The Economic Returns to Higher Education: Funding, coverage and quality in Latin America[1]

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Abstract

This paper presents new estimates of the returns to higher education in Latin America. In particular, combining administrative records from two countries in the region and a simple economic framework, we document large heterogeneity in the average return to higher education for those individuals obtaining a degree (TT). We deal with the potential selection using different definitions for the counterfactual outcome. Consistent with the recent literature we find negative net benefits for many degrees and institutions in Chile and Peru. We also show how the results vary across students' socio-economic characteristics and proxies of quality in the system. We conclude with a discussion of the implications of our findings for the design of funding policies in higher education in Latin America. More precisely, we discuss the implications, benefits and disadvantages of two alternative funding models: student loans and graduate taxes. We empirically prove the relative advantages of loans over taxes.

Keywords: Returns to education, higher education, funding policies.

I. Introduction

[1] This paper was prepared for the study of higher education in Latin America of the World Bank. We are indebted to the useful comments of María M. Ferreyra, Fernando Saltiel, Mario Macis, Yan Carrière-Swallow, the experts of Ministry of Labor and Ministry of Education of Perú and the seminar participants at the Authors' Workshop for the Regional Study on Higher Education in Latin America and the Caribbean (Nov, 2015).
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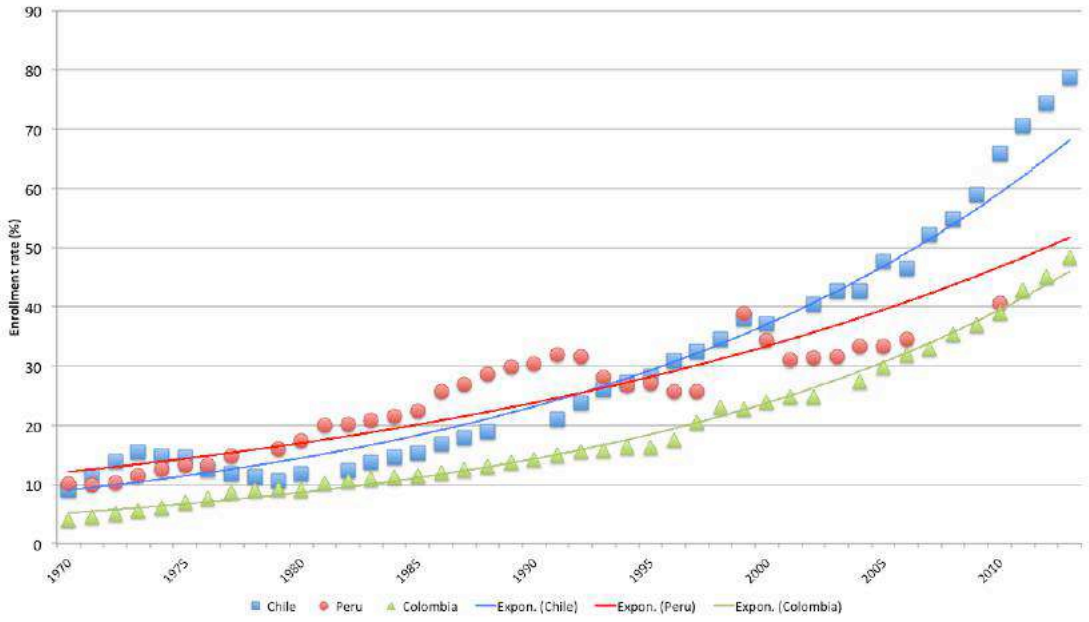
During the last two decades, many countries in Latin America and the Caribbean (LAC) expanded the coverage of their higher education systems. In 1991 the enrollment rate in post-secondary education (ISCED 5 and 6) in the region was only 17%. However, it had reached 43% by 2012. Chile and Colombia emerge as two good examples of this trend. In the same period, their enrollment rate in higher education increased by 238% and 221%, respectively. By 2012 these rates had already reached 45% in Colombia and 74% in Chile, figures that are comparable to the levels observed in many developed nations. Figure 1 presents the recent trends for these two countries.

Figure 1: Enrollment in Tertiary Education (%)



Note: Solid lines are exponential fitted curves

Source: UNESCO Institute for Statistics (World Education Indicators Programme). See also González-Veloso et al, 2015.

More recently, Peru had joined Chile and Colombia in their efforts to increase coverage. As Figure 1 shows, while in the middle of the 90s its enrollment was approximately 25%, the latest figures confirm a systematic increased, reaching 40% by 2010.

These achievements have been received with optimism in the region, particularly among policy makers. Increases in higher education coverage were to a great extent the result of public policies designed to facilitate access to the system and promote human

capital accumulation in economies characterized by large deficits of productive labor. Greater financial support for students and the geographical expansion of higher education institutions (HEI) in Chile and Colombia during the first decade of the new millennium are examples of these efforts.[2] And although Peru did not share those efforts then, the country is now eliciting similar efforts.

And, of course, a greater access to higher education was expected to bring significant economic and equity gains. In particular, public policies were designed and implemented under the assumption that first generations of college graduates, particularly those coming from vulnerable households, would be shielded against the effects of poverty and inequality. However, this optimistic view is now being weakened. There is a growing concern that the expansion in coverage has been accompanied by deterioration in the quality of the system. This phenomenon explains, at least partially, the massive student protests observed in Chile and Colombia during the last five years.

Concerns about the decline in the quality of higher education are not limited to Chile and Colombia, but extend to the rest of the region. The well-documented reduction in the returns to higher education in most countries in LAC could be explained, to some extent, by worsening in the quality of the system (e.g., Aedo and Walker 2012; Lustig et al 2013; Reyes, et. al. 2013). With coverage expansion, institutions and students of lower than marginal quality may have entered the system. This would explain why, in spite of the dramatic increases in educational coverage, labor productivity in LAC has grown at an exceedingly slow pace.

The objective of this paper is threefold. First, we analyze the economic returns to higher education in LA countries. We follow Willis and Rosen (1979), Heckman, Lochner and Todd (2006) and provide a theoretical framework to evaluate the return to higher education. By using publicly available data on tuition costs and estimations for future earning for a Chile, we estimate the financial return to different higher education programs. These calculations allow to evaluate the financial convenience of pursuing

[2] Between 2009 and 2013, the amount of public resources allocated to student financial aid in Chile increased from US$495 million to US$1.458 million.

different degrees and to compare them with alternative careers paths such as not pursuing postsecondary studies at all.[3]

Second, we analyze the convenience of different financing mechanisms and provide insights for policies that aim to enhance the higher education financing system. In particular, we study the implications of conventional student loans vis-à-vis a graduate tax. The idea of a graduate tax is to provide higher education studies at no upfront tuition cost but then impose a tax on graduates' earnings that pays for the costs of current students.

The interest in analyzing different financing mechanisms emerges from the recent debate in the region regarding the design of an optimal system for funding higher education. Student loans have become the most important source of funding for higher education in Chile, and they are currently being considered throughout Latin America. The idea of a graduate tax, on the other hand, is attractive to many progressives. In terms of its proposed distribution, it fits the rhetoric that proclaims that higher education is a "social right" essential to human development that has to be satisfactorily guaranteed by the State and not left to the market. Our empirical model of labor market outcomes and calculations of the returns to higher education allows us to simulate the financial convenience of both alternatives. Additionally we estimate the fiscal burden that a graduate tax imposes and critically analyze both alternatives.

Finally, the simple but comprehensive economic approach and the use of publicly available data make our methodology easy to understand. In this context, our framework allows for calculation that can be easily replicated by families, students, researchers and policy makers.

Our empirical results will have substantial implications for public policies. A first point that emerges from this is the importance of further efforts to construct and disseminate

[3] The literature analyzing the returns to education is vast. Recent papers analyzing this topic includes recent papers Rodney and Lovenheim (2014), Arcidiacono (2014), Binelli (2008), Bouillon, Legovini and Lustig (2005), Gallego (2011), Heckman and Li (2004) Grogger and Eide (1995), Bound and Turner (2011), Kaufmann (2014), Lindley and Machin (2011), Kane and Rouse (1995), Manacorda, Sanchez-Parama, Schady (2010)

information on the performance of higher education graduates in the labor market. In this context, our results will highlight the importance of using the information on labor market outcomes in the design of higher education policies. This new evidence will also call into question the benefits of the policies implemented in Latin America, which aim at expanding coverage of higher education without assuring the quality and relevance of educational programs. There was a dramatic expansion in access to a system that often failed in its promise to improve the economic conditions of those who decided to invest in higher education. Finally, the results will shed lights on the design of funding mechanisms.

This document is organized as follows. Section II describes the sources of information. Section III introduces our empirical model and fits it in the context of the literature. In section IV we present our main results. Section 5 concludes.

II. Sources of Information

The accuracy of analysis describe below heavily depends on the availability of data in each county. For this reason, our empirical analysis will focus on Chile and Peru, where relatively high quality data on higher education enrollment and job market outcomes are publicly available.

Chile. We employ four different sources of information. The primary dataset are administrative records from the Higher Education Information System (SIES). The SIES is the governmental body within the Ministry of Education that manages official higher education statistics, gathering official information on all public or private higher education institutions in the country, a list which includes institutions offering two-year college degrees (Technical Training Centers), four-year college degrees (Professional Institutes) and five-year college degrees (Universities).

From this source of information, we obtain student-level enrollment data for the period 2007-2013. More precisely, for those years, we are able to follow students over the duration of their studies and, in particular, we observe in which program they enrolled in after high school graduation. Importantly, the dataset includes, gender, age, region of

residence, high school characteristics, SES background and high school GPA. Furthermore, the data contains substantial information on the characteristics of the programs students are enrolled in, such as program duration, geographical location and tuition costs.

Our second source of information contains data on years of accreditation, a proxy for quality of HEIs, provided by the National Accreditation Commission (CNA). For each institution this data informs about the number of years that the HEI or program is granted accreditation. The range of the outcome goes from 0 (accreditation is denied) to 7 (maximum) years. The scale represents an understandable way to rank institutions and academic programs according to their quality.[4]

Our last data source is the portal *mifuturo.cl,* which provides salaries for information after four years of graduation for 1069 degrees in Chile. Salaries are reported by institution and by field of study using the ISCED classification.

