# ECONSTOR 

# Conference Paper <br> Human Capital Concentration and the Place-Based Policies in Chile 

55th Congress of the European Regional Science Association: "World Renaissance: Changing roles for people and places", 25-28 August 2015, Lisbon, Portugal<br>Provided in Cooperation with:<br>European Regional Science Association (ERSA)

Suggested Citation: Aroca, Patricio; Eberhard, Juan Pedro (2015) : Human Capital Concentration and the Place-Based Policies in Chile, 55th Congress of the European Regional Science Association: "World Renaissance: Changing roles for people and places", 25-28 August 2015, Lisbon, Portugal, European Regional Science Association (ERSA), Louvain-la-Neuve

This Version is available at: http://hdl.handle.net/10419/124818

## Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

[^0]
# Human Capital Concentration and the Place-Based Policies in Chile 

Patricio Aroca, Universidad Adolfo Ibáñez, Business School, Chile<br>Juan Pedro Eberhard, Universidad Adolfo Ibáñez, Business School, Chile<br>Diego Pereira, Universidad Adolfo Ibáñez, Business School, Chile


#### Abstract

Chile is one of the most concentrated country in the world. Most of the 40 percent of the population live in the capital city, Santiago, where around 45 percent of the GDP is produced. At the same time, most of the policies promoting welfare are focus on people and they are spatially blind.

This paper shows how the current array keeps concentrating people, especially with potential high human capital, around Santiago, and assesses whether this happened for difference in quality of life and opportunities or difference in the quality of the universities.

The data available on individuals, who end the high school and take the university admission test, that lets students applying to the university and program that they wish to go, allows identifying the region of origin of the students, the region where the university that they apply is located and where they were selected. Three programs are chosen for this study given the quantity of people that apply to them and because they are available across different cities in the country are pedagogy, engineering and physician.

In addition, in Chile they are more than 60 universities, however only the traditional 25 are the one that use this selection system for the period of this study that goes from 2006 to 2009. Recently some new universities have get into the system.

Assuming that most of the students end up working around the city where they got the degree, we use an aggregate discrete choice model to develop a methodology that consist in following the destination of the students who got the best scores in the university admission test. Those students can choose any university in the country, and the majority prefers to go to those in the capital city. Contrasting with these results, lower scores have an inverse pattern.

When we test if it is explained by the difference in the quality of life between cities versus the differences among the quality of the universities, the former has a larger explanatory power, which bring back the discussion if the policy should be oriented to place or people. It means, that will not be enough focus on increase the quality of the universities across the territories to attract better student to universities outside Santiago. It will need and strong complementary policies making those cities more interesting for the potential high human capital applicant.


## Introduction

Chile presents significant concentration around the Metropolitan Region, which is home to over $40 \%$ of the nation's population. In addition, nearly $45 \%$ of the total GDP is generated in that territory, and over $50 \%$ of the country's professionals live in Santiago.

The problem is not one of concentration but rather one of potential overconcentration that would move past optimal levels and the benefits related to agglomeration economies, aggravating existing regional disparities. Atienza and Aroca (2013) show that in recent literature, Chile has been described as a country with excessive concentration. This has negative impacts on the country's economic growth and generates differences among the territories' standards of living, which results in an increased resentment in the affected regions and encourages those who live there to use non-institutional routes to call attention to local problems (Armstrong and Taylor, 2985). Recently, Calama, Freirina, Aysén, Punta Arenas, Chiloé and other communities have seen the development of social protest movements that serve as indicators of these regional disparities.

One of the mechanisms of concentration around Santiago is school choice at the university level. Top-scoring secondary school students choose the best universities and/or regions where there are attractive job opportunities and good quality of life. The Metropolitan Region is the territory that meets those conditions. Orsuwan and Heck (2014) show that the likelihood of living in a territory increases when the person has completed their university studies in that region. As such, if the best students outside of Santiago are attracted to that region, one can expect that they will look for work in the capital when they graduate. This attraction of high potential from rural regions is called "brain drain" in the literature.

Following this line of inquiry, this study explores the migration decision that high school students must make when they choose their study program and the region where they will attend college. This is understood as a concentration mechanism for potential qualified human capital. We also explore whether this phenomenon is due to factors that are unique to the territories or differences in the quality of the universities.

Using the discrete choice theory in the context of the maximization of random utility, a model was developed that evaluates the ratio of the aforementioned factors by region of destination over region of origin. In order to estimate this model, a probit was used for aggregate data on the applications of selected students in Engineering, Medicine and Education, who given their characteristics represent the full range of scores.

The results obtained show that as the PSU scores earned by the students selected from the three fields increase, the attributes of the universities such as quality and tuition costs become less relevant for the decision to study outside of one's home region. Rather, these students are attracted by the characteristics of the region, measured as the feasibility of finding a job there.

This study is organized as follows: the next section will provide a brief description of Chile's higher education system and the various experiences in which the "brain drain" problem has been addressed in the United States. Section 3 presents a conceptual framework of the model that will be used to estimate the mechanism of concentration based on student migration. Section 4 describes the data that will be used to illustrate this phenomenon. Section 5 shows the results of the estimate, and Section 6 presents the conclusions.

## Earlier Experiences and Literature Review

## Chile's Higher Education System (MINEDUC, 2012)

Chile's higher education system is divided into three types of institutions: universities, professional institutes (IP) and technical training centers (CFT). Universities offer undergraduate programs that last for five or more years, as well as master's degrees and doctorates. CFT and IP programs last for two to four years. There are currently 25 universities that belong to the Rector's Council (Consejo de Rectores, CRUCH). These are called "traditional universities" and include both private and public institutions. Chile also has 45 private universities called "non-traditional universities."

When students finish their fourth year of high school, they have the option to register for the University Selection Test (PSU), an admission requirement for some educational institutions that is combined with a score equivalent to the high school grade point average (NEM). The PSU evaluates the knowledge acquired during the four years of high school and includes mandatory Language and Communications and Mathematics tests, as well as optional tests in History and Science (specifically Biology, Chemistry and Physics). The selection of optional tests depends on the program to which the student plans to apply. In 2012, the weighting of the student's rank within their grade level was added to the set of factors considered in the admissions process.

The Department of Student Evaluation, Measurement and Registry (DEMRE) is the institution responsible for the admissions process of the 25 Rector's Council universities and the development, construction and application of the PSU. In 2011, eight private nontraditional universities were added to the institution's admissions process.

