers in this literature are those of Greenwood (1969), Bowles (1970), Kaluzny (1975), Lee and Roseman (1999), and Ahn et al. (1999). The variables on which they focus are mainly

the country of origin. These studies claim that the flight of skilled workers towards countries with higher standards of living lead to impoverishment of developing countries, due to increasing returns and externalities in the level of human capital. These papers conclude that migration of skilled labor has negative effects on human capital and economic growth of the country of origin.⁴

Lately, a number of authors have shown that the possibility of migration might create some positive effects on the country of origin, termed the "brain gain" effect. This line of research has been engaged in by Mountford (1997), Stark, et al. (1997, 1998) and Stark (2004). An overview of this literature can be found in Docquier and Rapoport, (2008, 2012) and Gibson and McKenzie, (2011). They focus on the fact that the incentive to migrate could increase the investment in education, and on average would increase the level of human capital.⁵ Beine, et al. (2001) and Easterly and Nyarko (2008) both derive the theoretical effects of migration on human capital creation, and test these effects empirically.

This paper will not draw a dichotomy between decisions on education and those on employment. Instead, it will combine these two into one model, presented in the next section.

III. The Model

We develop a simple model that allows us to develop a cost-benefit analysis of migration decisions. The model combines the decisions related to migration of students and workers into a single model. It will show that under specific conditions, the usual brain drain strategy is sub-optimal and therefore in countries where globalization is such that young individuals can already travel for education, it is optimal to do so.

The model we develop is the following: In the first step, individuals decide where to study, and in the second step, they decide where to work. Two main elements affect the returns: wages and quality of higher education. Wages affects net income in a direct way, while the quality of education affects the level of human capital. And, two elements affect the costs: psychological and mismatch costs.

This paper will mainly focus on the quality of higher education as a main element driving migration: students know that their human capital is a function of the quality

⁴ See Hacque and Kim, (1995) and Docquier, (2006). Early articles in this direction are notably Grubel and Scott (1966) and Bhagwati and Hamada (1974). A summary of this literature can be found in Docquier and Rapoport (2012).

⁵ Nowadays, there are some models with multiple equilibria. See De laCroix and Docquier (2012) and Benassy and Brezis (2013).

of the education they have received.⁶ In consequence, this paper focuses on the heterogeneity in returns to schooling, and tests its effect on the decision of migration.

The general model takes into account the two stages of decisions. In Chart 1, we show the elements affecting the decisions at each stage of this model. In the first period, individuals invest in acquiring human capital, H , and decide whether to study overseas in country F , or in his home country, in country S . Their decision is a function of the costs and the returns from acquiring human capital. In the second period, they decide where to work.

The main idea of this two-steps model is that the decision to work is not completely independent of the decision the individual took previously in the first period. The main assumption is that the psychological costs of moving are different when young and when adult. This will drive the main results of the paper. The second assumption is related to the psychological costs of returning, vs. its new "identity" as a student, as we explain later on. Depending on these assumptions, we determine the optimal decision.

1. Returns from Mobility

One main element which affects the future income of students is the accumulated human capital. This accumulated human capital is a function of the quality of higher education they have acquired, as we stressed above. Students are aware that quality of higher education is heterogeneous and varies across countries; the higher the quality, the higher the human capital they are acquiring.⁷ The second element which influences the future income of students is the wages paid for a given amount of human capital.

So, individual's earning is a function of two factors: (i) the quality of higher education, Q_i which affects the accumulated human capital (where i is the index of the country in which he gets an education) (ii) The second element is the wage per unit of human capital, w_j where j is the index of the country in which the individual decides to work (country S or country F). The income of individuals takes the four possible forms:

(i) Moving as student and staying to work – strategy A_F .

Agents migrate in the first stage to country F in order to obtain education and remain there after graduation.⁸

⁶ See Aghion et al. (2009) and Brezis (2012), which discuss the notion of quality of higher education. On the relation of quality of secondary education and human capital, see Card and Krueger (1992) and Hanushek and Wossman (2007).

⁷ The assumption is that the choice of the country is based on its best universities, and that students are aware of the *aura* of the country.

⁸ We ignore the whole present value of income, and focus on the earning of a specific year, since discount factor will affect all incomes in the same way.

The income in this specific strategy is a function of Q_F and w_F and for sake of simplicity, we adopt this specific functional form:

$$W_{FF} = \psi(Q_F, w_F) = w_F Q_F^\alpha. \quad (1)$$

where W_{FF} are the earnings of an individual that obtains education and works in country F.⁹ The second possible strategy is:

(ii) Temporary migration – strategy A_S .