Finally we use the 2013 Chilean household survey "CASEN" to estimate employment rates for different types of graduates as well as expected salaries of workers that did not attend higher education (high school graduates).

Our empirical analysis is carried out using student level data, including the degree and institution in which she/he is enrolled, the associated years of accreditation and individual background variables. We restrict our sample to all students that enter the tertiary education system in 2012. We match their enrollment decisions with their corresponding salaries to estimate the expected return to each student.

Table 1 shows descriptive statistics of our key variables.

Table 1: Descriptive Statistics: Chile

	Type of HEI		
	Technical	Professional	Universities

[4] In fact, CNA officially labels three years as "satisfactory", five years as "appropriate", whereas seven is "optimal".

	Training Center (2yr degrees)	Institutes (4yr degrees)	(5yr degrees)
PANEL A. Supply Side			
# of HEIs	56	40	58
# of Field	191	141	434
Average tuition (USD)	$2,602	$2,694	$5,423
Average duration	2.42	3.18	4.60
# of campuses	167	178	219
Average years of accreditation	1.24	1.68	3.33
PANEL B. Demand Side			
# of students	62,282	111,240	152,832
% of total enrollment (market share)	19.1%	34.1%	46.8%
% female	52%	51%	52%
Average PSU score	406.55	412.06	519.95
Student Composition			
% Public Schools	45%	41%	28%
% Voucher Schools	53%	56%	56%
% Private Schools	2%	3%	16%
Total	100%	100%	100%

Source: Authors' calculations based on administrative records.

In our analysis, we distinguish ten different fields of study across the three different types of institutions.

As previously explained, types of higher education institutions are defined by the types of college degrees they offer. The taxonomy for fields of education, on the other hand, follows the International Standard Classification of Education: Fields of Education and Training (ISCEF-F), with adjustments by the Ministry of Education of Chile.

Peru. Our primarily data source is the portal "ponteencarrera.pe", an official website gathering detailed information on 3957 tertiary education programs in Peru.[5] As explained below, this source allows us to identify the key input variables for the estimation of the returns to higher education, distinguishing three different types of HEIs: Universities, "*Higher Education Technological Institutes*[6]*"* (IEST) and "*Higher*

[5] The portal *ponteencarrera.pe"* is a joint initiative of the Department of Education, the Department of Labor and a private corporation (IPAE Acción Empresarial)

[6] Institutos de Educación Superior Tecnológico

Education Institutes[7]" (ISE). The latter two offer technical and vocational programs in different fields. Those programs are typically of shorter duration and less expensive than those offered by universities. For all our analysis the last two categories are merged into a category called "Vocational".

The website was launched in July of 2015 and reports information on variables such as: program tuition costs, duration and total enrollment; campus geographic location; field of study as well as a program-level selectivity index. This index seeks to provide information on the demand for each specific degree, a proxy for quality, and it is constructed as the ratio of the number of admitted students to the number of applicants.

The dataset also contains information on graduates' salaries after graduation. However, this information is available for only 424 programs. Specifically, for these programs the website reports average monthly salaries over the first four years after high school graduation. Finally, salaries are reported at not reported at the program level but rather by field of study within institutions. According to the official disclaim, this aggregation secures the representativeness of the information.

Our second data source is the 2014 Peruvian national survey "ENAHO". As in the case of the 2013 Casen, we use this household survey to construct counterfactual salaries for those individuals graduating from postsecondary institutions had they not attended college. We also generate employment rates for different levels of education from ENAHO.

It is worth mentioning that unlike Chile, individual-level administrative information is not available in Peru. Hence we only estimate returns at the program level for Peru. **Error! Reference source not found.** shows descriptive statistics of our program level data.

	University	Vocational/Technical	Total
Institutions			
# of HEI	121	748	869
% Public	32.2%	47.3%	45.2%
Market Share (%)	55.5%	44.5%	

[7] Institutos Superiores de Educación

Programs			
# of programs	1519	2438	3957
Duration (avg)	5.13	3.05	3.85
Annual tuition (US$) (avg)	1243.4	433.5	744.9
Enrollment (avg)	120.2	62.2	85
Selectivity (%)	62.6%	82.6%	74.7%
Annual Salary (US$) (avg)	4999	3449	4045

Note: The category " Tertiary, non-University" includes "*Institutos de Educación Superior Tecnológico"* (IEST) and "*Institutos Superiores de Educación"* (ISE)

The data also identifies 79 fields of study. For expositional purposes we collapse them in 6 broader fields that match the fields of work used in the ENAHO survey. In our data all types of HEI offer at least one program in each of the fields of study.

III. Methodology

We follow the recent literature and postulate a simple econometric model allowing the estimation of the financial net return to higher education (Urzúa, 2012; and Gonzalez et al., 2014). As described below, it includes the identification of the impact of labor market experience on future earnings throughout the estimation of Mincer-type regression models and estimates of the employment rate for different types of workers.

We use these estimates and administrative information on labor market outcomes for recent cohorts of college graduates to predict the stream of earnings and the resulting net returns.

Importantly, our estimated returns must be interpreted with caution. They are intended to identify the average economic gain between the alternative of graduating from a specific field of study in a particular type institution versus the alternative of becoming a worker with a high school degree. In this context, our estimates do not represent the average effect of the marginal individual who is indifferent between college vs high school (Carneiro, Heckman and Vytlacil, 2014) nor the internal rate of return (Heckman, Lochner and Todd, 2006).

We rely on publicly available data and attempt to replicate what students or/and their families could do to evaluate the expected returns to a degree in a specific degree offer by a particular type of higher education institutions.

III.1. Defining the net returns to education at the individual level

Let I be the set of programs and J the set of HEIs. For simplicity, we assume that all programs are offered across all types of HEIs. Then, the overall supply of HEI degrees is the set of all possible tuples (i,j). We define the return to program $i \in I$ obtained in institution $j \in J$ by student k as:

$$r_p(i,j,k(= \frac{NPV(i,j,k(- NPV_p(k(}{NPV_p(k(} \quad , \quad (1($$

where NPV(i,j,k) denotes the net present value of earnings from program *i* in institution *j* for student *k,* and $NPV_p(k($ represents the present value of not pursuing higher education studies after high school graduation for the same individual. The subscript *p* refers to the p-th percentile of the income distribution of workers with high school degrees (without postsecondary education).

Specifically, NPV(i,j,k) is the discounted sum of all individual-level future expected earnings after graduating from program *i* in institution *j* discounting the effective tuition costs. Specifically, we have that

$$NPV(i,j,k) = \sum_{t=d_{ij}+1}^{R_k} \frac{Y_{i,j}(t) \times e_{i,j}(t)}{(1+r)^t} - \sum_{t=1}^{d_{ij}} \frac{C_{i,j}}{(1+r)^t} \quad , \qquad (2($$

where $Y_{i,j}(t)$ is the average annual income of graduates from program *i* in institution *j, t* years after graduation. $e_{i,j}(t)$ is the probability that a graduate from that program is employed in period *t* and $C_{i,j}$ is its annual tuition fee, which is assumed does not change over time, r is the discount rate, d_{ij} is the program's formal duration and R_k is the number of years between the moment student *k* enters the program and his retirement.

On the other hand, for student *k*, the second component of $r_p(i,j,k(, NPV_p(k($, denotes the present value of earnings associated with the alternative of "not pursuing higher education studies after high school graduation". Formally,

$$NPV_p(k(= \sum_{t=1}^{R_k} \frac{Y_p(t)}{(1+r)^t} \quad , \qquad (3($$

where $Y_p(t)$ represents the income level of the p-*th* percentile after *t* years of high school graduation.

As extensively discussed in the literature, the self-selection of individuals into college prevents the interpretation of mean differences in labor income between individuals

with and without postsecondary degrees as the effect of education on labor market outcomes. In this context, by modifying p we can empirically assess the potential role of selection.

The main empirical challenge is the estimation of $Y_{i,j}(t),\ t = 1 \ldots R_k$. We use the existing information on $Y_{i,j}(\bar{t})$, that is average earnings $\bar{t}$ after graduation to extrapolate and estimate series of labor earnings until retirement (age of 65). To do this, we consider the following steps:

1. From household surveys we estimate the following Mincer equation:
$$ln\, Y_i = \alpha + \beta_1 \times Age_i + \beta_2 \times {Age_i}^2 + \varepsilon_i \qquad ,(4($$
from the sample of individuals 24 to 65 years old, with a post-secondary degree but who are not attending higher education institutions.
2. Since our administrative records only contain earnings information for $t = \bar{t}$, we define $Y_{i,j}(\bar{t})$ as the initial earnings, and use the estimates from equation (1) to predict $Y_{i,j}(t)\ \forall\ t \neq \bar{t}$ as follows:
$$\widehat{Y_{i,J}}(t) = \widehat{Y_{i,J}}(t-1) \times exp(\widehat{\beta_1} + 2\widehat{\beta_2}(t-1((\qquad ,(5($$
3. This procedure is replicated for workers with different types of degrees. Specifically we estimate separate equations using the samples of workers with university degrees, four-year degrees and two-year degrees. This allows us to estimate different earning patterns along the working life.
4. The earning of workers who do not attend tertiary education, $Y_p(t)$, is estimated using a flexible functional form and data from the household surveys in Chile and Peru.
5. All earnings estimates are weighted by the probability of being employed in certain period, $e_{i,j}(t)$. Because of data availability, we assume $e_{i,j}(t) = e(t)$ for all workers graduating from the same type of HEI[8]. When employment rates are not reported in the data (like in Peru), we non-parametrically estimate it from the household survey. If the data reports employment rates at a given point in time[9] (at $t = \bar{t}$), we estimate $e_{i,j}(t)\ \forall\ t \neq \bar{t}$ using a similar procedure as with the

[8] In Chile, HEIs are classified in Universities, Technical Training Centers (TTC) and Professional Institutes (PI). In Peru they are classified in Universities and technical/vocational (IEST and ISE).
[9] The Chilean data reports the employment rate one year after graduating from the program.

earnings. From the household surveys we first estimate the probability of being employed at age *t* as follows:

$$P_i = \alpha + \gamma_1 \times Age_i + \gamma_2 \times {Age_i}^2 + \varepsilon_i \quad ,(6($$

We finally use $e_{i,j}(\bar{t})$ to estimate $e_{i,j}(t)\ \forall\ t \neq \bar{t}$ as follows:

$$\widehat{e_{i,j}}(t) = \hat{\alpha} + \hat{\gamma_1} \times (Age_{HS} + d_{ij} + t(+ \hat{\gamma_2} \times (Age_{HS} + d_{ij} + t(^2 \quad , \qquad (7($$

where Age_{HS} is the at which the student graduated from high school (assumed to be 18 is unknown).