In 2006, the Law to Ensure Quality Higher Education was created, which promotes accreditation of higher education institutions and supervises the licensing of new institutions. This law covers issues related to teachers, study programs, economic resources availability and other matters and is meant to ensure that schools are autonomous and able to grant technical or professional degrees. The National Accreditation Council (CNA) accredits institutions, which voluntarily participate in this process in order to certify their quality in terms of infrastructure and the study programs offered.

Universities set their fees for each program on an annual basis, in addition to a tuition paid by each student or guardian. However, there are benefits such as scholarships and credits for students who perform well on the PSU or lack the necessary resources to finance their studies. These benefits are provided by the State or the universities.

## "Brain drain"

The brain drain phenomenon has traditionally been related to the attraction of highly qualified human capital from developing countries to developed ones (Gibson \& McKenzie, 2011). However, this concept has recently been applied to the analysis of student behavior regarding which institution and territory they choose to complete their advanced studies (Orsuwan \& Heck, 2004; Sapra, 2013). It has also been broadened to consider the decisions made by professionals and recent graduates in regard to the territory that is most attractive to them in terms of developing their careers (Kodrzycki, 2001; Ishitani, 2011; Williams and Dreier, 2011).

Within this last line of inquiry, Sapra (2013) studies the decisions made by secondary students in the United States regarding where they enroll in tertiary studies (college). Using data from the Educational Longitudinal Study (ELS, 2002), which contains information regarding where the students who graduate from high school enroll in college, the author shows that better students tend to leave their state of origin and are not likely to return. States with higher high school student emigration rates tend to have brain drain problems because they lose their brightest students.

Ishitani (2011) was the first to engage in the effective monitoring of high school graduates by considering the state in which they decide to continue their studies and then decide to work. This study uses two databases to track individuals: the National Educational Longitudinal Study (NELS: 88/2000) and the Postsecondary Education Transcript Study (PETS, 2000). The latter includes detailed information on the schools from which the NELS respondents graduated. It was found that higher income families are more likely to enroll their children in higher education institutes outside their home states. This is also true for families where both parents have a university degree. Higher levels of per capita income also contribute to student migration. The likelihood that the student will return after college decreases when the student completes a doctorate and when the region where the university is located has a higher per capita income than the region of origin.

Kodrzycki (2001) explored where college graduates live five years after they finish their studies. Using data from the National Longitudinal Survey of Youth (NLSY), the study determined that individuals migrate for individual reasons rather than labor conditions when they finish their university studies. In other words, their preferences regarding the characteristics of the location (specific job offers, interpersonal relations, etc.) are more important. However, it is vital to note that the cost of housing, salaries, amenities and labor supply are also important factors for these decisions.

The interesting aspect about this study is that it not only analyzes the state of the individual who completes their university education. It also considers the data based on the state where the student finished high school, given that as we have seen, the place where one completes college and high school may vary. This study compares the behavior of the two types of graduates. This is one of the first studies to include amenities and proximity to a coast, average maximum wind speed, average number of sunny days and average number of warm days of each state in addition to variables such as race, gender and state characteristics.

Budgetary restrictions also impact the decision to migrate. Unfortunately, this study does not contain information about this, but articles such as the one authored by Orsuwan and Heck (2004) explore the impact of the implementation of the merit scholarship system on the decision to study in one's state of origin among students who could opt for this type of benefit. If the state of origin implemented these scholarships, the proportion of students who decided to stay increased considerably, given that this was a requirement for accepting the resources. This also caused the emigration rate of the students in the states that implemented the policy to decrease over time. Other authors (Ishitani, 2011; Williams and Dreier, 2011) have studied this sort of financial aid and have reached similar conclusions.

## Theoretical Framework

## Modeling

In order to better understand this mechanism of concentration, an aggregate model shall be presented based on the total number of high school students who move to different regions of the country in order to attend university. Below we explain how this aggregation is possible based on an individual mode.

When the student decides to enter the higher education system, he or she has a set choice of universities and study programs. This set is limited by the application requirements for each school and program. Given that the set choice limitations do not include geographic criteria, the student not only chooses the institution where they wish to study, but also the geographic place according to its location.

Studying an individual's choice regarding where they will continue their studies involves modeling their preferences in order to analyze how the aforementioned factors can influence them. The consumer theory represents these preferences through functions of utility, which include all the elements that will determine which option is chosen.

The heterogeneity in the unobservable characteristics of the individuals can be problematic. But this is due to the fact that individual preferences or the way in which the different factors come together or how much information one has about the attributes of the universities and regions may vary from one individual to the other. The Random Utility Maximization Model (Marshack, 1960, McFadden, 2001) takes up this problem by approaching the form of the original utility in a different way, dividing it into a determinate component and a random error:

$$
\begin{equation*}
U_{i j n}=V_{i}\left(W_{n}, Z_{j}, S_{j}\right)+\varepsilon_{i j} \tag{1}
\end{equation*}
$$

where $W_{n}$ is the individual's set of characteristics, i is the region of origin and j the region of destination. $Z s$ represent the set of characteristics of the regions, such as regional GDP,
unemployment rate, quality of life, etc. $S$ s represent the set of attributes of the university or universities in the regions such as their quality and fees. Finally, $\varepsilon_{i j}$ is a stochastic error that can have multiple sources (Manski, 1973). The deterministic part reflects the common optimal decision for all individuals, and the random error allows one to reconcile the fact that two optimal decisions of individuals with similar characteristics may be presented as two completely different alternatives.

A dichotomic indicator $I$ is defined for the decision to study in a region other than the region of origin:

$$
I=\left\{\begin{array}{l}
1 \text { if the person studies in a region other than the region of origin } \\
0 \text { studies in the region of origin }
\end{array}\right.
$$

In this model, the likelihood of studying in a region other than the region of origin will be equal to the likelihood of the utility that this alternative reports over staying in the region of origin. This process is described in:

$$
\begin{aligned}
& \mathbb{P}(I=1)=\mathbb{P}\left(U_{j n}>U_{i n}\right) \\
& =\mathbb{P}\left(V_{j n}+\varepsilon_{j}>V_{i n}+\varepsilon_{i}\right) \\
& =\mathbb{P}\left(\varepsilon_{i}-\varepsilon_{j}<V_{j n}-V_{i n}\right)
\end{aligned}
$$

Where the expression of the original utility was replaced and the stochastic part of the determinist was organized. Then, the likelihood that an individual will study in a different region can be represented as:
(2) $\mathbb{P}(I=1)=F\left(V_{j n}-V_{i n}\right)$
where F measures the behavior of the random errors. The decision to choose a region other than the region of origin shall be evaluated by the differential between the utilities reported by the characteristics of the regions and the attributes of the universities. Assuming that the individual characteristics may be separated, they have an additive form in the function of
utility ${ }^{1}$ and are invariants in the evaluation of which region to choose to study. By conducting the differential between the indirect utilities, this factor is naturally removed, so the decision to choose a region where to study will be made based on the characteristics of the regions and the attributes of the universities (3).
(3) $\mathbb{P}(I=1)=F\left(V_{j}-V_{i}\right)$

## Contrast of Hypothesis

In order to prove the hypothesis of this work, the Aroca and Hewings (2002) methodology will be used. Migration matrixes (Table 3.1) will be created that relate the region of origin and the destination and estimate the likelihood of studying in a region other than the region of origin. We will use an aggregate model to study how the factors assessed influence migration among regions. For this, we will add the individual probabilities in order to calculate the fraction of individuals who migrate. In that aggregation, it is important to assume that the individual utilities are independent.

