Fighting Brain Drain: 
The Ecuadorian Scholarship

The existing European systems for financing Higher Education students’ mobility, mostly based on the host country principle and country of origin principle are neither sustainable nor efficient because they produce an externality known as by brain drain. In 2007, the Republic of Ecuador introduced a new scholarship program for financing Ecuadorian students intending to study abroad. This program stipulated a compulsory return to the student’s home country after the completion of their studies abroad. Statistical data shows a return rate of about 90%, which is somewhat surprising at first glance. This paper aims to analyze the mechanism design of the Ecuadorian scholarship program and introduces it as a case study in the literature.

Keywords: Brain Drain, Financing System of Students’ Mobility, Higher Education, Students’ Mobility.


Introduction

Globalization has several implications for the mobility of students and skilled-workers. Over the last decade, the phenomenon of brain drain, a clear and peculiar consequence of the current globalized world, has gained the attention of many academic researchers. Particularly interesting for people coming from developing countries, brain drain arises when the general socio-economic conditions to stay abroad (that it is typically the country in which they have chosen to study) are better than the ones in their home country. In conjunction with the increasing number of international students, the percentage of students staying in the country in which they have studied is also increasing. As argued by Lange (2010), technological changes can explain a linear rise in the stay rate since communication has become cheaper and travel costs have also reduced, allowing students and graduates in their host countries to keep in touch with their relatives and friends abroad. In fact, Van Bouwel (2010), who analyzed the migration behavior of a sample of European economics students who obtained a PhD in the US, stated that “64% are currently working in the US, whereas only 24% moved back to their home country and an additional 10% moved to another European country”.

This phenomenon is especially disadvantageous for the human capital in developing countries where the need for highly skilled workers and highly educated people is greater. Among different country specific factors, the country’s level of development determines whether a country gains or losses in terms of the brain drain effect (Docquier, 2014). As discussed by Geesen (1998), brain drain makes developing countries less competitive than developed countries. In the same way, Docquier argues, “brain drain slows
with development” but “when a return is significant, it gives incentives to other waves of returnees to come home”.  

One of the causes of the brain drain phenomenon could be attributed to a lack of efficiency in the financing systems of students’ mobility, in particular, their country of origin’s system that, as we will show later, incentivizes the brain drain phenomenon. The country of origin is often paying scholarship fees to their own students to study abroad, in the false hope of seeing those students return once they have completed their studies abroad.

Not much literature seems to exist on the causes of returning or staying after studying abroad. Of course, one could say that it is logical and it is directly related to economic possibilities and higher salaries, but this argument is not exhaustive. In this sense the work of Baruch et al. (2007) brings forward a lot of interesting evidence regarding the inclination to stay abroad after studying. In particular, they argue that “students’ perceptions of ethnic differences and labor markets, their adjustment process to the host country, and their family ties in the host and home countries all affect their intention to stay”. Combining the “push-pull” model developed by Baruch (1995) and the theory of ‘reasoned action’ by Ajzen & Fishbein (1980), they examined the attitudes and perceptions of 949 foreign students who came to study in the UK and the USA.

The Republic of Ecuador introduced a new and original scholarship program to finance Ecuadorian students intending to study abroad. The Ecuadorian model stipulated a compulsory return to the home country with the obligation of working at home for double the length of time that they spent abroad. If students don’t fulfil that condition, they have to repay the entire costs of the scholarship. In exchange, authorities help students to find a job if necessary. Statistical data shows a return rate of about 90%, which is somewhat surprising at first glance.

On that basis, this work aims to understand that apparently successful outcome and, in particular:

- Bring the Ecuadorian scholarship as a case-study in the literature of financing systems of students’ mobility;
- Attempts to analyze the mechanism design of this scholarship and see how the return conditions could be a contributing factor in solving the brain drain problem.