Missing data. Datasets do not often report all income and tuition information, which are key variables to estimate the return to education. Instead of restricting the sample size to those programs with complete information we rather predict the missing values of tuition or graduates income. We first estimate two simple linear model as follows:

$$Y_{i,j}(\bar{t}) = \delta_0 + X_{i,j}\delta_1 + \varepsilon_{i,j} \quad ,(8($$

$$C_{i,j} = \theta_0 + X_{i,j}\theta_1 + \varepsilon_{i,j} \quad ,(9($$

where $\varepsilon_{i,j}$ is an idiosyncratic and $X_{i,j}$ are program and institution characteristics such as program's duration, HEI type, field of study fixed effects and institutions fixed effects and error. We the use the estimate of δ_0 and δ_1 to predict the missing values of $Y_{i,j}(\bar{t})$ and $C_{i,j}$ as follows:

$$\widehat{Y_{i,j}}(\bar{t}) = \widehat{\delta_0} + X_{i,j}\widehat{\delta_1} \quad ,(10($$

$$\widehat{C_{i,j}} = \widehat{\theta_0} + X_{i,j}\widehat{\theta_1} \quad ,(11($$

Despite the limitations imposed by the underlying assumptions, the resulting estimates from equation (1) allows us to compare the financial net returns of pursuing degree in field *i* in institution *j* versus the alternative of not pursuing that specific degree and entering the labor force as a high school graduate instead. The estimates take into account both the monetary and opportunity costs of higher education.

Identification argument. With the model of counterfactual outcomes we can proceed to define the treatment effect of interest. If we let E[A|B] be the conditional expectation of A conditional on B, and *D(i,j,k)* be an indicator functions, such that D(j,i,k)=1 if

individual k graduates from program i in institution j, and D(j,i,k)=0 otherwise, we define the treatment effect of interest as:

$$\Delta(\mathrm{i,j}(= E[NPV(i,j,k(- NPV(k(|D(i,j,k) = 1]$$
$$= E[NPV(i,j,k(|D(i,j,k) = 1] - E[NPV(k(|D(i,j,k) = 1] \ ,(12($$

Notice that the second expectation, $E[NPV(k(|D(i,j,k) = 1]$, is unobserved. This since it represents the expected net present discounted value associated with the alternative "high school degree" but calculated for those individuals with a college degree from program i in institution j. One alternative would be the substitution of this term by the average net present discounted value estimated from the sample of high school graduates without college experience. This, however, would produce biased and inconsistent results due to the self-selection of individuals into higher education degrees and institutions (Willis and Rosen, 1979).

In this paper, we use a different approach. Following the institution in Neal (2004), we approximate $E[NPV(k(|D(i,j,k) = 1]$ using different percentiles of the distribution of earnings (and NPVs). Conceptually, this approach assumes that the relevant comparison group for those obtaining a college degree is not the average high school graduate, but high school graduates obtaining earnings in the p percentile of the distribution. Our empirical results use the 75-th percentile.

IV. Results

IV.1. Returns to higher education in Chile

We estimate the financial returns to all degrees in Chile. In order to match information on salaries with the individual-level enrollment data, we aggregate the estimates by type of institution and fields of study.[10] This allows us to link labor market outcomes reported four years after graduation with information on the degree (defined by field and institution) pursued by the student. In this context, although we are not fully exploiting the variation across the 557 degrees available, we are able to capture

[10] Previous studies have used student level information on graduation, not enrollment.

heterogeneity given the differences in duration of degrees and tuition costs across fields and HEI types.

As described above, to compute net returns we contrast the average net present values of a specific field and HEI type and the alternative of not pursuing higher education studies. For the latter alternative we use salaries for the 75th percentile of the distribution (p=0.75 in equation 3).

This allows us to estimate returns for all students entering the higher education system in 2012. In Appendix 1 shows the estimates of the Mincer regression (eq. 5) and the employment rate equation (eq. 4 and 6, respectively) that allowed us to estimate the earning sequences. Appendix 2 shows the estimates of equations 8 and 9, which allowed us to predict tuition and earnings in cases when data was missing.

Table 2 displays the average returns by field (business administration, agriculture, arts, science, social sciences, law, education, humanities, health, and engineering and technology) and type of HEI (Technical Training Center or TTC, Professional Institutes or PI, and Universities). The results suggest that the largest returns are associated with five-year college degrees in the fields of “Business administration”, “Law”, "Science" and “Engineering and Technology”. This last field also concentrates the highest results across types of HEIs.

Table 2: Average Returns by field of study and HEI type

	Type of HEI			
	Technical Training Center (2ry degrees)	Professional Institutes (4yr degrees)	Universities (5yr degrees)	Total
Business Administration	57.1%	54.6%	126.8%	78.2%
Agriculture	35.3%	42.5%	62.7%	52.5%
Arts	66.1%	31.0%	49.0%	41.2%
Science	97.2%	115.5%	115.3%	113.6%
Social Sciences	34.5%	18.7%	47.0%	36.2%
Law	61.3%	38.6%	128.5%	115.1%
Education	-2.4%	9.5%	12.7%	9.6%
Humanities	-5.2%	12.1%	2.3%	4.1%
Health	40.5%	40.9%	101.5%	73.3%
Engineering and Technology	109.6%	99.8%	163.5%	125.8%
Total	66.2%	58.9%	97.5%	78.4%

Two other remarkable features of the data emerge from the previous table. First, there is substantial heterogeneity both across fields of study and HEI type. For example, while the average student following a university degree in "Engineering and Technology" expects a return of more than 160%, the average student enrolled in the same type of institution but pursuing a degree in "Humanities" expects a negative return of 2.3%. Large differences are also observed across types of HEI for a particular field. For example, while a degree in “Health” from a TTC has associated a return of 40%, a degree in the same field but from a university is expected to “deliver” an average return of 101%.

Second, returns in many fields and HEI (especially TTC) are negative. Pursuing an "Education” degree in a TTC has associated an average return of -2%. This means that, on average, students would have been better (in financial terms) not pursuing that degree versus the alternative of entering the labor force after graduating from high school.

In Appendix 3 we show the return results obtained with the available information on tuition and earnings data without fitting the data to incorporate missing values. We

found no significant differences. Appendix 3 also show the results obtained without correcting the earnings sequences by employment rate. Even though these return estimates are in general lower, the results are qualitatively similar.

As shown in Figure 2, 10% of the students face negative returns in Chile. The fraction of students with negative returns is significantly higher in TTCs and PIs, with an average of roughly 15.2%.

Figure 2: Negative Returns to Higher Education in Chile

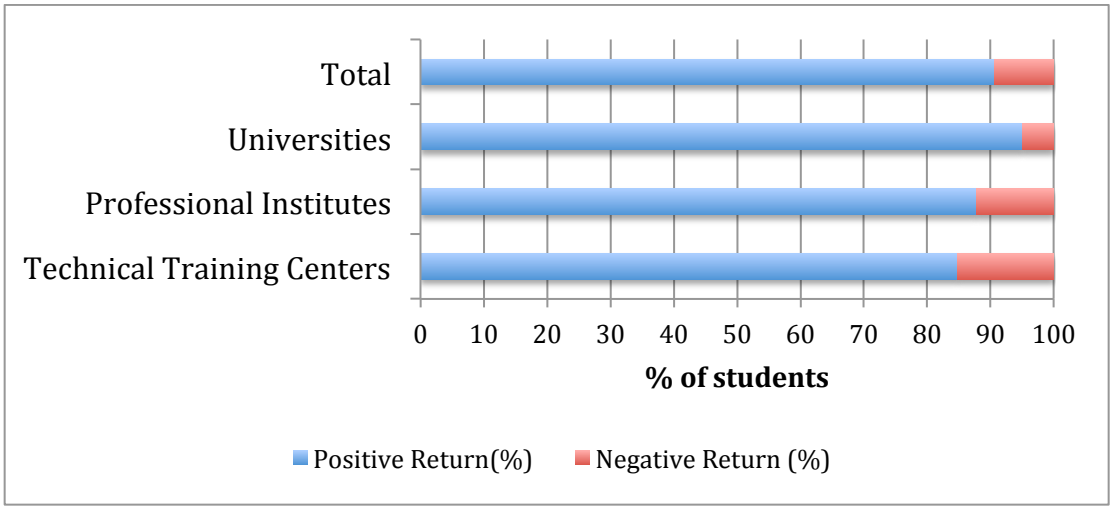
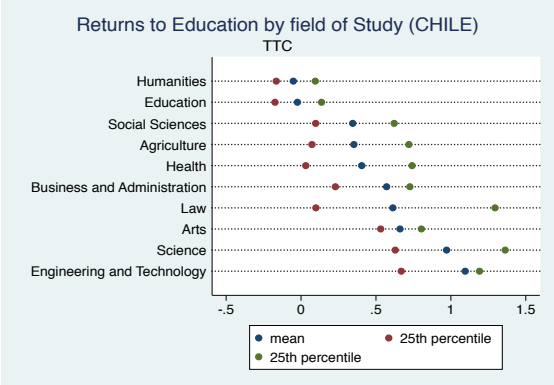


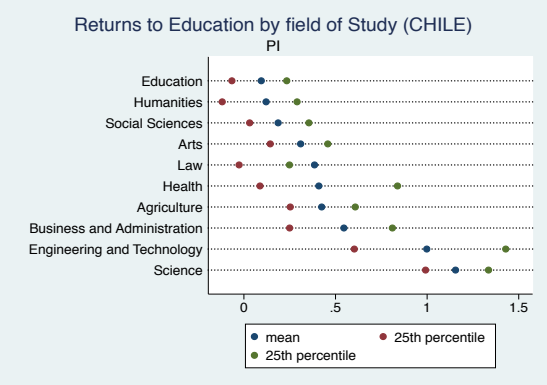
Figure 3 (Panels A, B and C) completes the previous results. Each of its panel describes how these returns are distributed by field and HEI type. In particular, they show the average return along with the return of the students in the 25th and 75th percentile of the distribution (of returns). As documented in previous studies, negative net returns are common across fields and types of HEIs.