## Table 3.1. Migration Matrix

| $j / i$ | Region of Origin |  |
| :--- | :--- | :--- |
| Destination  <br> Region  <br>   <br>   |  |  |

Given that the data used to estimate the probability of studying in a region other than the region of origin represent all applicants within the analyzed period, the information is censual in nature. Based on these data, it is possible to calculate the empirical likelihood as

[^1]the ratio between the people who choose to study in a region j and the total of the region of origin.
(4) $\frac{M_{i j}}{M i} \approx \widetilde{P_{l j}} \quad \forall j$

This ratio (4) is found in the migration matrix, as each $M_{i j}$ cell represents all the applicants from region i who migrate to region $\mathrm{j} . M_{i}$ are all the applicants who belong to a region of origin i. Integrating the approximate to (3), the probability is shown as:
(5) $\widetilde{P_{l \jmath}}=F\left(V_{j}-V_{i}\right)$

Where the empirical probability for grouped data is equal to the initial function for each individual.

Returning to the migration matrix, each $M_{i j}$ cell represents a homogeneous subgroup of the total population. This definition allows using the Berkson method (Ameniya 1985, BenAkiva and Lerman, 1985) for the estimation of the model under minimum weighted squares. As F is a function of accumulated distribution, it is possible to invert it, leaving it as:

$$
\begin{equation*}
F^{-1}\left(\widetilde{P_{l \jmath}}\right)=V_{j}-V_{i}=\alpha\left(\frac{z_{j}}{z_{i}}\right)+\beta\left(\frac{s_{j}}{s_{i}}\right)+\varphi \tag{6}
\end{equation*}
$$

Where the differential of the utilities can be lineally approximated as a Taylor series and $\alpha$ equals the coefficients that explain the characteristics of the regions and $\beta$ the attributes of the universities plus an $\varphi$ error. This method will cause the proportion of each $M_{i j}$ cell to be used for the estimation of the likelihood of choosing a region to study.

Assuming that the errors are independent from one another, the sum of these by central theorem limit approaches a normal distribution. This allows using the following probit model:

$$
\begin{equation*}
\Phi^{-1}\left(\widetilde{P_{l \jmath}}\right)=V_{j}-V_{i}=\alpha\left(\frac{z_{j}}{z_{i}}\right)+\beta\left(\frac{s_{j}}{s_{i}}\right)+\varphi \tag{7}
\end{equation*}
$$

## Data and Stylized Facts

## Applications

In order to explore how students choose which program/university they wish to be accepted in, it was necessary to design a system that shows the preferences of the applications and integrates the individuals' specific characteristics.

The data to be used represents the admissions processes of the universities that were part of the Rector's Council between 2007 and 2009. The sample contains information for 1,323,475 applications. The data includes the student's preferences regarding study programs, the university that accepted the student and the universities to which the person applied, the person's region of origin (in this case linked to the high school where they studied), the weighted score earned and at a disaggregated level for each test, plus the high school grades (NEM) score and the grade point average upon graduation. The data also includes information regarding the high school that the student attended, individual characteristics of their socio-economic level, family information, and the location of the applicant's domicile.

For the period analyzed, a total of 950,952 and 942 programs were offered by the universities, respectively. Each institution's offer ranges from 18 to 86 programs. However, in this article we will only consider three programs: Medicine, Engineering and Education. Annexes A, B, C and D present the data for each program by number of applicants, number of students accepted and the PSU score limit that would reflect the students' ability. Given that Chilean universities offer various types of engineering and education programs, these study programs were unified under a single name for each field.

Tables 4.1, 4.2 and 4.3 show the average PSU score of the applicants, selected students and selected students from outside the Metropolitan Region by year, as well as the standard deviation and minimum and maximum score selected for the programs. The type of students that each program captures is clear from the data. Note that the average score of the selected students for each study program drops nearly 10 points when students from Santiago are excluded.

Table 4.1. Medicine

| Year | PSU <br> Average <br> Applicants | PSU <br> Average <br> Admitted | PSU <br> Average <br> Admitted <br> from non <br> MR) | SD | PSU <br> Min | PSU <br> Max |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| 2007 | 671,80 | 751,50 | 746,22 | 24,14 | 706,7 | 826,2 |
| 2008 | 674,18 | 752,89 | 746,31 | 26,44 | 710,2 | 827,9 |
| 2009 | 673,69 | 754,43 | 749,09 | 26,34 | 706,9 | 823,5 |

Generated by the author using data from DEMRE.

Table 4.2. Engineering

| Year | PSU <br> Average <br> Applicants | PSU <br> Average <br> Admitted | PSU <br> Average <br> Admitted <br> from non <br> MR) | SD | PSU <br> Min | PSU <br> Max |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| 2007 | 586,65 | 607,79 | 594,80 | 69,67 | 415,5 | 830,7 |
| 2008 | 588,61 | 606,62 | 595,14 | 70,58 | 414,2 | 835,4 |
| 2009 | 586,61 | 611,56 | 600,30 | 68,26 | 450 | 833 |
| Generated by the author using data from DEMRE. |  |  |  |  |  |  |

Table 4.3. Education

| Year | PSU |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | PSU <br> Average Applicants | PSU <br> Average <br> Admitted | Average Admitted (from non MR) | SD | $\begin{aligned} & \text { PSU } \\ & \text { Min } \end{aligned}$ | PSU <br> Max |
| 2007 | 548,76 | 575,76 | 566,79 | 46,70 | 432,4 | 764,3 |
| 2008 | 549,50 | 571,72 | 562,45 | 46,89 | 428,4 | 792,4 |
| 2009 | 549,99 | 574,34 | 656,79 | 45,50 | 420,8 | 749,3 |

For Medicine, the applicants with the highest scores are admitted and there is a small variation among the scores. For Engineering, the variation can be explained by the number of study programs offered by each school. However, the average score is over 600 points for the students selected and there are students with top national scores who apply to these programs. Given the inclusion of all programs under the heading of Engineering and observing the average, maximum and minimum scores of the selected students, it is the study program that best represents the distribution of scores. These programs can capture students with scores between 500 and 550 points, as well as students with the highest scores ( 750 to 850 points).