Individuals migrate as student but later on return to their home country after graduation. The earnings under this strategy is a function of quality of education overseas, Q_F and wages at home, w_S :

$$W_{FS} = \psi(Q_F, w_S) = w_S Q_F^\alpha. \quad (2)$$

(iii) Permanent migration only as worker – strategy, B_F

The third possible strategy is that an individual will obtain education in his home country and migrate in order to work, following graduation. This is the usual “brain drain” strategy. The value of earnings under this strategy is a function of quality of education at home, Q_S and wages overseas, w_F :

$$W_{SF} = \psi(Q_S, w_F) = w_F Q_S^\alpha. \quad (3)$$

(iv) No migration – strategy, B_S .

An individual obtains education in his home country and remains to work there following graduation. The present value of earnings over time under this strategy is:

$$W_{SS} = \psi(Q_S, w_S) = w_S Q_S^\alpha. \quad (4)$$

So all four strategies present different returns depending on where the student learns and where he works. We now turn to the main costs related to learning and migration.

2. Costs of Migration

There are two main costs due to migration: costs due to geography, which is some sort of mismatch and psychological costs. We should emphasize that there are

⁹ This model focuses on migration between home and foreign countries, and it does not analyze moving from one foreign country to another.

also tuition fees, F , which are different in various countries, but they are not specific to migration.

(i) *Mismatch costs*

The mismatch costs, C which are subtracted from the returns, are unknown to the individual at the time of the decision. Therefore he can only have an expected value of the moving costs.

There are in fact two possibilities facing the individual. (i) He can either succeed in finding an adequate job in the country he moves to. (ii) As an alternative, he can choose to go back and get work in his home.

(i) In the first alternative, there is a discount, Z to the human capital he has accumulated. This discount is function of two main variables. The first one, is that the discount is a function of how far this country is from his own, x . It is not a question of physical distance properly, but of differences in the labor market between these two countries, The distance x , therefore affects the cost .

The second element affecting the discount is the discount costs per unit of distance, t , and therefore the total discount factor takes the form: $t\varphi(x) + \lambda$ where $\varphi'(x) > 0$, and $\lambda > 0$ is a constant. Therefore we get:

$$Z(t) = t\varphi(x) + \lambda .$$

The discount costs per unit of distance, t is a stochastic variable, since there are years where the costs are higher. There are times when migrants are less welcome, and other time when there are more welcome. For simplicity, we assume that t is distributed uniformly on $[0, t_h]$ with t_h being the maximum discount factor, which may be affected by exogenous factors, as the international political arena or economic crisis. We denote the average discount as \bar{t} , which is equal to:

$$\bar{t} = t_h / 2$$

We assume that at the time of making their decision to study in their country, individuals do not know the exact realization of t that will prevail when they migrate. Therefore ex-ante when deciding whether to study in their own country or to learn overseas, they only know the expected discount factors.

(ii) In the case he goes back home at a cost of A for the travelling back and forth and all the losses.

The decision for a person, when arriving at the host country, is choosing between staying there or returning home. Thus, it is given by the comparison between Z , the discount, and A , the cost of returning (see chart 1). Hence, when the realization of t is low enough, then individuals stay in the host country, while when it is high enough,

they decide to move back to their country of origin. The costs of moving in each case takes the form:

$$\begin{aligned} \text{if } t \leq (A - \lambda) / \varphi(x) \text{ then } C &= Z \\ \text{if } t \geq (A - \lambda) / \varphi(x) \text{ then } C &= A \end{aligned} \quad (5)$$

Hence ex-ante, when A is not too big such that $[t_h \varphi(x) + \lambda] > A$, the expected cost of moving, C will be given by:

$$C(x) = \int_0^{(A-\lambda)/\varphi(x)} \frac{Z(t)}{t_h} dt + \int_{(A-\lambda)/\varphi(x)}^{t_h} \frac{A}{t_h} dt$$

So that:

$$C(x) = A - \frac{(A - \lambda)^2}{4\bar{t}\varphi(x)} \quad (6)$$

As it is clear from equation (6), the mismatch costs, C are a positive function of two elements: the distance of the host country, x ; and the average discount costs, \bar{t} .

(ii) Psychological costs

Sjaastad (1962) argued that migrants bear costs which results from separation from family and friends. This definition of costs is known in the literature as psychological costs. The new literature developed by Akerlof and Cranton (2010) also put an emphasis on "identity". This literature takes into account that one of the main element people care about is their identity, or in other word, their culture.

In consequence, when a person leaves home, he has the cost of leaving his own culture and adapting to the new one.¹⁰ These costs are positively affected by the cultural differences between the sending and the receiving countries.

This phenomenon of adapting to a new culture is coined as acculturation (see, Narchal, 2007). Theories of acculturation stress that the interaction between different cultures and adaptation to the majority's culture, lead to a process in which migrants are losing their own cultural identity. Therefore, this process bears psychological cost, which depends on the cultural differences between the origin and the destination countries.

¹⁰ Some psychologist will also emphasize the costs of loneliness and isolation; Others argued that as a result of changes in the identity of the individual, mental illness might appear (see Bhugra, 2004).