Figure 3. Return to Higher Education by fields of study and type of institution

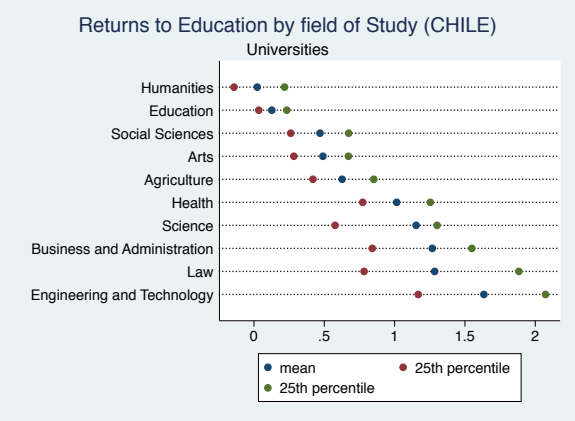
Panel A.



Panel B.



Panel C.



Heterogeneous returns by pre-college variables. In order to study to what extent the heterogeneity reported above was due to pre-college variables, we use the characteristics of our data to compute net returns by type of high schools.

Since the early 1980s, schools in Chile can be public, private or state-subsidized (voucher).

Table 3 shows the net returns to higher education across fields, types of HEI and school type. To the best of our knowledge, this is the first time net rate of returns have been computed across these three dimensions.

Table 3. Average returns by High School type

	Type of HEI		
	Technical Training Center (2ry degrees)	Professional Institutes (4yr degrees)	Universities (5yr degrees)
PANEL A. Public Schools			
Business and Administration	63.56%	60.88%	120.35%
Agriculture	32.75%	42.20%	63.87%
Arts	73.29%	31.40%	49.65%
Science	106.33%	122.70%	116.44%
Social Sciences	44.92%	23.78%	43.47%
Law	69.30%	42.11%	119.63%
Education	2.57%	13.29%	13.20%
Humanities	-12.88%	21.98%	2.50%
Health	42.47%	43.07%	101.23%
Engineering and Technology	117.78%	104.57%	164.75%
Total	71.39%	62.24%	93.66%
PANEL B. Voucher Schools			
Business and Administration	63.49%	63.75%	125.22%
Agriculture	40.50%	47.47%	62.21%
Arts	74.68%	32.55%	50.25%
Science	98.48%	128.42%	111.92%
Social Sciences	46.89%	23.92%	48.49%
Law	70.85%	45.80%	134.79%
Education	-2.91%	13.85%	14.68%
Humanities	9.81%	23.00%	2.20%
Health	46.52%	46.71%	103.65%
Engineering and Technology	117.89%	110.48%	167.98%
Total	73.92%	66.97%	97.75%

Table continuation...

	Type of HEI		
	Technical Training Center (2ry degrees)	Professional Institutes (4yr degrees)	Universities (5yr degrees)
PANEL C. Private Schools			
Business and Administration	59.04%	59.49%	194.19%
Agriculture	53.12%	45.15%	79.41%
Arts	68.53%	33.78%	50.88%
Science	103.35%	124.70%	128.16%
Social Sciences	30.67%	27.96%	75.17%
Law	101.41%	26.53%	189.81%
Education	-4.64%	20.50%	21.81%
Humanities	-8.13%	19.56%	10.61%
Health	45.09%	28.41%	119.16%
Engineering and Technology	125.67%	102.44%	207.73%
Total	70.42%	57.34%	133.60%

The results suggest that, in general, students coming from private schools have higher returns in most of the fields, regardless of the HEI type. The largest differences are observed for five-year degrees in the fields of engineering and technology, law and business and administration. The estimates also indicate that average negative results emerge across types of degrees, even after controlling for type of high school.

These results however, do not take into account the potential effect of heterogeneity in pre-college abilities in the population. To understand the potential role of this dimension, we compute net returns to higher education by field of study controlling for school type as well as students' performance in the college admission exam (PSU), our proxy of student pre-college ability.

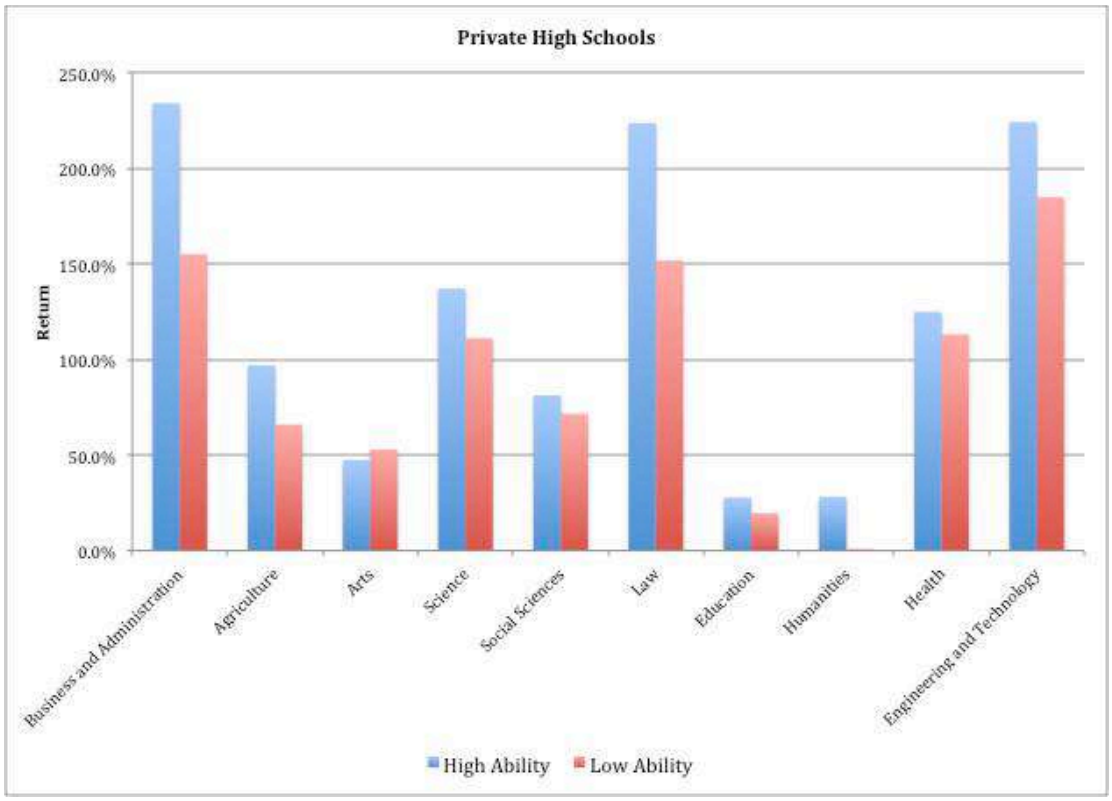
Figure 4 and

Figure 5 presents the results for University degrees distinguishing high and low ability individuals obtaining high school diplomas from private schools and public or voucher, respectively.

The results show that high ability individuals have, in general, higher returns to higher education than low-ability individuals. Furthermore, individuals obtaining high school diplomas from private institutions tend to have higher returns compared to those graduating from voucher and public high schools Finally, the largest ability- and high-school gradients are observed in “Business administration” and "Engineering & Technology" degrees. All in all, the presence of significant heterogeneity, even after controlling for ability and type of high school, provides new insights for the sources of uncertainty when investing in human capital in Latin America.[11]

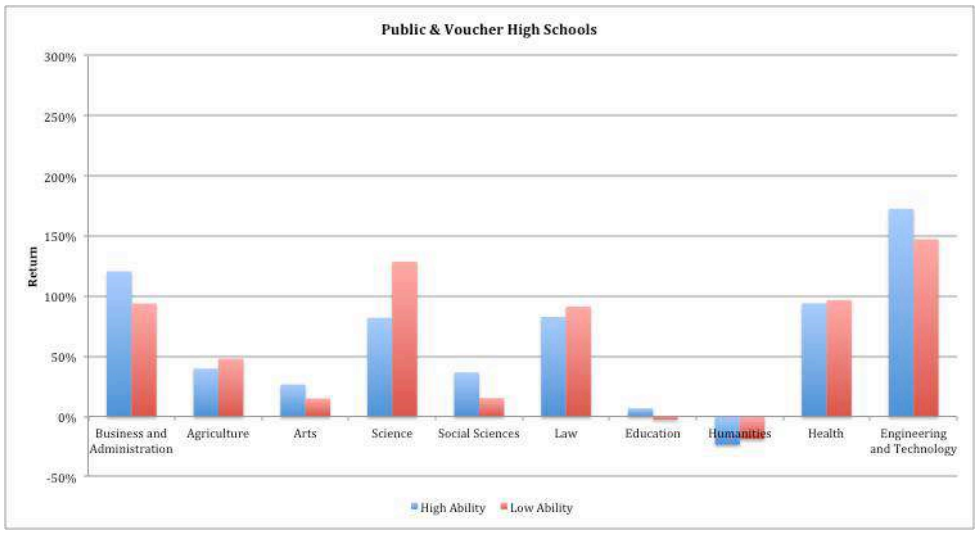
[11] Previous studies have documented negative returns to specific higher education degrees. These results also emerge in our analysis, but they are attenuated once we aggregate the results at the field level.

Figure 4. Average Returns to Five-year College Degrees by Field of Study and ability level: Private High Schools



Note: "High ability" ("Low ability") individuals are those scoring above (below) the 90th percentile in the college admission test (PSU).