The case of Education is similar to Engineering because it covers all types of programs linked to that field. However, the deviations are smaller than those observed for Engineering and the average for selected students is under 600. In addition, for the period observed, no selected students had a weighted score over 800 , unlike in the case of Engineering and Medicine.

## Quality

In this case, using quality indexes that contain information on the selection of students, for example, the average PSU score data of the students enrolled in a university, is problematic because the endogeneity of these decisions would contaminate the estimates of the empirical model. As such, in order to integrate the quality of education into the model, the indicators should reflect the level of teaching and research and the relationship with the surroundings of each institution. In other words, they should be quality indexes that are not affected by the students' decision to enroll in a specific institution.

In Chile, this data is collected by the National Accreditation Council during the accreditation processes of each school. The information for the Rector's Council universities was gathered considering the years for which they were accredited during the period analyzed and the areas in which they were accredited. Information obtained from the

National Council on Education was also used, including tables that contain data such as the fee structure of the programs by university.

## Localization

In order to determine the effect of each region's characteristics, data from the 2006 National Socio-economic Characterization Survey (CASEN) was used. Researchers used data on the main occupation's income for each type of program analyzed, that is, for engineers, doctors and teachers. This is because when a person chooses a program, he or she thinks about how much a professional in that field will earn.


Developed by the author using DEMRE data.
Figure 4.1. Behavior of students with PSU scores above 700
In addition, the number of persons working per one million inhabitants was obtained for each region. This will serve as a proxy for identifying the territories with greater opportunities for finding work. The quality of life was determined based on the work of López and Aroca (2012), where they estimate the inflation of housing prices in various regions. This data allows exploring region characteristics such as amenities and cost of living.

## Student Movement in Various Regions

Figure 4.1 shows the percentage of students who obtained scores above 700 on the PSU in regions other than the capital and who migrated from their region of origin. It also shows how many of those students choose the Metropolitan Region to develop their talents and receive professional training. The line represents the regional GDP. It is easy to see that as regions generate more resources, migration decreases. We will consider which aspect of regional development decreases the likelihood of studying in a region other than the region of origin in greater detail.

For example, Regions V and VIII have the greatest regional GDP outside of the Metropolitan Region and the smallest percentages of migrants. From these, fewer than 30\% choose to live in Santiago. This may be due to the fact that the quality of their universities is comparable to that of Santiago. Top universities in these regions include Universidad Técnica Federico Santa María, Universidad de Valparaíso and Universidad de Concepción, respectively. The opposite is true for students who earn scores below 550 on the PSU. These students tend to stay in their region of origin. Of those who migrate, less than $2 \%$ from each region head to Santiago.


Developed by the authors using DEMRE data.

Figure 4.2. Behavior of students from Santiago

On the other hand, the Metropolitan Region (Figure 4.2) presents results that "mirror" those presented above. Of those who obtain a score of 550 or lower, $89.4 \%$ migrate to other regions (with $97 \%$ staying in Santiago, Fig. 4.1). In other words, students from rural areas who earn high scores go to Santiago, while those who obtain low scores in the capital migrate to other regions.

This reorganization of students implies that a great majority of students with high scores end up studying in Santiago. As we noted before, it is quite likely that they will remain there once they finish their studies. Rural regions receive students with lower scores who may enter their job markets. This process increases the disparity in the distribution of students with high potential and favors their concentration in the capital.

## Model Estimate

## General Results

The following section describes the results obtained from the estimates for Engineering, Education and Medicine programs. Again, the equation for the estimate is:

$$
\Phi^{-1}\left(\widetilde{P_{l j}}\right)=V_{j}-V_{i}=\alpha\left(\frac{Z_{j}}{Z_{i}}\right)+\beta\left(\frac{S_{j}}{S_{i}}\right)+\varphi
$$

Where $Z \mathrm{~s}$ represent the unique characteristics of the region and $\mathcal{S}$ the attributes of the universities. The ratio between the region of destination and the region of origin is evaluated for each variable.

The regression is estimated with the following controls: Housing prices as an approximation of the cost of living in the regions; Main Occupation Income as an approximation of the expected income for those who graduate from each type of program; Number of Employed Individuals, measured to examine the feasibility of being hired in a region; Tuition Fees as an approximation of the cost of enrolling in a program; and

Maximum Accreditation as the best institutional quality option the student will have access to. These controls allow exploring the factors associated with migration flows, presenting an estimate that includes Santiago as a destination region.

Finally, the marginal effects calculated as the elasticities associated with each variable over the difference between the regions evaluated are presented in order to elucidate the influence of the factors analyzed on the likelihood of studying in a region other than one's region of origin.

Table 5.1 Estimated Model

| VARIABLES | Education |  | Ingineering |  | Medicine |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | (1) | (2) | (3) | (4) | (5) | (6) |
|  | $>450$ | >550 | >600 | >650 | >720 | >740 |
| Housing Price | -0.0415 | -0.609 | 0.138 | 1.089* | -0.285 | 0.622 |
|  | (0.322) | (0.408) | (0.385) | (0.561) | (0.391) | (0.746) |
| Main Occupation Income | 0.743 | 0.864 | 0.355 | 0.666* | -0.0882 | 0.181 |
|  | (0.453) | (0.541) | (0.278) | (0.342) | (0.129) | (0.232) |
| Number of Employed Individuals | -0.0224 | -0.00720 | 0.0160** | 0.0163* | 0.0517*** | 0.0490*** |
|  | (0.0181) | (0.0187) | (0.00655) | (0.00830) | (0.0113) | (0.0169) |
| Tuition Fees | -0.362* | -0.586** | -1.106 | -1.837 | 1.247 | 1.259 |
|  | (0.185) | (0.227) | (0.901) | (1.146) | (0.825) | (1.177) |
| Maximum Accreditation | 0.643*** | 0.765*** | 0.722*** | 0.692*** | -0.0318 | -0.535 |
|  | (0.163) | (0.191) | (0.188) | (0.242) | (0.551) | (0.926) |
| Constant | -3.311*** | -2.742*** | -2.513*** | $-2.733 * *$ | $-2.887 * * *$ | -3.419*** |
|  | (0.395) | (0.468) | (0.854) | (1.089) | (0.695) | (1.007) |
| Observations | 107 | 96 | 94 | 62 | 42 | 25 |
| $\mathrm{R}^{2}$ | 0.204 | 0.275 | 0.379 | 0.483 | 0.650 | 0.713 |

The results of the model estimation are presented in Table 5.1. The table presents data obtained for Education, Engineering and Medicine, organized as described above in order
to represent the best score distribution for the characteristics of each program. The estimate was conducted for various cohorts of scores, but only the most illustrative for each program are presented here.