The paper is organized as follows. The second session introduces the Ecuadorian scholarship program in detail: data, facts, and institutions. The third session describes the country of origin principle and analyzes the mechanism design of the Ecuadorian policy. The fourth session proposes a detailed agenda for research as an extension of the Baruch’s Push-Pull Model. The fifth session concludes this study and presents some tentative lessons for the management of the higher education system on students’ mobility.

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1Ireland after the fiscal reform of 1987 and Taiwan in the 1980s (see Docquier, 2014).
The Ecuadorian Scholarship: Data, Facts, and Institutions

The Republic of Ecuador is a developing country situated in the northern area of South America with a population of around 16 million. Between 2007 and 2014, it experienced a period of significant economic growth and consequent poverty reduction. This was particularly due to the boom in oil prices.

During that period, in 2007, Ecuador introduced a new scholarship program for financing Ecuadorian students who intended to study abroad, in order to transfer knowledge back to their own country after graduation. As mentioned in the program itself, higher education is one of the fundamental pillars of the Ecuadorian development model, which has been created in order to face the main difficulties of a developing country: low-skilled workers, especially in the most sensitive and vulnerable population. Moreover, the design of this particular type of scholarship has been designed in such a way to avoid the so-called brain-drain phenomenon through a strong incentive to return to Ecuador after the completion of studies abroad.

The requirements of these programs are as follows:

- Natural person with Ecuadorian citizenship
- ≤ 35 year old for Master
- ≤ 45 year old for PhD
- Certification of admission to a foreign university
- A guarantor

The selection process includes tests that verify capacity for logic, mathematics, verbal expression, ability to write in, and knowledge of English. With a minimal result of 75% (60% for vulnerable categories), it is possible to progress to the final step, an interview that evaluates the motivation level of the candidate.

The Ecuadorian model stipulates a compulsory return (for this reason the presence of a guarantor is necessary) to their home country with the obligation of working at home for twice the amount of time spent abroad. If students do not satisfy these conditions, they have to repay the entire amount of the received scholarship plus a fixed quantity of interest. In exchange, authorities help the students to find a job, if necessary.

To better understand the functioning of that scholarship device, let us focus on Figure 1, which explains the alternatives that the student faces, once they finish their studies abroad:

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Figure 1. The Ecuadorian Scholarship Mechanism

It turns out that, *ceteris paribus*, if the student attains a good job abroad that allows them to repay the total amount of the scholarship, they will prefer to stay abroad. Vice-versa, they will prefer to return to their home country.

The amount of the scholarship (see Table 1) depends on the country of destination and it takes into account the income level of the beneficiary.

<table>
<thead>
<tr>
<th>Degree</th>
<th>Latin America and Caribbean</th>
<th>US, Canada and Australia</th>
<th>Europe, Asia and Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master (max 2 years)</td>
<td>66,000 USD</td>
<td>103,000 USD</td>
<td>108,000 USD</td>
</tr>
<tr>
<td>PhD (max 4 years)</td>
<td>162,000 USD</td>
<td>218,000 USD</td>
<td>204,000 USD</td>
</tr>
<tr>
<td>Professional Specialization in Medicine (per year)</td>
<td>38,000 USD</td>
<td>51,000 USD</td>
<td>57,000 USD</td>
</tr>
</tbody>
</table>

Source: SENECYCT.

Over the period between 2007-2018, the Ecuadorian Government funded 11,214 scholarships for both undergraduate and graduate level students: 26% to study Engineering; 23% for Health and Medical Studies; 16% to Natural Sciences, Mathematics and Statistics; 11% for Social Sciences and Communication; and 7% for IT Studies. For more detail, see Table 2.2 below.