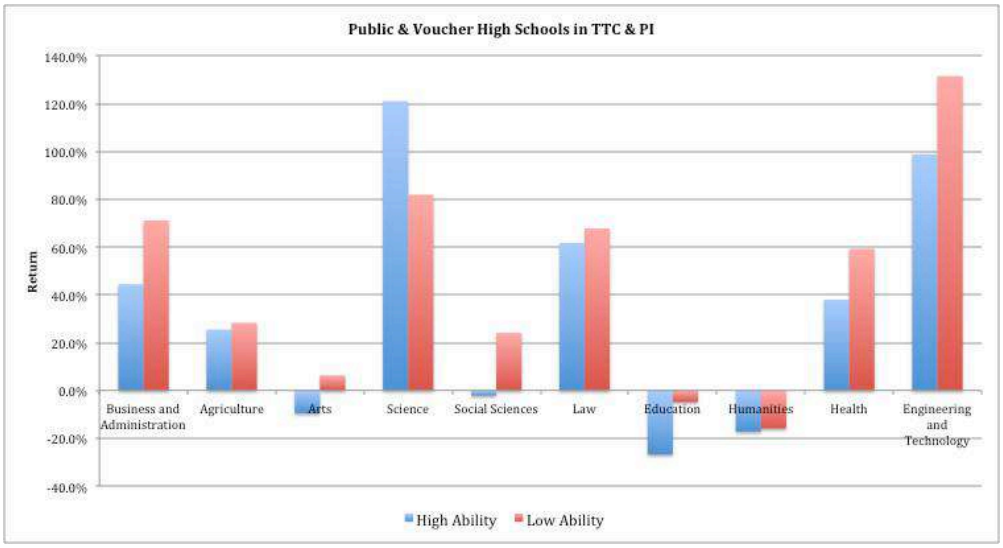
Figure 5. Average Returns to Five-year College Degrees by Field of Study and ability level: Public & Voucher High Schools



Note: "High ability" ("Low ability") individuals are those scoring above (below) the 90th percentile in the college admission test (PSU).

Figure 6, on the other hand, replicates the previous analysis, but for degrees in TTC and PI. The clear ability-gradient documented for five-year college degrees vanishes for two-year college degrees.

Figure 6. Average Returns to TTC & IP by Field of Study and ability level: Public & Voucher High Schools



A set of figures in Appendix 4 presents the relationship between returns and the standardized test for college admissions for different fields.

Does quality matter? Our previous results omitted quality of degree/institution as determinant of the returns to higher education. We use individual-level information on returns and institution-level data on years of accreditations to estimate the following regression model:

$$r_p(l,i,k,j(= \alpha + \beta Q(k(+ \pi(i(+ \mu(j(+ \varepsilon(l,i,k,j(\quad (6($$

where $r_p(l,i,k,j($ is the return for individual *l* in field *i* attending institution *k* of type *j*, *Q(k)* denotes years of accreditation of institution *k*, and $\pi(i($ and $\mu(j($ are field and HEI type fixed-effects, respectively. Column (1) of

Table 4 presents the estimated effect of years of accreditation on average returns. We estimate that an extra year of accreditation is associated with an increase of 9.2 percentage points on average returns. The point estimate is significant at 1 percent.

Columns (2) and (3) present similar estimates for TTCs, PIs and Universities. The largest estimated coefficients (in brackets) are reported for Universities, followed by TTCs. Surprisingly the results for PI are slightly negative than for the rest of the HEIs.

Table 4. The effect of quality on labor market returns

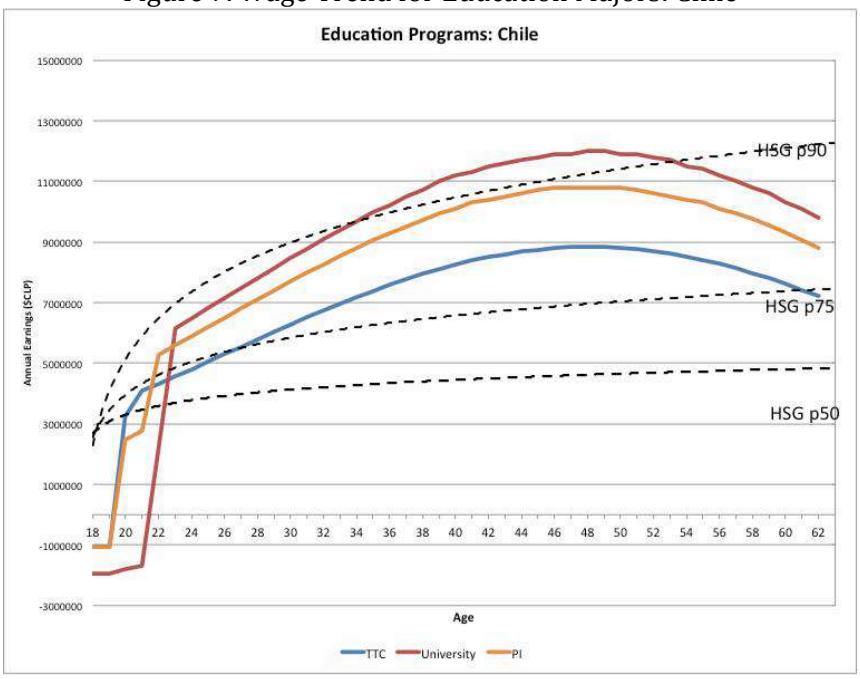
	(1)	(2)	(3)
Accreditation	0.056***		
	(0.001)		
Accreditation x TTC		0.005***	-0.004***
(baseline)		(0.001)	(0.001)
Accreditation x PI		-0.023***	-0.005***
		(0.001)	(0.001)
		[-0.018]	[-0.009]
Accreditation x Universities		0.121***	0.134***
		(0.13)	(0.14)
		[0.13]	[0.14]
Field FE	YES	YES	YES
HEI type FE	YES	NO	YES
Field x HEI FE	NO	NO	YES
Constant	0.202***	0.394***	0.373***
	(0.004)	(0.005)	(0.006)
R^2	0.51	0.54	0.56
N	307,242	307,242	307,242

Note: Numbers in parentheses represent standard errors. Numbers in brackets represent overall effects.

Overall these results confirm the empirical correlation between years of accreditation of HEIs and the net returns to their degrees.

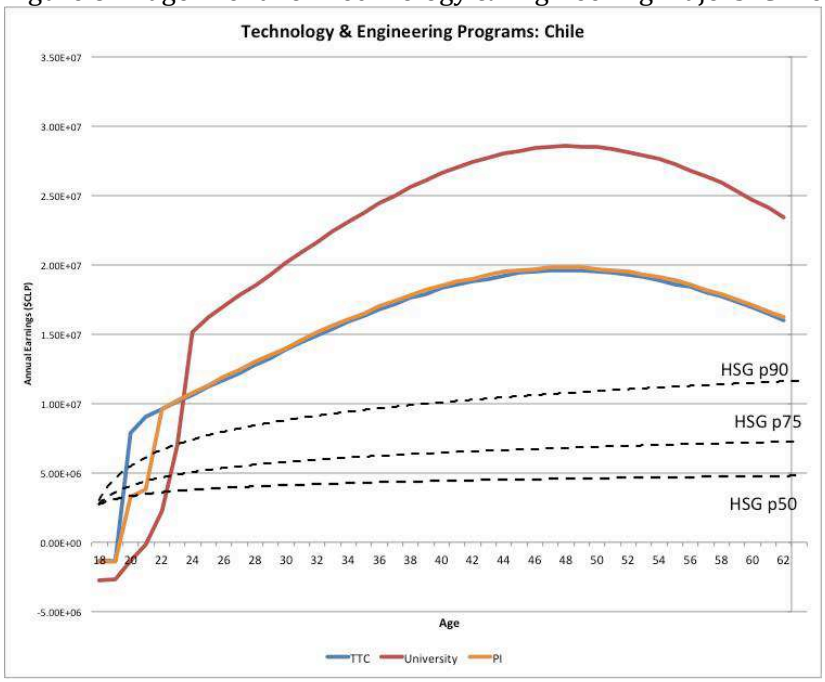
Figure 7 and Figure 8 show estimated earning streams for students in education and technology/engineering majors compared to those of worker with completed secondary education (high school graduates, HSG) located at different levels of the income distribution. The former have relatively low earnings, which implies low o even negative returns. On the contrary, students in technology and engineering programs have high salaries compared to those of high school graduates.

Figure 7. Wage Trend for Education Majors: Chile



Note: Dashed lines show earning trends for High School Graduates (HSG) whose earning belong to different percentiles of the income distribution (percentiles 90, 75 and 50).

Figure 8. Wage Trend for Technology & Engineering Majors: Chile



Note: Dashed lines show earning trends for High School Graduates (HSG) whose earning belong to different percentiles of the income distribution (percentiles 90, 75 and 50).

IV.2. Returns to higher education in Peru

We report the return estimates for Peru. Since data is at the program level and not at the individual level, we present the average return to different degrees rather than individual returns. Appendix 5 presents Mincer and employment level regression used to estimate the earning streams. Appendix 6 shows the regression with which we estimated tuition and earnings when they were imputed as missing values.

In Peru returns show substantially lowers average returns than in Chile. The average return is 36.8%. Even though estimates still show some degree of heterogeneity across fields of study, there tend to be more homogeneous than in Chile. The field that exhibits higher returns is "Sciences/Engineering/Manufacturing" with more than 58% while "Education" programs have a negative return. This evidence follows the same pattern than in Chile. Table 5 summarizes the results.

Table 5. Average Returns by field of study and HEI type: Peru

	HEI Type		
	Vocational/Technical	University	Total
Social Sciences/Communications	11.6%	27.8%	27.6%
Education	-18.5%	-18.5%	-18.5%
Others	50.5%	33.0%	43.2%
Health	31.3%	7.1%	18.8%
Business & Administration	31.9%	24.3%	28.6%
Arts & Architecture	16.3%	47.9%	34.6%
Sciences/Engineering/Manufacturing	70.7%	49.4%	58.5%
Total	44.7%	30.5%	36.8%

We also found significant return differences between public and private institutions. As shown in

Figure 9 and **Figure 10**, private universities have substantially larger returns and similar patterns are encountered in vocational and technical programs, respectively.