As one can see, as the PSU score in the estimate increases, the characteristics linked to the quality of the universities (fees and maximum accreditation) cease to be relevant. As such, for students with low scores, the decision to study in a different region depends on the quality and cost of the program. For medium scores, both regional and institutional characteristics are important when making the decision to migrate. In this case, the cost ceases to be relevant. Finally, for those who earn the highest scores, only factors associated with the location, measured as the feasibility of being hired, can explain movement to regions where these characteristics are more attractive.

## Marginal Effects

This section presents the marginal effects associated with the estimate for each program type. These effects are calculated as elasticities associated with the controls in order to analyze the impact of the $1 \%$ increase on the factors and explore the influence this percentage change can have on the likelihood of studying in a different region.

Table 5.2 shows the marginal effects for each program type and variable associated with the regional characteristics and attributes of the universities. One can see that both quality and cost are sensitive to any change in these variables. For both low and high scores, the expected income and cost of living in the region are also elastic in their marginal change, though they are much less significant ( $90 \%$ ).

The feasibility of being hired, which is a measurement linked to the characteristics of the place, turns out to be inelastic for those with high scores and a percentage of those with medium scores, though when its coefficient increases, the score "gains" elasticity. In other words, even if the conditions are improved in the other regions where this measure is not so
attractive, the mitigation of the concentration, for example, in the Metropolitan Region where this measurement is better, will only be observed in the long term.

Table 5.2 Marginal Effects

| VARIABLES | Education |  | Ingineering |  | Medicine |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | (1) | (2) | (3) | (4) | (5) | (6) |
|  | >450 | >550 | $>600$ | >650 | >720 | >740 |
| Housing Price | -0.114 | -1.663 | 0.363 | 2.311* | -0.671 | 1.240 |
|  | (0.886) | (1.119) | (1.009) | (1.208) | (0.926) | (1.488) |
| Main Occupation Income | 2.045* | 2.327 | 0.940 | 1.495* | -0.262 | 0.476 |
|  | (1.243) | (1.455) | (0.734) | (0.774) | (0.387) | (0.605) |
| Number of Employed Individuals | -0.162 | -0.0510 | 0.140*** | 0.158** | 0.396*** | 0.460*** |
|  | (0.138) | (0.134) | (0.0512) | (0.0708) | (0.0817) | (0.150) |
| Tuition Fees | -1.030* | -1.641** | -2.766 | -3.991 | 2.809 | 2.427 |
|  | (0.537) | (0.663) | (2.260) | (2.514) | (1.866) | (2.289) |
| Maximum Accreditation | 1.896*** | 2.282*** | 2.046*** | 1.802*** | -0.0741 | -1.121 |
|  | (0.474) | (0.560) | (0.517) | (0.599) | (1.283) | (1.957) |
| Observations | 107 | 96 | 94 | 62 | 42 | 25 |

## Conclusions

The goal of this study was to elucidate the factors that influence migratory flows of students from one region to another in order to explain one of the causes for the concentration of qualified human capital in Chile. The estimate of the models shows that the characteristics associated with the regions, measured as the expected income of the students, cost of living and feasibility of being hired in a region, consistently affect the likelihood that the individuals with good scores will study in a region other than their home region more than the factors associated with the quality of education.

The comparison between Engineering and other majors allowed us to observe the heterogeneities between the migratory flows of these three types of students. As we noted, Engineering is most representative of the population because when we standardize all the types of programs in this field it covers selected students with low scores as well as an important number of students with the best scores for the years considered. This made it possible to compare the heterogeneity within a single field and compare it to Education and Medicine.

In addition, given the changes that have taken place in the regulations regarding higher education institutions and the increase in the quality of the universities, those who are selected with low scores and a portion of those with middle scores may decide to study in a different region. If higher education becomes free, only those with low scores will change their behavior, gaining the opportunity to migrate in order to study in a different region.

The results of the model estimate suggest that policies aimed at the best students, such as tuition scholarships designed to keep those individuals in their regions of origin, will not mitigate the concentrating effect in Santiago. This is due to the fact that, based on the estimates, factors linked to the place are more important to them. As such, in order to mitigate the concentration of human capital, incentives and the improvement of the conditions in these territories must be considered, as should the improvement of job opportunities and the offer of basic services in regions outside the capital.

## REFERENCES

Amemiya, T. (1985). Advanced econometrics. Harvard University Press.

Armstrong, H., \& Taylor, J. (1985). Regional economics and policy. Oxford: Phillip Allan.

Aroca, P., \& Hewings, G. J. (2002). Migration and regional labor market adjustment: Chile 1977-1982 and 1987-1992. The Annals of Regional Science,36(2), 197-218.

Atienza, M., \& Aroca, P. (2013). Concentration and Growth in Latin American Countries. Ch. 6, in Regional Problems and Policies in Latin America (2013). Edited by Juan Ramón Cuadrado-Roura and Patricio Aroca. Springer, New York, USA

Ben-Akiva, M. E., \& Lerman, S. R. (1985). Discrete choice analysis: theory and application to travel demand (Vol. 9). MIT press.

Gibson, J., \& McKenzie, D. (2011). Eight questions about brain drain. The Journal of Economic Perspectives, 107-128.

Ishitani, T. (May, 2011). Exploration of interstate college and post-graduation migration in the United States. Paper to be presented at the 51st Annual Forum of the Association for Institutional Research, Toronto, ON, CA.

Kodrzycki, Y. K. (2001). Migration of Recent College Graduates: Evidence from the National Longitudinal Survey of Youth. New England Economic Review, Jan/Fen, 13-31.

Ley no. 20.129 (2006). Ley de aseguramiento de la calidad de la educación superior. Diario Oficial de la República de Chile

López, E., \& Aroca, P. (2012). Estimación de la inflación regional de los precios de la vivienda en Chile. Trimestre Economico, 79(315), 601.

Marschak, J. (1960). Binary-choice constraints and random utility indicators. Proceedings of a Symposium on Mathematical Methods in the Social Sciences (Vol. 7, pp. 19-38).