The literature emphasizes that these psychological costs are much bigger for adults than young individuals starting learning. Therefore in this paper, we assume that there are two different costs, one borne by adults migrating, P_o (o for old), and one by students, which are smaller and coined, P_s .

Moreover, we assume that the student feels more integrated in the host country than in his own home country. Since we assume a two-step decisions model, then the psychological costs will also occur when he returns home. Based on the theory of acculturation, the psychological costs are a function of Cu which is the differences between the culture of the migrant and the culture of the majority in the destination country, but also of language, and distance.

In summary, the net incomes under each of the strategies are as follows:

$$A_F \quad NV_{AF} = w_F Q_F^\alpha - (F_F + P_S) \quad (\text{Ci})$$

$$A_S \quad NV_{AS} = w_S Q_F^\alpha - (F_F + P_S + \varepsilon) \quad (\text{Cii})$$

$$B_F \quad NV_{BF} = w_F Q_S^\alpha - (F_S + C + P_o) \quad (\text{Ciii})$$

$$B_S \quad NV_{BS} = w_S Q_S^\alpha - F_S \quad (\text{Civ})$$

3. Optimization

Individual decides whether to migrate for education purpose or later on as skilled worker, according to the net returns under each of these four strategies. In the next proposition we analyze the optimality of the strategy, which is coined the 'brain drain' decision, and in which individuals stay to learn at home, and then go to work in a foreign country. Under which condition is this strategy optimal?

Let us define:

$$\text{Condition I:} \quad C + P_o > Q_S^\alpha (w_F - w_S).$$

$$\text{Condition II:} \quad (P_o - P_S) + w_F (Q_F^\alpha - Q_S^\alpha) > (F_F - F_S)$$

Proposition:

Under either Condition I or Condition II, Brain Drain (strategy B_F) is suboptimal and individual will prefer either to leave their country already as a student, or to stay in their home country.

Proof: (see appendix A)

This proposition states that either under Condition I or II, there is always a strategy which will be better than B_F , the usual brain drain. The meaning of the Proposition is that when we allow for migration of students, and do not restrain ourselves to the question of migration as adult, then we get that when differences in tuition fees are not big and when psychological cost of adaptation are higher when adult, the strategy of brain drain is sub-optimal. It is always one of the other strategies which is optimal. Moreover, whenever the quality of higher education is higher overseas, then A_F is optimal and is a better solution than the regular brain drain.

Still the brain drain strategy, B_F is commonly used for individuals from poor countries who cannot afford learning abroad, and for whom tuition fees abroad are too high. They move when they have saved enough to travel to the developed world.

This two-steps model is especially important for countries in the border of the developed world, from which students can easily travel to learn. This model shows that they will either stay in their countries, or move when they are still young. For them, the strategy B_F is sub-optimal.

In other words, for the strategy ‘brain drain’ to be optimal we need that condition I *and* condition II do not hold. This is the case only when migration is not permitted when young, or the differences between tuition fees are very high. Moreover, the costs P_o and C have to be small.

This model encompasses the idea that in the past, when learning overseas was not as easy as today, brain drain was more frequent. In the future, we might face a structure in which young people, with secondary education will leave the country to learn overseas, and will not come back, unless for them, the “previous identity” or family ties are essential elements of their well being.

IV. Empirical analysis

In this empirical part, we regress the probability of migration as a function of the elements that appears in equations (Ci-Civ): wages, quality of education, psychological costs and tuition fees.¹¹ To these variables, we add a variable checking if there is a different behavior when an individual belongs to the EU, and if the education system is similar. In consequence, we estimate the following equation:

¹¹ This part is based on Brezis and Soueri (2015).

$$Pmig = \alpha + \beta_1 \Delta Wage + \beta_2 \Delta Cu + \beta_3 \Delta Tuition + \beta_4 \Delta Tuitionsq + \beta_5 EU_F + \beta_6 \Delta Quality \quad (7)$$

$$+ \beta_7 Distance + \beta_8 Similarity + \beta_9 Language + \beta_{10} Top5 + \beta_{11} Wage5 + u + \varepsilon$$

We investigate this equation with a country fixed effect, u and analyze a panel data of students' flow published by the OECD on the years 2001-2006, and we focus on two groups of countries, and will present the data for two samples.

The first sample includes 29 countries: the countries from the EU 27 (without Croatia) including Switzerland and Norway. The second sample includes only the 15 EU countries (which belonged to the EU before 2004), since they were inside the EU for a longer time.

The decision on migration is a qualitative variable, based on macro-data, therefore, we use a logit transformation when estimating equation (7).

1. The variables of the model

$Pmig$ is the dependent variable which is a logit transformation of the probability to emigrate from country S to country F. The dependent variable is therefore:

$$Pmig = \ln \frac{P_{SF}}{1 - P_{SF}} \quad (8)$$

where P_{SF} is the probability to migrate from country S to country F, calculated by dividing the number of foreign students from country S in country F by the total number of students in country S.