Figure 9. Average Returns by field of study and HEI type: University programs in Peru

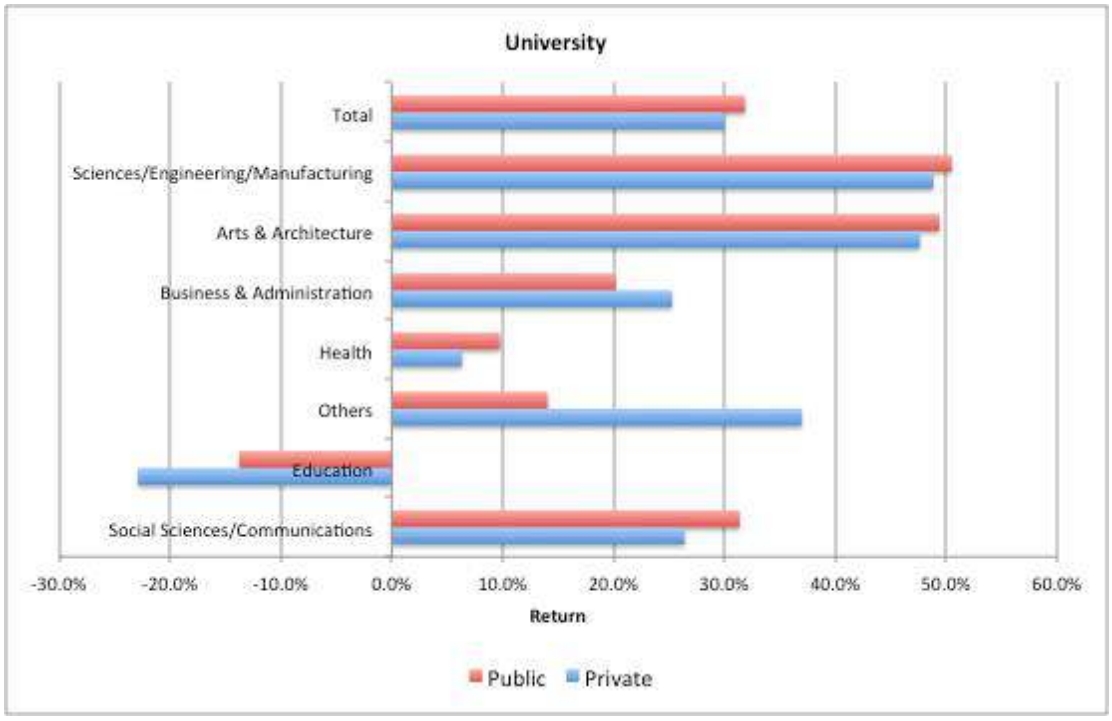
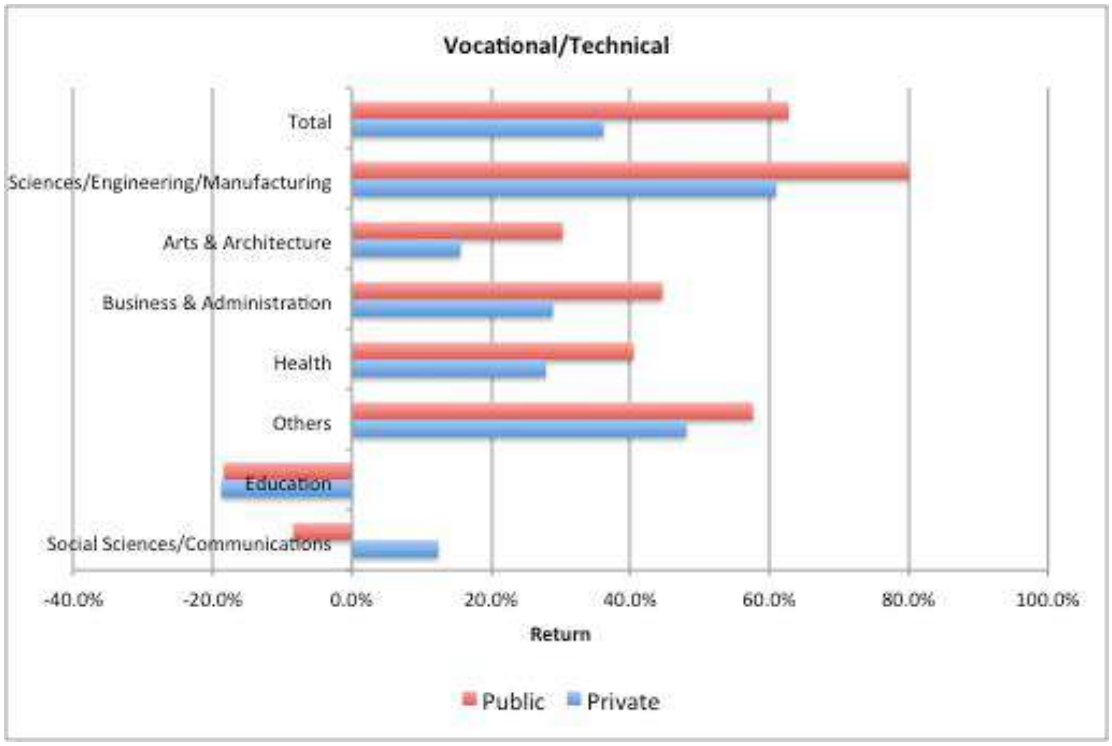


Figure 10. Average Returns by field of study and HEI type: Vocational/Technical programs in Peru



We dot have a proper proxy for program quality in Peru. However we analyze return difference across programs with different levels of selectivity. In particular, we classify programs in three broad categories. We define a "highly-selective program" as a program that admits less than one third of its applicants. Similarly, a "non-selective program" admits more than two thirds of it applicant. Finally "moderately selective programs " admits between one and two of their pool of applicants. As shown in Table 6, we do find a significant return premium for highly-selective university programs. However no such differences are in vocational/Technical institutions.

Table 6. Average Returns by program selectivity and HEI type: Peru

	Vocational/Technical			University		
	Highly Selective	Moderately Selective	Non-Selective	Highly Selective	Moderately Selective	Non-Selective
Social Sciences/Communications		56.6%	8.9%	38.6%	67.7%	15.3%
Education		-25.0%	-17.3%	-18.0%	-21.3%	-16.7%
Others		56.5%	55.1%		18.8%	35.6%
Health	32.5%	40.1%	30.3%	11.4%	6.7%	6.3%
Business & Administration	49.9%	44.6%	30.1%	23.4%	62.8%	18.4%
Arts & Architecture	5.0%	29.1%	16.5%	65.9%	39.4%	42.2%
Sciences/Engineering/Manufacturing	80.5%	75.9%	69.6%	60.4%	63.0%	41.6%
Total	66.1%	54.6%	43.0%	42.5%	45.6%	23.6%

Note: Highly selective programs accept less than 1/3 of it applicants. Similarly non-selective and moderately selective accept more than 2/3 and between 1/3 and 2/3 of their applicants, respectively.

We finally show the salary projection for two different types of program.

Figure 11 shows estimated earning for student attending education programs. The dashed lines show earning of high school graduates (HSG) at three percentiles in the income distribution (90, 75 and the median). The figure illustrates how poorly these graduates perform in the labor market. Graduates earn higher salaries than those in the 75th percentile, but do never earn more than those in the 90th, except for the period they are studying.

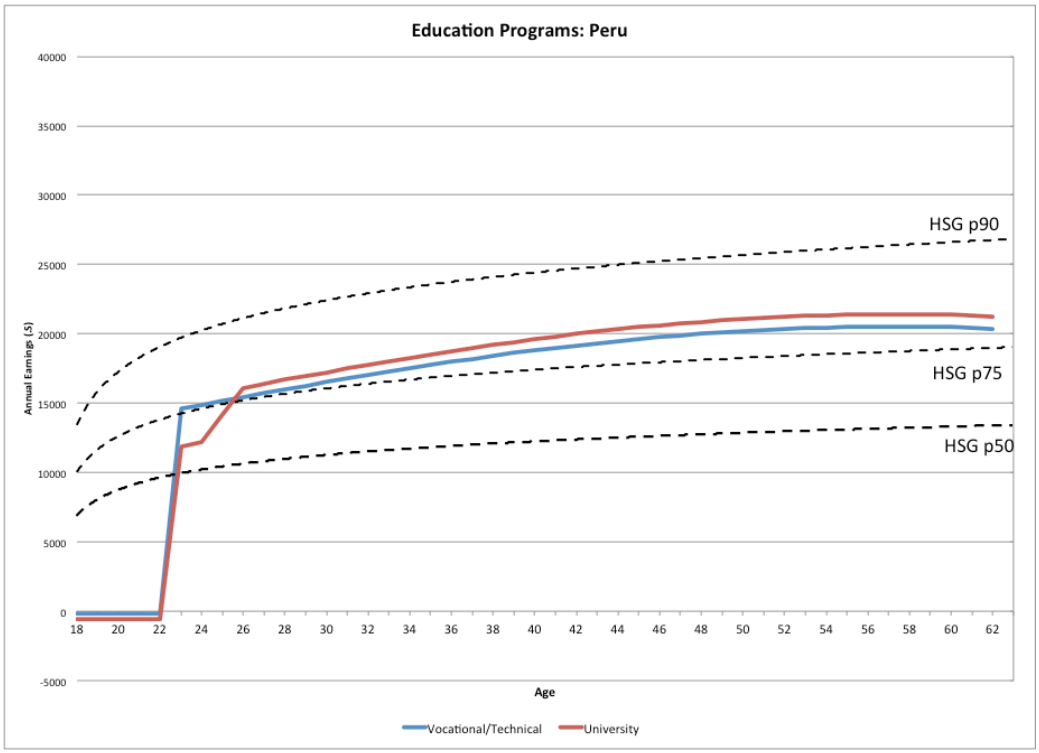


Figure 12 on the other hand illustrates a situation in which graduates earn substantially more than working with completed secondary education which in turn imply large returns.