Manski, C. F. (1973). The analysis of qualitative choice (Doctoral dissertation, Massachusetts Institute of Technology).

McFadden, D. (2001). Economic choices. American Economic Review, 351-378.

Ministerio de Educación. (2012). Evolución de la Inversión y de la Gestión Pública en Educación Superior 1990-2011. Recuperado de: http://www.divesup.cl/usuarios/1234/imagen/2013/inversionygestion90_11/index.html

Orsuwan, M., y Heck, R. H. (2009). Merit-based student aid and freshman interstate college migration: Testing a dynamic model of policy change. Research in Higher Education, 50(1), 24-51.

Sapra, R. (2013). Do High School Graduates Attend College In-State or Out-State? Role of Individual-Level and State-Level Factors. Rutgers University.

Williams, J. A., \& Dreier, J. B. (2011). State Merit Based Scholarship Programs Influence on Outmigration. Recuperado de http://www.aefpweb.org/sites/default/files/webform/State\ Merit\ Aid\ and\ Ou tmigration.pdf

## Anexos

## Anexo A

Tabla A.1. Datos de estudiantes seleccionados entre 2007-2009

| $j / i$ | I | II | III | IV | V | RM | VI | VII | VIII | IX | X | XI | XII |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| I | 5622 | 574 | 153 | 262 | 271 | 802 | 198 | 106 | 146 | 44 | 52 | 7 | 10 |
| II | 612 | 6813 | 580 | 802 | 296 | 701 | 175 | 107 | 128 | 39 | 49 | 9 | 12 |
| III | 22 | 48 | 1428 | 234 | 75 | 142 | 82 | 27 | 31 | 14 | 11 | 2 | 1 |
| IV | 80 | 139 | 581 | 4824 | 227 | 529 | 156 | 40 | 46 | 20 | 26 | 9 | 8 |
| V | 577 | 503 | 451 | 1113 | 18659 | 6887 | 3172 | 794 | 333 | 263 | 806 | 167 | 326 |
| RM | 392 | 387 | 259 | 572 | 1162 | 39092 | 2317 | 1153 | 692 | 425 | 833 | 81 | 179 |
| VI | 3 | 3 | 3 | 7 | 53 | 267 | 273 | 16 | 5 | 0 | 1 | 3 | 2 |
| VII | 13 | 7 | 9 | 13 | 28 | 305 | 1341 | 5756 | 304 | 23 | 26 | 5 | 12 |
| VIII | 133 | 122 | 84 | 124 | 433 | 2062 | 1056 | 2494 | 25850 | 818 | 835 | 202 | 148 |
| IX | 37 | 36 | 22 | 60 | 154 | 1072 | 369 | 250 | 1144 | 8882 | 1221 | 231 | 83 |
| X | 32 | 38 | 22 | 61 | 210 | 1132 | 226 | 164 | 388 | 709 | 7596 | 251 | 183 |
| XII | 2 | 4 | 9 | 21 | 61 | 314 | 53 | 49 | 42 | 28 | 113 | 85 | 1239 |
|  | 7525 | 8674 | 3601 | 8093 | 21629 | 53305 | 9418 | 10956 | 29109 | 11265 | 11569 | 1052 | 2203 |
|  | 178399 |  |  |  |  |  |  |  |  |  |  |  |  |

Elaboración propia con datos DEMRE

## Anexo B

Tabla B.1. Datos de postulantes a Medicina entre 2007-2009

| $j / i$ | I | II | III | IV | V | RM | VI | VII | VIII | IX | X | XI | XII |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| II | 331 | 782 | 99 | 120 | 136 | 224 | 46 | 67 | 71 | 33 | 39 | 6 | 12 |
| IV | 87 | 92 | 64 | 313 | 119 | 144 | 30 | 36 | 33 | 11 | 16 | 3 | 10 |
| V | 219 | 148 | 94 | 174 | 1990 | 1396 | 282 | 179 | 178 | 85 | 158 | 25 | 67 |
| RM | 306 | 275 | 127 | 248 | 790 | 7327 | 522 | 477 | 472 | 251 | 323 | 27 | 89 |
| VII | 44 | 32 | 17 | 28 | 112 | 342 | 280 | 1079 | 272 | 61 | 79 | 13 | 15 |
| VIII | 170 | 124 | 44 | 75 | 283 | 856 | 209 | 472 | 2879 | 325 | 346 | 29 | 88 |
| IX | 40 | 26 | 19 | 16 | 80 | 311 | 47 | 80 | 358 | 1087 | 299 | 26 | 49 |
| X | 70 | 50 | 28 | 33 | 201 | 618 | 113 | 141 | 324 | 534 | 1284 | 54 | 135 |
|  | 1267 | 1529 | 492 | 1007 | 3711 | 11218 | 1529 | 2531 | 4587 | 2387 | 2544 | 183 | 465 |
|  |  |  |  |  |  | 33450 |  |  |  |  |  |  |  |

Elaboración propia con datos DEMRE

Tabla B.2. Datos de seleccionados a Medicina entre 2007-2009

| $j / i$ | I | II | III | IV | V | RM | VI | VII | VIII | IX | X | XI | XII |  |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| II | 25 | 90 | 4 | 4 | 12 | 12 | 2 | 5 | 7 | 1 | 0 | 2 | 2 | 166 |
| IV | 8 | 7 | 15 | 81 | 32 | 21 | 8 | 4 | 6 | 2 | 2 | 2 | 2 | 190 |
| V | 8 | 5 | 3 | 3 | 199 | 61 | 13 | 3 | 1 | 0 | 1 | 0 | 0 | 297 |
| RM | 18 | 32 | 8 | 29 | 44 | 615 | 60 | 37 | 34 | 25 | 25 | 0 | 5 | 932 |
| VII | 3 | 2 | 1 | 1 | 4 | 11 | 40 | 81 | 24 | 8 | 3 | 0 | 0 | 178 |
| VIII | 5 | 8 | 1 | 2 | 11 | 28 | 9 | 42 | 327 | 7 | 22 | 1 | 2 | 465 |
| IX | 1 | 0 | 1 | 0 | 2 | 3 | 1 | 1 | 14 | 134 | 10 | 0 | 0 | 167 |
| X | 1 | 2 | 1 | 1 | 5 | 13 | 5 | 4 | 5 | 18 | 111 | 1 | 11 | 178 |
|  | 69 | 146 | 34 | 121 | 309 | 764 | 138 | 177 | 418 | 195 | 174 | 6 | 22 | 2573 |