$\Delta Wage$ is the difference in the monthly average wage in manufacturing between country F and country S, based on the ILO database.

$\Delta Quality$ measures the differences in quality of higher education between the sending and the receiving countries. Our quality index defines the quality of higher education in a country according to the number of universities in this country which are ranked among the world's top 100 universities. Therefore the quality of country is higher when it has more universities which are ranked in the top 100. There are two main ranking of universities in the world – the THE and the SJTU-ARWU (Shanghai ranking). We have chosen to use the SJTU ranking since it uses criteria of research quality, research productivity, quality of the faculty and quality of teaching. Some previous work (Mac and Moncur, 2001) uses instead the expenditure on education, but OECD research has shown that the correlation between budgets and quality is weak.¹²

¹² It should be noted that our own index has also some weakness, because many countries don't have universities which are ranked in the world top 100. As a result this index provides information on a limited set of countries.

$\Delta Tuition$ is the difference in tuition fees between the origin and host countries. based on the CESifo Dice report. We should note that tuition fees in Europe are very low and in many countries students obtain education free of charge.¹³

$\Delta Tuitionsq$ is the square difference in tuition fees between the sending and the receiving countries.

EU_F is a dummy variable which receives the value 1 if the destination country is a member of the EU 27 countries.

$Distance$ measures the geographical distance between the capital cities of the origin and the destination countries. The series are based on the Gleditsch and Ward (2001) database. This variable is part of the mismatch costs.

ΔCu is an index of cultural differences between countries. We developed this index based on the World Values Survey.

$Similarity$ is a dummy variable which get the value 1 if the structure of higher education in the sending and the receiving countries was similar prior to the adoption of the Bologna process. As we will show, this element is not important for understanding migration in Europe.

$Language$ is a dummy variable that gets the value 1 if the official language in the origin and the destination country is the same.

$Top5$ is a dummy variable which gets the value 1 if the destination country is one of the five countries which has the highest quality of education according to top100 index of quality. In fact, we use this variable to measure concentration by quality. The top five countries are France, Germany, UK, Switzerland and Sweden.

$Wage5$ is a dummy variable which get the value 1 if the destination country is one of the five OECD countries with the highest wage in manufacturing. The top five countries are: Austria, Denmark, Holland, Norway and Switzerland.

Finally, u represent a fixed country effect and ε is the random error.

V. Empirical results

The results of our analysis are presented in Table 1. In all regressions, the dependent variable $Pmig$ represents the transformation of the probability to emigrate from country S to country F according to the logistic distribution.

In the first and third columns of Table 1 we present the regression in the overall sample and in the second and forth columns we present the regressions for the EU15 sample.

¹³ It is important to note that the EU forbids discrimination regarding tuition fees that are charged from EU, EEA citizens and citizens of countries which have special agreements with the EU. Since all the countries in our data are either EU countries or countries which have agreement with the EU, tuition fees are the same for local students as well as for overseas students.

1. Main results

(i) Wages and Quality of Education

Table 1, columns 1 and 2, present the results when the explanatory variables are quality of university and the gap in wages between the country of origin and the host country.

We find that in both samples (total sample and the EU15), there are significant negative effects of wage differences on migration of students (see columns 1 and 2). This result is interesting because the literature stresses that wages are a positive and significant element in the decision of student migration (see Rosenzweig 2006). Our paper shows that this is not so. This result is puzzling and needs some more research. We return to this question below, and we focus now on the element which is significant and positive: the quality of higher education.

$\Delta Quality$ - Following our theoretical model, positive quality differences between the receiving and the sending countries is expected to encourage students to migrate. Indeed, we find a positive and significant effect of the quality of higher education on the probability of students' migration (see columns 1 and 2).

In conclusion, we find negative and significant effect of wage differences on migration of students and positive and significant positive effect of quality of education on migration.

(ii) Top Wages and Top Quality of education

We check whether quality of higher education or wage lead to some concentration effect. In order to explore this effect, we add two dummy variables in columns 3 and 4 of Table 1. The first one is *Top5-quality*. This variable gets the value 1 if the destination country is one of the top five countries in quality of higher education. This variable measures concentration of students in top quality countries.

Similarly, we add the variable *Wage5* which measures whether the destination country is one of the five countries with the highest wage. In other words, this variable measures concentration of students in high wage countries.

The results show positive and significant effect of the *top5-quality* variable and negative and significant effect of the *wage5* variable. Therefore we find evidence that the pattern of flows is to countries with high quality of universities and not to countries with high wage.

This result is puzzling as we have stressed above. It also leads to think that maybe the unified brain drain model should be refined to take these elements into consideration. Our results seem to show that students study where the higher education is best, but where wages are not the highest. Indeed, in Table 2, we present the correlation between wages and quality of higher education. We find that the correlation between wages in manufacturing in each country and its number of

universities in the world's top100, top 200 and top500 universities is around 0.35. Therefore the countries with the highest quality of education are not necessary the countries with high wages. This could be explained by more flexibility in the labor market, which is a positive element for students which just have finished to learn and are without experience.