Figure 11. Wage Trend for Education Majors: Peru

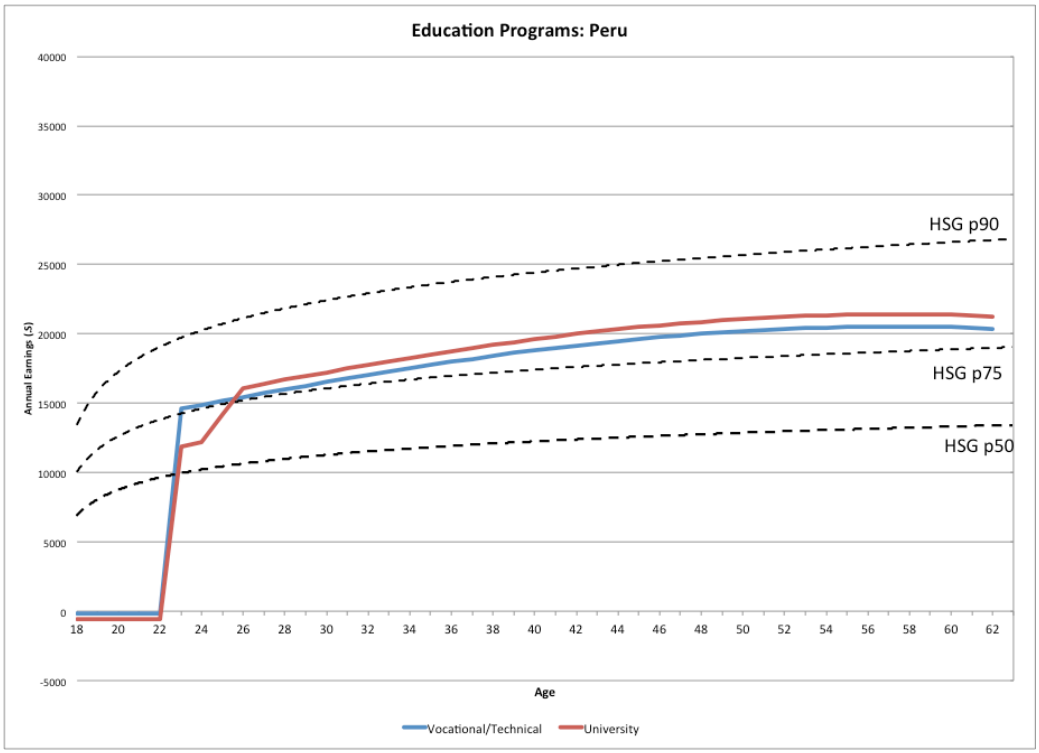
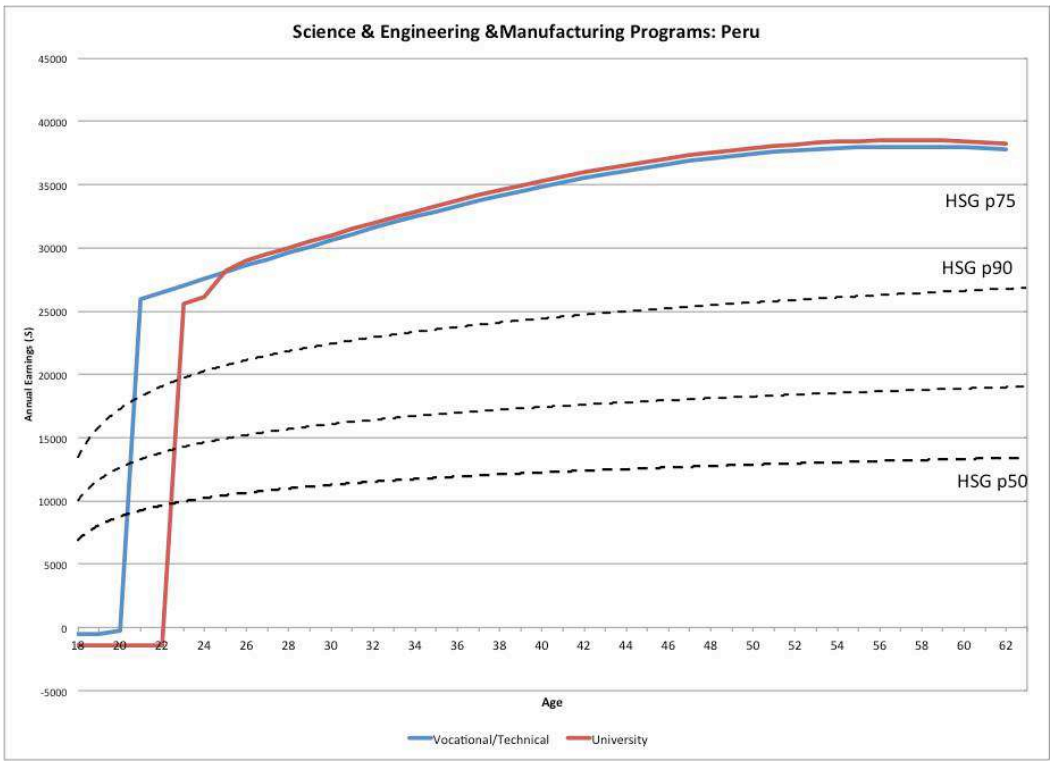


Figure 12. Wage Trend for Technology & Engineering Majors: Peru



IV.3 Financing higher education

We can use our estimated returns to higher education by type of degree to examine different approaches to finance higher education. Specifically, we study the implications of implementing a conventional student loan system[12] versus a graduate tax. While the former exists in many countries around the globe, the latter has only been proposed in countries like UK, Australia and most recently Chile.

We analyze two dimensions of both alternatives. First, we examine the financial convenience for students if they were to opt between the two mechanisms, and second we attempt to estimate the fiscal burden of implementing a graduate tax. The cost of such implementation comes from the fact that for a certain number of years the government has to pay for the cost of providing higher education. The system does not generate any revenues until the first cohort graduates and starts paying the tax. The system can eventually balance and generate surplus but that is not achieved upon implementing the graduate tax but several years later. The fiscal burden is the deficit that is generate during that period of time[13].

To achieve our first goal, we calculate the net present value of each alternative for each student. Let τ be the tax rate imposed on graduates earning and $\hat{y}_t$ be the estimated salary at t years after graduation. (For notational convenience we suppress the (i,j) subscripts). The net present value of the costs of pursuing higher education studies under the graduate tax regime ($NPV_\tau($ is given by:

$$NPV_\tau(\cdot, \tau(= \sum_{t=19+d}^{R} \frac{\tau \hat{y}_t}{(1+\delta(^{t-18}}, \quad (6($$

where d is the duration of the degree, δ a discount factor and R the retirement age. On the other hand, the net present value of the costs of financing the studies through a conventional student loan at an interest rate r is given by:

[12] By conventional student loan we refer to a mortgage-type fixed installment loan.
[13] This type of analysis is only feasible when total enrollment for all programs is available. Unfortunately, for Peru this data is not available. This explains why we only focus on Chile.

$$NPV_l(\cdot, r) = \sum_{t=19+d}^{R} \frac{c(r, N, d)}{(1+\delta)^{t-18}}, \quad (7($$

where *c* is the loan installment, which depends on the interest rate *r*, the duration of the degree *d* , and the loan term N.

In order to compare both alternatives we compute the critical interest rate r^* under which the net present values of the two schemes are equal. Formally, we find r^* such that:

$$NPV_l(\cdot, r^*(= NPV_\tau(\cdot, \tau(. \quad (8($$

The economic interpretation of r^* is straightforward. For any market interest rate $r < r^*$ the graduate tax is dominated by the loan. For a given market interest rate and tax rate we compute the fraction of students that would prefer one regime or the other. Similarly, for a given discount rate r and at equal stream of earnings, if $NPV_l(\cdot, r(- NPV_\tau(\cdot, \tau(< 0$ the student loan financially dominates the graduate tax. Finally, we estimate the fiscal cost of implementing the graduate tax scheme. Specifically we calculate the number of years until which that alternative would generate a fiscal burden, estimating the associated overall costs. Espinoza and Urzua (2015) discuss the practical difficulties and distortions that the introduction of a graduate tax may generate at different levels. However, we limit our analysis to the fiscal cost of such policy.

Chile. We first analyze the financial convenience for students of the two schemes: graduate tax or loans. For each student we determine the critical interest rate leaving her indifferent between both alternatives. Table 7 shows the fraction of students who would financially prefer each alternative. The results indicate that for an interest rate of 7% and a tax rate of 8.5%[14], roughly three quarter of the student would be better off financing their studies through a loan. Similar to Barroilhet, Espinoza and Urzua (2015) who analyze an Income Contingent Loan (ICL) scheme to finance higher education, we found that a graduate tax would mostly benefit rich students (from Private high

[14] Graduate tax proposals have considered a tax rate of this magnitude.

schools) and harm students from poorer backgrounds. Moreover, a graduate tax tends to benefit those pursuing long and expensive degrees and hurt those enrolling short and cheap programs.

Table 7. Who Benefits from a Graduate Tax in Chile

	Benefited by Graduate Tax	Benefited by Loan
Student's Characteristics		
Public	14.5%	85.5%
Voucher	19.0%	81.0%
Private	44.9%	55.1%
All	19.9%	80.1%
Program characteristics		
Avg Duration (years)	5.05	3.11
Avg Annual Tuition (US$)	6,001	3,435
Field Of Study		
Business and Admin.	3.0%	97.0%
Agriculture	50.6%	49.4%
Arts	35.3%	64.7%
Science	27.6%	72.4%
Social Sciences	40.3%	59.7%
Law	31.4%	68.7%
Education	33.8%	66.2%
Humanities	51.0%	49.1%
Health	27.6%	72.4%
Engineering and Tech.	3.7%	96.3%

Note: We assume an interest rate of 7% and a graduate tax rate of 8.5%

On the fiscal side, implementing a graduate tax to finance a tuition free higher education imposes a fiscal burden, caused by the temporal imbalances between revenues coming from future taxes and the needs for funding to cover immediate education expenses of current students.

Figure 13 shows the net cash dynamics after implementing a graduate tax for different tax rates. Assuming an interest rate of 7% and a tax rate of 8.5%, a graduate tax would generate a deficit of US$ 15,082.56 millions (in present value). Revenues would balance the cost only after 10 years.

Of course, a lower graduate tax rate makes the graduate tax more attractive to students, but, as shown in

Figure 13 and **Table 8**, this comes at a larger and costly implementation cost.