Elaboración propia con datos DEMRE

Tabla B.3. Datos de seleccionados a Medicina entre 2007-2009 con puntajes sobre 735 puntos PSU

| $j / i$ | I | II | III | IV | V | RM | VI | VII | VIII | IX | X | XI | XII |  |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| II | 5 | 23 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 32 |
| IV | 1 | 3 | 3 | 25 | 1 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 38 |
| V | 7 | 3 | 3 | 3 | 139 | 29 | 8 | 2 | 1 | 0 | 0 | 0 | 0 | 195 |
| RM | 18 | 32 | 8 | 29 | 44 | 615 | 60 | 37 | 34 | 25 | 25 | 0 | 5 | 932 |
| VII | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 32 | 2 | 0 | 0 | 0 | 0 | 37 |
| VIII | 3 | 8 | 1 | 2 | 8 | 24 | 9 | 35 | 261 | 5 | 17 | 1 | 2 | 376 |
| IX | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 6 | 93 | 5 | 0 | 0 | 106 |
| X | 0 | 2 | 1 | 1 | 3 | 5 | 4 | 3 | 4 | 3 | 78 | 1 | 10 | 115 |
|  | 34 | 71 | 17 | 61 | 195 | 677 | 87 | 109 | 309 | 126 | 125 | 3 | 17 | 1831 |

Elaboración propia con datos DEMRE

## Anexo C

Tabla C.1. Datos de postulantes a Ingeniería entre 2007-2009

| $j / i$ | I | II | III | IV | V | RM | VI | VII | VIII | IX | X | XI | XII |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| I | 5911 | 688 | 134 | 163 | 139 | 404 | 119 | 70 | 66 | 39 | 47 | 5 | 7 |
| II | 903 | 9059 | 885 | 934 | 256 | 620 | 175 | 87 | 113 | 47 | 54 | 12 | 4 |
| III | 89 | 154 | 2559 | 369 | 148 | 247 | 146 | 55 | 59 | 28 | 21 | 4 | 3 |
| IV | 117 | 372 | 931 | 6285 | 245 | 577 | 222 | 66 | 45 | 18 | 29 | 10 | 15 |
| V | 758 | 766 | 521 | 1084 | 2354 | 68497 | 4208 | 2109 | 1340 | 822 | 1417 | 237 | 258 |
| RM | 1541 | 1316 | 1224 | 2465 | 28499 | 12391 | 6049 | 2297 | 1191 | 766 | 2221 | 388 | 660 |
| VI | 2 | 1 | 2 | 6 | 16 | 354 | 118 | 14 | 6 | 3 | 1 | 4 | 0 |
| VII | 18 | 10 | 11 | 20 | 47 | 423 | 1461 | 7884 | 213 | 26 | 29 | 12 | 22 |
| VIII | 228 | 243 | 145 | 196 | 416 | 2372 | 1365 | 3317 | 38558 | 1649 | 1633 | 373 | 224 |
| IX | 67 | 48 | 34 | 62 | 135 | 1038 | 287 | 220 | 1234 | 14105 | 1805 | 315 | 99 |
| X | 61 | 55 | 22 | 72 | 219 | 949 | 214 | 208 | 435 | 957 | 8554 | 338 | 159 |
| XII | 7 | 3 | 1 | 9 | 11 | 33 | 7 | 12 | 17 | 8 | 34 | 31 | 796 |

Elaboración propia con datos DEMRE

Tabla C.2. Datos de seleccionados a Ingeniería entre 2007-2009

| $j / i$ | I | II | III | IV | V | RM | VI | VII | VIII | IX | X | XI | XII |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| I | 1341 | 97 | 16 | 33 | 30 | 112 | 20 | 22 | 13 | 4 | 5 | 1 | 0 |
| II | 194 | 2438 | 206 | 236 | 55 | 181 | 43 | 21 | 28 | 8 | 10 | 3 | 1 |
| III | 13 | 22 | 494 | 59 | 25 | 55 | 34 | 12 | 11 | 6 | 3 | 0 | 0 |
| IV | 12 | 33 | 148 | 1235 | 35 | 96 | 29 | 5 | 4 | 1 | 3 | 1 | 2 |
| V | 262 | 211 | 164 | 407 | 4787 | 1549 | 975 | 348 | 123 | 146 | 386 | 59 | 122 |
| RM | 93 | 89 | 67 | 131 | 255 | 9680 | 607 | 286 | 185 | 112 | 227 | 26 | 35 |
| VI | 0 | 0 | 0 | 0 | 4 | 92 | 29 | 3 | 2 | 0 | 0 | 2 | 0 |
| VII | 1 | 1 | 2 | 0 | 5 | 55 | 250 | 1456 | 25 | 1 | 1 | 0 | 3 |
| VIII | 22 | 21 | 15 | 19 | 47 | 313 | 185 | 496 | 6673 | 212 | 218 | 56 | 23 |
| IX | 7 | 7 | 4 | 9 | 22 | 254 | 45 | 32 | 236 | 2802 | 279 | 59 | 18 |
| X | 9 | 7 | 5 | 16 | 45 | 235 | 29 | 43 | 87 | 170 | 1970 | 74 | 26 |
| XII | 1 | 0 | 0 | 6 | 1 | 13 | 0 | 6 | 2 | 1 | 13 | 13 | 257 |
|  | 1955 | 2926 | 1121 | 2151 | 5311 | 12635 | 2246 | 2730 | 7389 | 3463 | 3115 | 294 | 487 |

Tabla C.3. Datos de seleccionados a Ingeniería entre 2007-2009 con puntajes sobre 700 puntos PSU

| $j / i$ | I | II | III | IV | V | RM | VI | VII | VIII | IX | X | XI | XII |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| I | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| II | 2 | 26 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| III | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| IV | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| V | 33 | 36 | 16 | 32 | 355 | 22 | 47 | 58 | 16 | 62 | 79 | 4 | 17 |
| RM | 39 | 48 | 21 | 58 | 85 | 2502 | 228 | 136 | 98 | 73 | 137 | 13 | 17 |
| VI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| VII | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 20 | 0 | 0 | 0 | 0 | 0 |
| VIII | 1 | 1 | 0 | 1 | 0 | 4 | 3 | 25 | 340 | 22 | 22 | 3 | 2 |
| IX | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 47 | 1 | 1 | 0 |
| X | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 5 | 26 | 0 | 1 |
| XII | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | 90 | 112 | 41 | 97 | 440 | 2531 | 279 | 240 | 455 | 209 | 265 | 21 | 37 |