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*SENECYCT stands for ‘Secretaría Nacional de Educación Superior, Ciencia, Tecnología e Innovación’ and is the governmental institution that promotes scientific research and technological innovation.*
Table 2. Field of Studies of Beneficiaries (2007-2018)

<table>
<thead>
<tr>
<th>Field of Studies</th>
<th>No. of students</th>
<th>% of the total number of outbound students supported by the Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering</td>
<td>2,570</td>
<td>26%</td>
</tr>
<tr>
<td>Health and Medical Studies</td>
<td>2,313</td>
<td>23%</td>
</tr>
<tr>
<td>Natural Sciences, Mathematics and Statistics</td>
<td>1,589</td>
<td>16%</td>
</tr>
<tr>
<td>Social Sciences and Communication</td>
<td>1,096</td>
<td>11%</td>
</tr>
<tr>
<td>IT</td>
<td>704</td>
<td>7%</td>
</tr>
<tr>
<td>Agriculture, Forestry, Fishery and Veterinary</td>
<td>594</td>
<td>6%</td>
</tr>
<tr>
<td>Arts and Humanities</td>
<td>533</td>
<td>5%</td>
</tr>
<tr>
<td>Business, Management and Law</td>
<td>343</td>
<td>3%</td>
</tr>
<tr>
<td>Educational Sciences</td>
<td>236</td>
<td>2%</td>
</tr>
</tbody>
</table>

Source: SENECYCT.

According to the available data (see Table 3 and 4), 43% of the beneficiaries chose a country in Europe, Asia or Africa; 35% chose a country in Latin America and Caribbean; and 22% US, Canada and Oceania.

Table 3. Destination of Beneficiaries (Region of Studies)

<table>
<thead>
<tr>
<th>Region</th>
<th>No. of students</th>
<th>% of the total number of outbound students supported by the Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latin America and Caribbean</td>
<td>3,450</td>
<td>35%</td>
</tr>
<tr>
<td>US, Canada and Oceania</td>
<td>2,209</td>
<td>22%</td>
</tr>
<tr>
<td>Europe, Asia and Africa</td>
<td>4,319</td>
<td>43%</td>
</tr>
</tbody>
</table>

Source: SENECYCT.

The preferred host countries are: Cuba (16%), Spain (15%), UK (10%), US (10%), Australia (8%). The other destinations are below 5%. It could be useful to underline the fact that in Cuba, there is a very good and well-known university of Medical Studies, ‘Escuela Latinoamericana de Medicina’ which is the best in Latin America. The fact that the second destination is Spain could be justified by a language oriented choice.
Table. Destination of Beneficiaries (Country of Studies)

<table>
<thead>
<tr>
<th>Country</th>
<th>No. of students</th>
<th>% of the total number of outbound students supported by the Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuba</td>
<td>1,611</td>
<td>16%</td>
</tr>
<tr>
<td>Spain</td>
<td>1,519</td>
<td>15%</td>
</tr>
<tr>
<td>UK</td>
<td>1,047</td>
<td>10%</td>
</tr>
<tr>
<td>US</td>
<td>1,030</td>
<td>10%</td>
</tr>
<tr>
<td>Australia</td>
<td>801</td>
<td>8%</td>
</tr>
<tr>
<td>Canada</td>
<td>376</td>
<td>4%</td>
</tr>
<tr>
<td>Russia</td>
<td>358</td>
<td>4%</td>
</tr>
<tr>
<td>Honduras</td>
<td>343</td>
<td>3%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>326</td>
<td>3%</td>
</tr>
<tr>
<td>Argentina</td>
<td>281</td>
<td>3%</td>
</tr>
<tr>
<td>France</td>
<td>276</td>
<td>3%</td>
</tr>
<tr>
<td>Chile</td>
<td>267</td>
<td>3%</td>
</tr>
<tr>
<td>Brazil</td>
<td>220</td>
<td>2%</td>
</tr>
<tr>
<td>Venezuela</td>
<td>212</td>
<td>2%</td>
</tr>
<tr>
<td>Mexico</td>
<td>211</td>
<td>2%</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>168</td>
<td>2%</td>
</tr>
<tr>
<td>Germany</td>
<td>152</td>
<td>2%</td>
</tr>
<tr>
<td>Belgium</td>
<td>130</td>
<td>1%</td>
</tr>
<tr>
<td>Portugal</td>
<td>127</td>
<td>1%</td>
</tr>
<tr>
<td>Hungary</td>
<td>124</td>
<td>1%</td>
</tr>
<tr>
<td>Italy</td>
<td>102</td>
<td>1%</td>
</tr>
</tbody>
</table>

Source: SENECYCT.