The concentration effect stressed in Table 1 can be presented in a different manner in Tables 3a and 3b, in which we present the distribution of student flows according to quality of higher education (in Table 3a), and according to wages (in Table 3b).

Table 3a shows that around 67 percents of student flows in the OECD and EU countries concentrated into the top five countries in quality of higher education.¹⁴ Are these flows also concentrated in the top five countries in wage?

In Table 3b, we measures concentration in countries with the highest wage. We show that more than 80 percent of the student flows went to the low wage countries. Therefore, unlike the concentration of students in high quality countries, we don't find concentration in high wage countries.

2. Some more results

The next four variables, *similarity*, *language*, *distance* and *culture* are related to the costs, P_s and C .

Similarity - measures similarity between the structure of higher education in the host and origin countries. When the structure of the systems is more similar the compatibility costs are lower. In our empirical investigation, this variable was not significant.

Language – In all regressions, we find a positive effect of the same language in the host and the origin countries on migration. Note that this positive relation was also found in previous studies.

Distance – Similar to previous studies on migration, we find negative effect of distance between countries on migration.

ΔCu - Table 1, row 3 shows that higher cultural differences, as reflected by the cultural index, reduce significantly the rate of migration in all four regressions.

These results lead us to conclude that students are indeed affected by psychological moving costs. Are the tuition cots affecting migration as emphasized by the literature?

$\Delta Tuition$ - A priori, we expected to find negative effect of tuition fees gap on migration, but we found positive effects. Already Mak and Moncur (2001) found also

¹⁴ More specifically, around 19 percent of students went from low quality countries to low quality countries. Around 48 percent went from low quality countries to the top five countries, 14 percent from the top five countries to the low quality countries, and 19 percent were between the top five countries.

positive effect of tuition fees on migration of students, while Bessey (2007) found insignificant effect. In this paper we also find a significant and positive effect of tuition fees gap on migration in both samples, meaning that students migrate to countries with higher tuition fees. This positive effect could be due to a signaling effect of the level of tuition fees on the quality of education.

$\Delta Tuitionsq$ - The positive effect of tuition fees on migration led us to check whether there is a non linear relation between tuition fees and migration. The results are not clear cut.

EU_F - We get a positive and significant effect of the host country being a member of the EU. There is clearly a club effect since migration to the EU area could raise the returns on migration.

VI. Conclusion

This paper has shown that the effects of heterogeneity in the quality of education and in returns to schooling have significant effects on the mobility of individuals.

The first contribution of this paper is that we develop a “unified brain drain” model that merges the decision to move as a student with the decision to migrate as a worker. Our first result is that the usual brain drain might be sub-optimal, and that migration is towards the countries with higher quality of education. Heterogeneity in returns to schooling is the main variable which affect migration.

This issue might appear redundant, since *a priori*, countries with high wages will also be countries with high education quality. Yet among the empirical regularities exposed herein, we show that this is not the case: The correlation between wages and education quality is only 35%.

This empirical analysis shows that while heterogeneity in returns of quality of education affects positively migration, wages do not affect positively migration. Previous researches, which have analyzed the impact of wages, did not include any variable for quality of education: Our paper shows that this is the element driving movement of students.

Moreover, we test whether there is concentration in specific countries. We show that young people travel to the top five countries in terms of education quality. Our indices show a concentration of students in the top-quality education countries, and not into countries with the highest wages, so that students’ emigration is motivated by quality of education and not by wages.

Nobel Prize Laureate Robert Lucas raised a famous query in his paper: “Why doesn’t capital flow from rich to poor countries?” Paraphrasing Lucas, we could state that human capital doesn’t flow from poor to rich countries, but rather from countries of low returns on education to those with high returns to education.

This fact has strong redistribution effect, as the usual brain drain. On one hand, the students who move to countries with good universities have a better chance to go

up the ladder to success, if they come back to their country of origin. (see Brezis and Krugman, 1996, 1997). On the other hand, if they don't return, the country has lost its young individuals, which leads to lower economic growth.