Elaboración propia con datos DEMRE

## Anexo D

Tabla D.1. Datos de postulantes a Pedagogía entre 2007-2009

| $j / i$ | I | II | III | IV | V | RM | VI | VII | VIII | IX | X | XI | XII |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| I | 5533 | 673 | 173 | 272 | 206 | 512 | 256 | 106 | 173 | 59 | 55 | 3 | 6 |
| II | 151 | 3604 | 344 | 445 | 212 | 312 | 174 | 115 | 108 | 22 | 34 | 5 | 3 |
| III | 24 | 56 | 1398 | 215 | 56 | 78 | 71 | 11 | 28 | 7 | 12 | 1 | 0 |
| IV | 137 | 397 | 1128 | 8389 | 376 | 771 | 364 | 129 | 77 | 31 | 89 | 23 | 9 |
| V | 392 | 465 | 471 | 1352 | 28 | 10257 | 5354 | 1431 | 629 | 256 | 841 | 229 | 238 |
| RM | 211 | 146 | 136 | 311 | 990 | 39120 | 2739 | 1046 | 475 | 292 | 527 | 75 | 71 |
| VI | 0 | 1 | 0 | 0 | 9 | 329 | 248 | 8 | 5 | 2 | 4 | 0 | 0 |
| VII | 13 | 11 | 9 | 17 | 62 | 372 | 1878 | 9422 | 342 | 40 | 54 | 16 | 13 |
| VIII | 120 | 95 | 62 | 145 | 425 | 2026 | 1993 | 4529 | 37314 | 1205 | 1005 | 231 | 118 |
| IX | 19 | 17 | 12 | 44 | 156 | 1072 | 457 | 388 | 1713 | 12347 | 2190 | 338 | 89 |
| X | 32 | 34 | 19 | 58 | 225 | 805 | 482 | 223 | 499 | 772 | 10310 | 319 | 127 |
| XII | 5 | 4 | 4 | 21 | 91 | 275 | 100 | 48 | 60 | 36 | 161 | 84 | 1218 |

Elaboración propia con datos DEMRE

Tabla D.2. Datos de seleccionados a Pedagogía entre 2007-2009

| $j / i$ | I | II | III | IV | V | RM | VI | VII | VIII | IX | X | XI | XII |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| I | 1059 | 109 | 33 | 53 | 53 | 145 | 60 | 25 | 32 | 12 | 9 | 0 | 4 |
| II | 19 | 829 | 72 | 107 | 54 | 76 | 40 | 25 | 31 | 3 | 4 | 0 | 0 |
| III | 1 | 6 | 270 | 63 | 7 | 18 | 12 | 1 | 7 | 3 | 1 | 0 | 0 |
| IV | 17 | 25 | 120 | 1166 | 24 | 115 | 37 | 10 | 12 | 4 | 8 | 0 | 0 |
| V | 51 | 50 | 42 | 145 | 3558 | 1436 | 726 | 121 | 39 | 22 | 88 | 29 | 31 |
| RM | 25 | 17 | 12 | 30 | 59 | 4744 | 277 | 95 | 38 | 18 | 52 | 5 | 8 |
| VI | 0 | 1 | 0 | 0 | 0 | 75 | 57 | 0 | 1 | 0 | 0 | 0 | 0 |
| VII | 1 | 2 | 1 | 2 | 2 | 39 | 257 | 1219 | 21 | 2 | 2 | 2 | 2 |
| VIII | 12 | 8 | 5 | 8 | 28 | 207 | 186 | 585 | 4746 | 102 | 89 | 15 | 8 |
| IX | 3 | 1 | 0 | 5 | 18 | 204 | 75 | 68 | 257 | 2102 | 382 | 76 | 177 |
| X | 4 | 4 | 2 | 3 | 25 | 109 | 64 | 18 | 52 | 43 | 1517 | 30 | 9 |
| XII | 0 | 0 | 2 | 5 | 14 | 110 | 23 | 18 | 9 | 5 | 31 | 25 | 282 |
|  | 1192 | 1052 | 559 | 1587 | 3842 | 7278 | 1814 | 2185 | 5245 | 2316 | 2183 | 182 | 361 |

Tabla D.3. Datos de seleccionados a Pedagogía entre 2007-2009 con puntaje sobre 650 puntos PSU

| $j / i$ | I | II | III | IV | V | RM | VI | VII | VIII | IX | X | XI | XII |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| I | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| II | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| III | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| IV | 1 | 1 | 5 | 37 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| V | 6 | 10 | 5 | 6 | 173 | 18 | 26 | 7 | 2 | 3 | 9 | 5 | 4 |
| RM | 8 | 2 | 5 | 6 | 14 | 674 | 55 | 22 | 6 | 2 | 14 | 2 | 3 |
| VI | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| VII | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 28 | 1 | 0 | 0 | 0 | 0 |
| VIII | 0 | 1 | 0 | 0 | 0 | 1 | 3 | 18 | 113 | 1 | 7 | 2 | 0 |
| IX | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 1 | 35 | 13 | 0 | 2 |
| X | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 4 | 46 | 2 | 1 |
| XII | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 72 |
|  | 28 | 28 | 18 | 51 | 187 | 698 | 90 | 76 | 123 | 45 | 89 | 11 | 17 |

Elaboración propia con datos DEMRE

## Anexo E

Tabla G. 1 Latin American countries with excess of concentration

| Paper | Primacy index | Latin American countries with excess of concentration | Estimation method |
| :---: | :---: | :---: | :---: |
| Henderson (2000) | Primacy 1 | Argentina, Chile, Uruguay, Paraguay, Peru, Panama, Costa Rica, El Salvador, Nicaragua, Guatemala. | Panel Data |
| $\begin{aligned} & \text { Henderson } \\ & (2003) \end{aligned}$ | Primacy 1 | Argentina, Chile, Mexico, Peru | Panel Data |
| Bernitelli and <br> Strobl (2007) | Primacy 1 | Argentina, Chile, Uruguay, Paraguay, Peru, Costa Rica, El Salvador, Nicaragua, Guatemala, Honduras | Semi-parametric estimation |
| Brulhart and Sbergami | Primacy 1 and primacy $>750,000$ | Argentina, Chile, Peru, Uruguay, Venezuela | Panel Data |
| Pholo Bala (2009) | Primacy 1 and density > 750,000 | Argentina, Chile, Dominican Republic, Guatemala, Nicaragua, Peru, El Salvador | Semi-parametric estimation |


[^0]:    Terms of use:
    Documents in EconStor may be saved and copied for your personal and scholarly purposes.

    You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

    If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

[^1]:    ${ }^{1}$ In other words, the decision to study in a different region is independent of individual factors such as age, gender and the networks that the student may have.