Statistical data shows a return rate of about 90%, which is somewhat surprising at first glance. Among the returnees, 34% worked in educational institutions, 18% in healthcare institutions, 15% in the private sector, and 14% for governmental institutions.

The Country of Origin Principle and the R Parameter

The existing European system for financing students’ mobility, based on the *host country principle*, is neither sustainable nor efficient since it produces too little cross-border education (Gérard 2007 and 2010, Haupt, Krieger and Lange, 2011). One of the explored alternative solutions to the current *host country principle* is the *country of origin principle*. But, as argued by the same authors, this principle still seems to be inefficient. However, the outcome of
this design is more efficient than the previous one if the probability of 
returning home after completion of studies is higher than a given threshold.\ \textsuperscript{4}

Under the assumption of a simple world consisting of two countries 
denoted by \(i\) and \(j\) respectively, the model is essentially based on the number of 
ECTS (European Credit Transfer System) obtained by the student, used as an 
indicator of the opportunity-cost related to the mobility.

The objective function of the government of country \(i\) is:

\[
W_i = f(e_{ii}, r\beta e_{ij} + (1 - r)\beta e_{ji}) - c(e_{ii} + e_{ji}) - w(e_{ii} + e_{ij})
\]

where:

\(e\) is the number of ECTS (European Credit Transfer Scale) where the first 
subscript indicates the origin country and the second one indicates the 
destination country (for studying purposes).

\(\beta \geq 1\) is the ability to contribute to wealth production.

\(c\) is the cost of producing ECTS.

\(w\) is the opportunity cost of dedicating time to getting an ECTS rather than 
contributing to current generation of local wealth.

\(r\) is the probability of returning home after the completion of the studies abroad

Under the \textit{country of origin principle}, those numbers refer to the students sent 
abroad by the country at its own expense and they are inefficient. The lack of 
efficiency of this system has to be appreciated with respect to an efficient 
benchmark that derives from the joint maximization of \(W_i + W_j\) w.r.t 
\(e_{ii}, e_{ij}, e_{jj}, e_{ji}\)^\textsuperscript{5}

\[
e^E_{d} = \frac{1}{c + w} \quad e^E_{m} = \frac{\beta}{c + w}
\]

Where the superscript \(E\) refers to efficiency and the subscript \(d\) refers to purely 
domestic students and \(m\) to internationally mobile ones.

Under the same assumptions, the equilibrium numbers of ECTS for the country 
of origin principle (O) are:

\[
e^O_{d} = \frac{1}{c + w} \quad e^O_{m} = r \frac{\beta}{c + w}
\]

Where the inefficiency comes from the presence of an externality:

\textsuperscript{4}By ‘more efficient’ they meant that the number of ECTS of foreign students is closer to that 
generated by the efficient benchmark.

\textsuperscript{5}Assuming the right concavity of the production function, that \(c\) and \(w\) are linear in ECTS, that 
countries are symmetric and that the production technology is specified by 
\(f(x,z)=\ln x+\ln z\) where \(x=ejj\) or \(eji\) and \(z=reij+(1-r)eji\) or \(reij+(1-r)ejj\).
\[ E^0 = e_m^e - e_m^o = (1 - r) \frac{\beta}{c + w} \]

Which is positive anyway and it is the gift made by the origin country to the host country and consists of a fraction 1-r of the students whom it finances the studies of, but who will remain in the host country and be productive in that latter jurisdiction (it is easy to understand when we know that the stay rate in the USA is around 70% for international students). This phenomenon of brain drain is particularly important when students from developing countries decide to study in a university in a developed country.