References

- Aghion, P., M. Dewatripont, C. Hoxby, A. Mas-Colell and A. Sapir. 2009. "The Governance and Performance of Research Universities, Evidence from Europe and The US". *Economic Policy*.
- Ahn, N., De la Rica, S. and A. Ugidos. 1999. "Willingness to Move for Work and Unemployment Duration in Spain", *Economica*, 66(263): 335-357.
- Agasisti, T. and A. Dal Bianco. 2007. "Determinants of College Student Migration in Italy: Empirical Evidence from a Gravity Approach", Working Paper series.
- Akerlof, GA and R. Kranton. 2010. *Identity Economics*. Princeton University Press
- Altbach, P.G. 1998. "Comparative Higher Education: Knowledge, the University, and Development", Ablex Publishing.
- Altbach, P.G. and J. Knight. 2007. "The Internationalization of Higher Education: Motivations and Realities", *Journal of studies in International Education*.
- Bartel, A.P. 1979. "The Migration Decision: What Role Does Job Mobility Play?", *The American Economic Review*, 69 (5): 775-786.
- Baryla, E.A. and D. Dotterweich. 2001. Student Migration: Do Significant Factors Vary by Region?", *Education Economics*, 9 (3): 269-279.
- Beine, M., Docquier, D. and H. Rapoport. 2001. "Brain Drain and Economic Growth: Theory and Evidence", *Journal of Development Economics*. 64: 275-289.
- Beine, M., Docquier, D. and H. Rapoport. 2008. "Brain Drain and Human Capital Formation in Developing Countries: Winners and Losers", *The Economic Journal*, 118: 631-652.
- Benelux Bologna Secretariat. <http://www.ond.vlaanderen.be/hogeronderwijs/bologna>
- Benassy, J.P and E.S. Brezis. 2013. "Brain Drain and Development Traps", *Journal of Development Economics*, 102: 15-22.
- Bessey, D. 2006. "International Student Migration to Germany ", University of Zurich, Institute for Strategy and Business Economics, Economics of Education Working Paper Series, n. 6.
- Bhugra, D. 2004. "Migration distress and cultural identity", *British Medical Bulletin*, 69: 129-141.
- Borjas, G.J. 1987. "Self-Selection and the Earnings of Immigrant", *The American Economic Review*, 77(4): 531-553.
- Borjas, G.J. 1989. "Economic Theory and International Migration", *International Migration Review*, 23 (3): 457-485

- Borjas, G.J. 1999. "Immigration and Welfare Magnets", *Journal of Labor Economics*, 17(4): 607-637.
- Bowles, S. 1970. "Migration as Investment: Empirical Tests of the Human Investment Approach to Geographical Mobility", *The Review of Economics and Statistics*, 52 (4): 356-362
- Brezis E.S and P. Krugman. 1996. "Immigration, Investment and Real Wages" *Journal of Population Economics*, 9: 83-93.
- Brezis E.S and P. Krugman. 1997. "Technology and Life Cycle of Cities" *Journal of Economic Growth*, 9: 369-383.
- Brezis E.S. 2012. "Why are US Universities at the top of the International Rankings?" in J. Brada, W. Bienkowski and G. Stanley, eds. *The University in the age of Globalization*, Palgrave Macmillan pp. 155-179.
- Brezis E.S and T. Verdier. 2012. "Non-Linear Geographics and the Economics of Transition and Democratization" *Economics of Transition*, (3):1-19.
- Brezis E.S and J.P. Benassy. 2013. "Brain Drain and Development Traps", *Journal of Development Economics*, 2013: 15-22.
- Brezis E.S and T. Verdier. 2014. "Geography, Economic and Political Systems: A bird's eye view", *Journal of Institutional Comparisons*, 1: 29-36.
- Brezis E.S. and A. Soueri. 2015. "Mobility of Students in the EU: The Paradox of the Bologna Process", mimeo
- Card, D. and A. Krueger. 1992. "Does School Quality Matter? Returns to Education and the Characteristics of Public Schools in the United States" *Journal of Political Economy*, 100: 1-40.
- CESifo. 2007. "Tuition Fees in Europe", CESifo Dice Report: Journal for Institutional Comparison, 5(4): 56-58.
- Chiswick, B.R. 1999. "Are Immigrants Favorably Self-Selected?", *The American Economic Review*, 89 (2): 181-185.
- De la Croix, D. and Docquier, F. 2012. "Do brain drain and poverty result from coordination failures?" *Journal of Economic Growth* 17, 1-26.
- Docquier, F. 2006. "Brain drain and inequality across nations", IZA Discussion Paper No. 2440.
- Docquier, F., Rapoport, H., 2008. The brain drain, in the *New Palgrave Dictionary of Economics*, second edition, Macmillan.
- Docquier, F., Rapoport H., 2012. "Globalization, brain drain and development". *Journal of Economic Literature* 50: 681-730.
- Ehrenberg, R.G and R.S. Smith. 2002, "Modern Labor Economics: Theory and Public Policy", Addison Wesley, Eighth edition.
- Ernest George Ravenstein E.G. 1889. "The Laws of Migration." *Journal of the Royal Statistical Society*, 52 (2): 241-305.
- Gleditsch, K.S and M.D. Ward. 2001. "Measuring Space: A Minimum Distance Database and Applications to International Studies," *Journal of Peace Research*, 38, 739-58.