Figure 13. Fiscal Balance after implementing a graduate tax

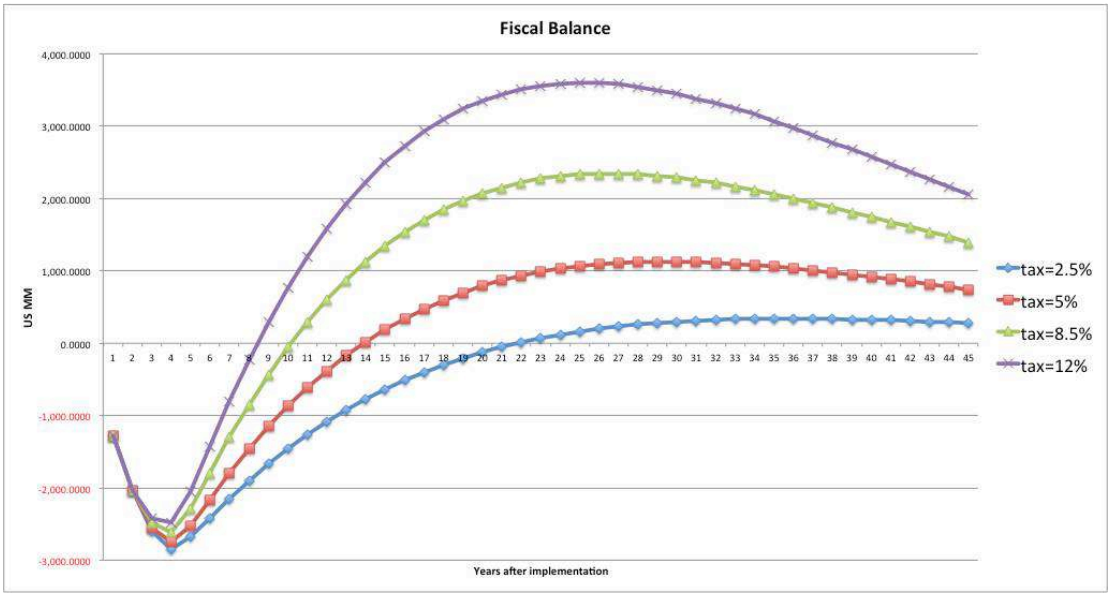


Table 8 presents a sensitivity analysis for the key outcomes (deficit, its duration, fraction opting for loans) relative to different values of the graduate tax rate (holding the interest rate constant at 7%). While a higher graduate tax generates a lower and shorter fiscal deficit, it becomes less attractive for students since their future earnings decline considerably.

Table 8. Graduate Tax scenarios

Graduate Tax Rate	Deficit (US MM)	Deficit Duration (years)	% of students preferring a loan regime
2.50%	$-27,251.61	21	25.26%
5%	$-19,726.01	13	52.84%
8.50%	$-15,082.56	10	80.10%
12%	$-12,684.00	8	95.32%

Peru. Similar patterns emerge in the case of Peru. The graduate tax benefits only 2.1% of the students. Similarly, it only benefits students studying long and expensive programs, which are generally pursued by student from the higher percentiles of the income distribution.

Table 9. Who Benefits from a Graduate Tax in Peru

	Benefited by Graduate Tax	Benefited by Loan
% Students attending		
Vocational/Technical	0.1%	99.95%
University	3.8%	96.2%
All	2.1%	97.9%
Program characteristics		
Avg Duration (years)	5.66	4.21
Avg Annual Tuition (US$)	6015.9	996.99
Field Of Study		
Social Sciences/Com.	1.9%	98.1%
Education	1.8%	98.2%
Others	3.4%	96.6%
Health	5.2%	94.8%
Business & Admin.	0.3%	99.7%
Arts & Architecture	7.4%	92.6%
Sciences, Engineering	1.6%	98.4%

V. Conclusions

Many Latin American countries had implemented sound policies aimed at promoting access to higher education, and many more will continue doing so in the years to come. However, it is unclear whether these efforts have paid (and will pay) enough attention to education quality. This is particularly important if we consider that the significant increases in enrollment rates observed in the region altered the characteristics of the marginal students. Each year a larger fraction of individuals coming from vulnerable households enrolled in higher education institutions in countries such as Chile, and Peru. Thus, to the extent that these new generations of students probably for years attended low-quality (primary and secondary) institutions, the issue of whether the higher education systems throughout the region can alleviate their lack of skills and provide them with the capacities to success in the labor market turns critical. This paper seeks to shed light into this issue.

Using administrative information, complemented with household surveys, we estimate the returns to higher education in Chile and Peru. We focus our interest on a specific parameter, namely the return to education for those individuals obtaining college degrees (average treatment effect on the treated). We estimate them by field of study and type of higher education institution.

Consistent with previous studies, we document large heterogeneity in returns in Chile, with a non-trivial fraction of students facing the possibility of negative net returns. In contrast to the literature, we document returns after controlling for pre-college variables, including type of high school and proxies for ability. In the case of Peru, we provide new evidence suggesting that the phenomena documented in Chile might not be an exception.

We use our findings to examine two alternative higher education financing policies: student loans and graduate taxes. Our results suggest that financing a higher education system through a graduate tax imposes a significant fiscal burden in the years following its implementation. Furthermore, we show that option is not financially attractive for a large fraction of students, who would be better off under a system based on student loan.

Overall, when it comes to the future efforts in the higher education systems in developing countries, our evidence suggests that securing education quality and designing efficient financing policies must be top priorities.

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Appendix 1. Mincer and Employment Regressions: Chile

Table A1.1. Mincer Regressions: Chile

	CFT	IP	University
Age	0.062***	0.065***	0.094***
	(0.007)	(0.006)	(0.004)
Age^2	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)
Constant	11.590***	11.566***	11.371***
	(0.152)	(0.124)	(0.093)
R^2	0.04	0.04	0.06
N	2,691	4,643	11,028

Table A1.2. Employment Regressions: Chile

	CFT	IP	University
Age	0.037***	0.036***	0.049***
	(0.003)	(0.002)	(0.001)
Age^2	-0.000***	-0.000***	-0.001***
	(0.000)	(0.000)	(0.000)
Constant	0.065	0.094**	-0.163***
	(0.061)	(0.048)	(0.030)
R^2	0.06	0.06	0.15
N	3,544	6,141	14,188

Appendix 2. Missing Data Estimation

Table A2.1. Missing Data Regressions: Chile

	Dependent Variable		
	Earnings	Tuition	Duration
Agriculture	-220,057.388***	288,975.387***	1.215***
	(61,387.798)	(75,215.190)	(0.200)
Arts	-277,323.987***	321,282.902***	0.698***
	(53,856.764)	(70,041.717)	(0.179)
Science	-136,876.021*	-142,201.771	0.694***
	(78,434.517)	(100,393.461)	(0.261)
Social Sciences	-289,436.501***	11,775.528	0.082
	(45,584.232)	(59,009.102)	(0.155)
Law	101,351.249*	197,037.620***	1.607***
	(53,480.905)	(64,116.622)	(0.176)
Education	-409,802.793***	-270,520.128***	-0.372**
	(45,984.358)	(56,234.308)	(0.147)
Humanities	-574,775.800***	-258,903.917**	-0.521*
	(95,813.777)	(112,521.793)	(0.292)
Health	-24,069.067	390,443.194***	-0.027
	(48,984.589)	(58,697.246)	(0.152)
Eng. & Tech	215,296.860***	100,443.905*	0.514***
	(44,523.689)	(55,659.206)	(0.145)
Constant	-220,057.388***	288,975.387***	1.215***
	(61,387.798)	(75,215.190)	(0.200)
Region FE	YES	YES	YES
HEI FE	YES	YES	YES
R^2	0.78	0.92	0.85
N	387	540	505

Appendix 3. Alternative Returns to Higher Education: Chile

Table A3.1. Returns with original data: Chile

	Type of HEI			
	Technical Training Center (2ry degrees)	Professional Institutes (4yr degrees)	Universities (5yr degrees)	Total
Business Administration	20.54%	39.32%	130.19%	65.77%
Agriculture	-4.97%	9.97%	51.45%	31.91%
Arts	37.30%	-16.25%	25.31%	4.60%
Science	49.84%		114.69%	108.55%
Social Sciences	-33.39%	-7.49%	39.54%	22.23%
Law	-28.83%	-27.46%	122.83%	96.49%
Education	-55.70%	-21.26%	6.37%	-8.23%
Humanities		11.58%	-13.89%	-9.34%
Health	-16.80%	-17.34%	111.54%	52.28%
Engineering and Technology	86.96%	88.14%	171.93%	120.90%
Total	31.28%	36.73%	99.75%	66.13%

Table A3.2. Returns without adjusting salaries by employment rate: Chile

	Type of HEI			
	Technical Training Center (2ry degrees)	Professional Institutes (4yr degrees)	Universities (5yr degrees)	Total
Business Administration	18.13%	24.02%	91.64%	44.10%
Agriculture	-7.45%	15.69%	39.92%	24.83%
Arts	26.95%	0.92%	27.02%	13.38%
Science	29.65%	-9.94%	82.63%	78.74%
Social Sciences	-16.81%	-2.57%	24.23%	13.89%
Law	3.06%	-5.65%	101.56%	84.38%
Education	-29.35%	-14.77%	-5.43%	-11.30%
Humanities		-2.24%	-4.44%	-4.05%
Health	-2.37%	6.12%	66.55%	36.21%
Engineering and Technology	62.21%	61.85%	122.46%	84.57%
Total	24.77%	26.83%	66.71%	45.17%

Appendix 4. Mincer and Employment Regressions: PERU

Table A5.1. Mincer Regressions: Peru

	Technical/Vocational	University
Age	0.038***	0.064***
	(0.009)	(0.009)
Age^2	-0.000***	-0.001***
	(0.000)	(0.000)
Constant	6.116***	5.992***
	(0.175)	(0.182)
R^2	0.05	0.04
N	2,535	2,587

Table A5.2. Employment Regressions: Peru

	Technical/Vocational	University
Age	0.029***	0.040***
	(0.002)	(0.002)
Age^2	-0.000***	-0.000***
	(0.000)	(0.000)
Constant	0.249***	0.003
	(0.047)	(0.052)
R^2	0.06	0.10
N	5,343	4,535

Appendix 5. Missing Data Estimation: Peru

Table A51. Missing Data Regressions: Peru

	Earnings	Tuition
Duration	11.138	-445.441***
	(58.070)	(78.841)
University		493.302
		(313.982)
Public		-2,867.364***
		(291.320)
Field of Study FE	YES	YES
HEI FE	YES	YES
Constant	1,996.115***	5,784.451***
	(271.814)	(1,036.884)
R^2	0.91	0.97
N	789	2,826