The question that arises at this point is the following: starting from this country of origin model, could we reduce the positive externality by increasing our parameter \( r \), the probability to return home after the completion of studies abroad? The answer is positive and comes from an existing model that provides a quasi-compulsory return to the home country. This is the Ecuadorian Scholarship model, inspired by other similar models (for example, the one applied to the USA military force). It is then possible to eliminate the ‘free-riding’ phenomenon described by Gérard (2012): a country, which may have the studies of the further contributors to its own GDP, financed by taxpayers of the other country.

Coming back to the country of origin model\(^6\), it turns out that if the Ecuadorian model is efficient and then capable of achieving a targeted return rate \( r^* \) of about 0.90, the analyzed inefficiency:

\[ e_m^e - e_m^o = (1 - r^*) \frac{\beta}{c + w} = 0.1 \frac{\beta}{c + w} \]

will be close to zero and completely eliminated as \( r^* \to 1 \).

But what is the probability for a student who has completed their studies abroad of returning to their country of origin? And how could that probability change with the presence of a constraint such as the one provided by the Ecuadorian scholarship program?

In an attempt to answer this question, I describe the ‘Ecuadorean Student Behavior’ by a simple variation of the migration model proposed by Borjas (1987) and repurposed by many authors like Clark et al, 2004. Note that the focus here is only whether to stay abroad or return back home after studies.

Let us suppose that a student \( i \) resident of country of origin \( O \) and studying in host country \( H \), has to decide whether to go back after they complete their studies. Let us suppose that for studying abroad they received a constrained ‘Ecuadorean-scholarship’ \( S \). The probability that the student will stay abroad (in the host country) is:

\[ U_i = w_H(s_i)(1 - \rho_i) + w_O(s_i)\rho_i - \frac{c^2}{2} (1 - \rho_i)^2 \]  

\(^6\)Let us suppose that \( c \) includes the fine cost.
2019-3424-AJBE-COLEDU

\[ U_p = -w_H(s_i) + w_O(s_i) + c^2(1 - \rho_i)S = 0 \]

\[ Sc\rho_i = Sc^2 + w_O(s_i) - w_H(s_i) \]

\[ \rho_i = 1 + \frac{w_O(s_i) - w_H(s_i)}{c^2 S} \]

Where

- \( \rho_i \) is the probability of returning home.
- \( w_H(s_i) \) is the discounted value of host country’s salary, which depends on the students’ skills \((s_i)\).
- \( w_O(s_i) \) is the discounted value of country of origin’s salary.
- \( S \) is the amount of the scholarship received + interest.
- \( c \) is a ‘stay-cost’ (adaptability, cultural difference etc).
- We can see that, for a given skill level:
  - Higher wage rates in the host country and lower mean wages in the country of origin increase the return rate.
  - Higher stay costs increase the return rate.

So, the probability that a student who studied abroad returns home after graduation increases with the difference between the country of origin’s wage and the host country’s wage. Since this difference is likely to be negative (because we suppose that the student chose to study in a ‘richer’ country), the probability of returning home is higher in the presence of an Ecuadorian constraint.

An Agenda for Research: the Push-Pull Model

The Baruch (1995) push/pull model, used to explain the phenomenon of international migration, describes the forces that push or pull one or another decision: namely, whether to stay, or to migrate. The final decision will be a weighted combination of the nature and the direction of these forces. Baruch identifies two main categories that influence the decision: the person’s environment and their societal context, and target environment. In particular, the personal environment includes personal values, needs, preferences and aspirations, as well as political, social and economic factors, while the target environment will be represented by culture, the legal system, and economy etc. (see Figure 2).
Baruch et al. (2007) developed a new model combining the push-pull model with the theory of reasoned action of Ajzen and Fishbein (1980) for emigration. The theory states that the students’ decision to stay or return to their home countries after studies will be “positively related to their inclination to do so, which, in turn, will be affected by their attitudes. Different factors influence that inclination; for example, culture-shock” (Lee and Mauer, 1999), the “adjustment process when moving to a different culture” (Shay & Baack, 2004), “the students’ orientation programs” (Martin and Dixon, 1994), and “their level of satisfaction with the university” (Baruch et al., 2007).