- Greenwood, M.G. 1969. "An Analysis of the Determinants of Geographic Labor Mobility in the United States", *The Review of Economics and Statistics*, 51 (2): 189-194
- Gross, D.M. and N. Schmitt. 2003. "The Role of Cultural Clustering in Attracting New Immigrants". *Journal of Regional Science*, 43 (2): 295-318.
- Grossman J.R. 1989, "*Land of hope: Chicago, Black southerners, and the Great Migration*", University of Chicago Press.
- Grubel, H. and A. Scott. 1966, "The International Flow of Human Capital", *American Economic Review*, 56 (2): 268-74.
- Hansen, M. 1940. "*The Atlantic Migration*", Harper&Row.
- Hanushek and Wossman. 2007. "The Role of Education Quality in Economic Growth" IMF.
- Haque, N. U and S. Kim. 1995, "Human Capital Flight: Impact of Migration on Income and Growth", *IMF Staff Papers*, 42(3): 577-607.
- Harris, J. and M. Todaro. 1970. "Migration, Unemployment & Development: A Two-Sector Analysis". *American Economic Review*, 60(1):126-42.
- Heaton, C. and D. Throsby. 1998."Benefit-Cost Analysis of Foreign Student Flows from Developing Countries: The Case of Postgraduate Education". *Economics of Education Review*, 17(2): 117-126.
- ILO. 2001-2006. Laborsta. <http://laborsta.ilo.org>
- Kaluzny. R.L. 1975. "Determinants of Household Migration: A Comparative Study by Race and Poverty Level". *The Review of Economics and Statistics*, 57 (3): 269-274.
- Karemera, D., Iwuagwu Oguledo,V. and B. Davis. 2000. "A Gravity Model Analysis of International Migration to North America", *Applied Economics*, 32: 1745-1755..
- Karras, G. and C. U. Chiswick. 1999. "Macroeconomic Determinants of Migration: The Case of Germany 1964 – 1988", *International Migration*, 37 (4): 657-677.
- Krugman, P.R. and M. Obstfeld. 2005. "*International Economics Trade and Policy*", Seventh - edition, Addison-Wesley Publishing company.
- Kwok, V. and H. Leland. 1982. "An Economic Model of the Brain Drain", *The American Economic Review*, 72 (1): 91-100.
- Kyung, W. 1996. "In-Migration of College Students to the State of New York", *The Journal of Higher Education*, 67 (3) : 349-358.
- Lee, S. and C.C Roseman. 1999. "Migration determinants and employment consequences of white and black families, 1985 – 1990", *Economic Geography* 75 (2): 109 – 133
- Li, M. and M. Bray. 2007. "Cross-Border Flows of Students for Higher Education: Push-Pull Factors and Motivations of Mainland Chinese Students in Hong Kong and Macau", *Higher Education*, 53 (6): 791-818.
- Lucas, R.B. 1988. "On the Mechanics of Economic Development", *Journal of Monetary Economics*, 22: 3-42.
- Mak, J. and J.E.T. Moncur. 2001. "Interstate Migration of College Freshmen: An Economic Analysis". University of Hawaii at Manoa, Working Paper, 11-5.

- Mayda, A. 2010. "International migration: a panel data analysis of the determinants of bilateral flows," *Journal of Population Economics*, 23(4): 1249-1274.
- McHugh, R. and J.N. Morgan. 1984. "The Determinants of Interstate Student Migration: a Place-to-Place Analysis". *Economics of Education Review*, 3 (4): 269–278.
- Mechtenberg, L and R. Strausz. 2008. "The Bologna Process: How Student Mobility Affects Multi-Cultural Skills and Educational Quality", *International Tax and Public Finance*, 15(2): 109-130.
- Narchal, R. 2007. "Migration: Destruction and Reconstruction of the Self", *E-journal of Applied Psychology*, 3 (1): 55-64.
- OECD. 2003-2012. *Education at a Glance*, Paris. <http://www.oecd.org>
- Papatsiba, V. 2005. "Political and Individual Rationales of Student Mobility: a Case Study of Erasmus and a French Regional Scheme for Studies Abroad", *European Journal of Education*, 40 (2): 173-188.
- Poutvaara, P. 2004. "Public Education in an Integrated Europe. Studying to Migrate and Teaching to Stay", CESifo Working Paper, n. 1369.
- Romer, P. 1990. "Endogenous Technological Change", *The Journal of Political Economy*, 98 (5): S71-S102.
- Rosenzweig, M.R. 2006. "Global Wage Differences and International Student Flows," in Collins, Susan M. and Carol Graham, ed., *Brookings Trade Forum 2006: Global Labor Markets*, forthcoming.
- Shanghai Jiao Tong University Institute of Higher Education. 2007. "Academic ranking of world universities". <http://www.arwu.org>
- Sjaastad, L. 1962. "The Cost and Returns of Human Migration", *The Journal of Political Economy*, 70 (5): 80-93.
- Stark, O. 2004. "Rethinking the Brain Drain", *World Development*, 1: 15-22.
- Stark, O., Helmenstein, C. and A. Prskawetz. 1997. "A Brain Gain with a Brain Drain", *Economics Letters*, 55: 227-234.
- Stark, O., Helmenstein, C. and A. Prskawetz. 1998. "Human Capital Depletion, Human Capital Formation, and Migration: a Blessing or a "Curse"?", *Economics Letters*, 60: 363-367.
- Unesco. 2006. *Globe Education Digest*. Paris.
- World Values Survey Association. 2000. <http://www.worldvaluessurvey.org>

Appendix B– proof of the proposition

I.

Under which condition do we get that $B_S \succ B_F$?

1. If $w_S > w_F$

Then this is obvious.

2. If $w_F > w_S$.

Then, under Condition Ia, we get that $B_S \succ B_F$.

II.

Under which condition do we get that $A_F \succ B_F$?

If: $(P_o - P_S) + \lambda w_F (Q_F^\alpha - Q_S^\alpha) > (F_F - F_S)$

Condition II

Then, we get that $A_F \succ B_F$.

So either due to condition Ia, or to condition II, B_F is not optimal.

TABLE 1

REGRESSION RESULTS: DETERMINANTS OF STUDENTS EMIGRATION

<i>Variable</i>	<u>Overall panel</u>	<u>Square EU15</u>	<u>Overall panel</u>	<u>Square EU15</u>
Dependent variable: <i>Pmig</i> - Probability of emigration from country S to country F				
<i>Constant</i>	-7.182035 (-60.24)	-6.435478 (-46.77)	-7.95478 (-73.18)	-6.244323 (-42.02)
Δ <i>Quality</i>	1090795 (10.35)	.1303641 (9.73)	.1028747 (5.67)	.006896 (0.22)
Δ <i>Wage</i>	-.0000999 (-4.61)	-.000155 (-3.31)	.0003671 (9.61)	.000042 (0.61)
Δ <i>Cu</i>	-.1115142 (-3.00)	-.2533198 (-3.62)	-.1654175 (-4.12)	-.2716306 (-4.11)
Δ <i>Tuition</i>	.0006905 (13.22)	.0007624 (8.25)	.0006239 (10.24)	.0011574 (9.21)
Δ <i>Tuitionsq</i>	2.94e-07 (6.85)	4.23e-07 (5.40)	-7.26e-08 (-1.57)	-1.57e-07 (-2.19)
<i>EU_F</i>	.4820245 (4.34)	-----	1.02883 (14.39)	-----
<i>Distance</i>	-.0014917 (-20.54)	-.0011801 (-9.13)	-.0014072 (-18.90)	-.0015966 (-13.06)
<i>Similarity</i>	-.0560596 (-1.08)	.0369502 (0.41)	.0221401 (0.39)	.0580827 (0.68)
<i>Language</i>	1.75015 (14.58)	1.929312 (11.99)	1.455952 (11.23)	1.315127 (8.95)
<i>Top5-quality</i>	-----	-----	1.4821480 (13.49)	2.243006 (10.59)
<i>Wage5</i>	-----	-----	-.4348655 (-4.24)	-.5718809 (-4.15)
<i>R</i> ²	0.3194	0.4603	0.4303	0.5421
<i>Obs</i>	3030	1131	3030	1131

Note: t-values are in parenthesis.

TABLE 2

CORRELATION BETWEEN WAGES AND QUALITY OF HIGHER EDUCATION

	<u>Top100</u>	<u>Top200</u>	<u>Top500</u>
Average wage	0.34	0.37	0.33

Sources: Shanghai Jiao Tong University, World university ranking, 2007, and International Labor Organization, 2001-2006.

TABLE 3A

CONCENTRATION EFFECT – PERCENTAGE OF MIGRANTS BETWEEN LOW AND HIGH QUALITY GROUPS

	<u>Low to Low</u>	<u>Low to High</u>	<u>High to Low</u>	<u>High to High</u>
2001	19	48	14	19
2002	19	48	14	19
2003	19	47	15	19
2004	18	49	14	19
2005	19	47	15	19
2006	20	45	17	18

Source: Own calculation.

Notes: “High” represents the top 5 countries according to the quality index of the top 100. According to this index the top 5 countries are France, Germany, Sweden, Switzerland and United Kingdom. “Low” represents all the other countries.

TABLE 3B

 CONCENTRATION EFFECT – PERCENTAGE OF MIGRANTS BETWEEN LOW AND HIGH
 WAGES GROUPS

	<u>Low to Low</u>	<u>Low to High</u>	<u>High to Low</u>	<u>High to High</u>
2001	73	15	11	1
2002	73	15	11	1
2003	74	15	10	1
2004	72	16	11	1
2005	71	18	9	2
2006	70	19	10	1

Source: Own calculation.

Notes: “High” represents the top 5 countries in wages. The top 5 countries are Austria, Denmark, Netherlands, Norway and Switzerland. “Low” represents all the other countries.

Chart 1: Individual's decision