Vaiman and Haslberger (2010) argue that another environment has emerged over the past few years: the transnational context. In particular, “whereas before it was a matter of weighing up the advantages and disadvantages of staying vs (temporarily) migrating, now it is also a matter of the advantages and disadvantages of mobility in general (not a particular geography)”. As they explain, the fact of having a ‘mobile background’ nowadays represents a positive quality on a worker’s Curriculum Vitae. So the decision to move could be influenced by this factor.

In particular, in their work, Baruch et al. examined the reasons for international students’ inclination to stay in their host countries from a sample of 949 management students in the UK and USA. Among this variety of factors (see Figure 3), their results support what they call a ‘three-fold model of factors’ that influences the final decision: student’s perceptions of ethnic differences and labor markets, their adjustment process to the host country, and their family ties in their host and home countries.
As discussed in chapter 3, the Ecuadorian Scholarship model analysed could be a potential candidate for an efficient students’ mobility financing system, since empirical data shows a return rate of 90%, which is a key-parameter once we move to a country of origin principle financing system. This could be a possible solution to the brain drain issue, especially significant for developing countries.

As explained, the achievement of a high return rate could be explained by the presence of a compulsory return of the entire scholarship funding in the case the student decides to stay abroad after the completion of their studies. In terms of the push/pull model, the presence of the scholarship could be a key push-factor (in the sense that it ‘pushes’ the decision to return) that will positively influence the final decision to return to the country of origin. Then, the hypothesis to be tested in further research in the empirical model will be the following:

A scholarship with constraint, i.e. a compulsory return to the country of origin after the completion of studies abroad, will be positively associated with the intention of the foreign student to return to their country.

If this hypothesis is empirically confirmed, we can affirm that a country’s financing system that grants a scholarship obliging the students to return after the completion of their studies, such as the Ecuadorian model, increases the return rate, internalizing the positive externality, which is generally produced by the standard country of origin principle financing system.

The extended push/pull model to the Ecuadorian system will consider, among the other factors, the presence of this important constraint: the scholarship. I propose then the following model to be tested (Figure 4).
Figure 4. The Ecuadorian Push/Pull Model.

The main idea for the empirical part is to test whether the presence of this constraint represents the main push-factor for the Ecuadorian students who decided to study abroad using the government scholarship.

Conclusions

Globalization has several implications for the students’ and skilled-workers’ mobility and fosters the phenomenon of brain drain that, as discussed, is especially disadvantageous for human capital in developing countries.

We have seen that, although the country of origin principle seems to be more efficient than the host country principle, it still produces an externality represented by a brain drain. I proposed a new study case with a detailed analysis of the Ecuadorian financing system of students’ mobility that introduced an important incentive to return home once graduated. In theoretical terms, I have shown what follows, which constitutes a tentative lesson for public policy. The probability that a student who studied abroad goes home after graduating increases with the difference between the country of origin’s wage and the host country’s wage. Since this difference is likely to be negative (because we suppose that the student chose to study in a ‘richer’ country), the probability of returning home is higher in the presence of an Ecuadorian constraint. So it seems that the Ecuadorian device is a strong incentive that fosters the return rate and fights the brain drain phenomenon.

I finally introduced an agenda for research introducing the push-pull model, and am proposing a new extension that includes the scholarship as a pull-factor. More about this data needs to be said in order to test whether the presence of the scholarship constitutes a pull-factor for Ecuadorian students.
References


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