

# Unequal head start: heterogeneous short-term impacts of graduating on employment and income

A fixed-effects regression analysis \*

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## Abstract

Literature shows that horizontal inequalities in accessing more market-oriented undergraduate courses has relevant impact on inequality. This paper estimates heterogeneous short term impacts of graduating in Brazil, a country with strong segmentation in the educational system. Using a panel data from 2017 and 2018, we explore the heterogeneity between public/private institutions, with a new database provided by Brazilian Institute of Geography and Statistics. Using a fixed-effects regression, it's found that getting a undergraduate degree has an impact of around 10% on income over a year. We also find evidence that this increase is added by 7p.p. if one has previously attended a private high school and a public university or college. Different kinds of institution of tertiary and secondary education also make graduating have distinct impacts on employment, formality and weekly hours in labor.

**JEL Classification:** I240 I260 I280 J240 J310

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## Resumo

A literatura mostra que as desigualdades horizontais no acesso a cursos de graduação mais orientados para o mercado de trabalho têm impacto relevante na desigualdade de rendimentos. Este trabalho estima os impactos heterogêneos de curto prazo da graduação no Brasil, um país com forte segmentação no sistema educacional. Utilizando dados em painel de 2017 e 2018, exploramos a heterogeneidade entre instituições públicas/privadas, com um novo banco de dados fornecido pelo Instituto Brasileiro de Geografia e Estatística. Usando uma regressão de efeitos fixos, constatou-se que a obtenção de um diploma de graduação tem um impacto de cerca de 10 % sobre a renda ao longo de um ano. Também encontramos evidências de que esse impacto aumenta em 7p.p. se o indivíduo já frequentou uma escola particular e uma universidade pública. Além disso, diferentes tipos de instituições de ensino superior e de ensino médio também fazem com que os graduados tenham impactos distintos no emprego, formalidade e horas semanais de trabalho.

**Palavras Chave:** Educação, Mercado de Trabalho, Instituições, Dados em Painel

# 1 Introduction

Brazil, despite improvements in the last 20 years, remains a poorly educated country, even compared to its neighbors. Among the largest countries in Latin America, only Colombia has educational levels similar to Brazil's. The gap between its average years of schooling and leaders of the region is around 25%.

Although the strong role of human capital in wage formation in Brazil is consensual [Langoni, 1973; Barbosa Filho et al., 2010; De Moura and Barbosa Filho, 2014], there is little empirical evidence on the country's labor returns of education. Griffin and Edwards [1993] estimates from a mincerian equation the rate of return to an additional year of schooling between 12.8 and 15.1%. Stefani and Biderman [2006] estimated a 28% increase in wages with data from 1996. However, there is a general lack of estimates using evidence from natural experiments or with emphasis on research design, with a credible causal identification strategy, as described in Angrist and Pischke [2010]. Estimating returns to schooling and college premiums in middle-income countries such as Brazil is an immediately policy-relevant question.

In this paper, we present causal evidence of educational returns on labor market using a new short-term panel data (five quarters), with information on the institution of education (whether public or private) after graduation. This way, we manage to perform a fixed-effects regression of labor income on tertiary degree, interacting with a dummy of public/private institution in college and high school. Our results show that, when graduating in college, labor income increases around 10% in one year or less. Besides, if the worker graduated in a private high school, there is an extra increase of 3p.p.

This paper uses the data from the Brazilian National Continuous Sample Household Survey (PNADC), a special survey conducted by the Brazilian Institute of Geography and Statistics every quarter. Unlike many other surveys with schooling-related variables, such as the Demographic Census, PNADC follows households for five quarters, making it possible to identify residents from their date of birth. More specifically, the National Continuous Sample Household Survey has a supplement on education in every second quarter, in which surveyees were asked whether the institutions from which they graduated in high school and college were private or public.

Our paper contributes to the literature showing that, besides high short-term tertiary education returns, there is another channel of inequality through institutional design in Brazilian educational system, which reinforces previous segregation. We explore this channels, showing that, while public tertiary education institutions are better evaluated in quality for most areas, students from private high schools tend to be more present in higher return courses in those public tertiary education institutions.

In our paper, however there's an limitation: the lack of panel data in for more than five quarters. This way, we may only estimate short-term impacts of tertiary education premium on labor income.

There are many economic benefits from which individuals with a tertiary degree are able to take advantage, such as more likelihood to be employed, higher incomes on and even for some health outcomes, such as less likelihood to suffer from depression. OECD [2018] shows that relative earnings of workers with college degree is 150% above average upper secondary education job wages, but without controlling on covariates. According to th institution, these benefits vary widely with the courses. As an example, engineering, construction, manufacturing, communication technologies students have the highest employment rate on average across OECD countries.

Moreover, there are researches exploring the relation between education and inequality. Reporting socioeconomic differences in the United Kingdom universities, Crawford [2014] explains what happens to different background individuals when they arrive at college exploring differences in university outcomes, such as drop-out, degree completion and degree

classification. Higher socioeconomic background students are more likely to graduate, less likely to drop-out the course and more likely to graduate with upper-classes honours (first or 2:1) than those from lower socioeconomic background, even comparing individuals on the same course. These differences in university outcomes can be explained by the fact that these groups arrive at college with very different levels of human capital.

[Chetty et al. \[2017\]](#) showed that access to college varies greatly by parents income in United States, with children whose parents are in the high-income of the distribution more likely to attend a college than those whose parents are in the low-income of the distribution.

[Davies and Guppy \[1997\]](#) examine if there are inequalities in process by which students enter lucrative fields of study, selective colleges and lucrative fields within selective colleges in United States. They find that males are more likely to enter higher economic returns fields of study than females; students from higher socioeconomic backgrounds, although do not have greater access to lucrative fields, are more likely to enter selective universities and lucrative programs within selective universities; measured ability is a determinant of student's chances of entering lucrative fields and selective universities; and higher-ranked schools and fields attract students who score greater on ability tests.

[Andini \[2017\]](#) reports that "tertiary education for all" may not reduce the overall level of wage inequality. Even that it reduce wage inequality due to differences in education levels across individuals, it may increase wage inequality due to differences in unobservable characteristics of individuals by favouring students with higher ability more than those with lower ability. However, [Brand and Xie \[2010\]](#) find evidence suggesting negative selection in heterogeneous economic returns to higher education in United States, that is, individuals most likely to benefit from college education are the least likely to obtain one.

Stratification and selection theories impose doubt about the effect of education on inequality. There are many ways that education affects students. These private returns vary among individuals and demographic groups. According to [Hout \[2012\]](#), Education affects more those who are less likely to pursue a college education than traditional college students, which supports the negative selection theory.

Other papers examine the impact of education on inequality in Brazil. [Arias et al. \[2004\]](#) showed that, although differences in human capital do not explain all of the racial earnings gaps, they explain most of these. Differences in human capital are due to the more favorable socioeconomic background of whites and to the fact that they tend to study in schools with relatively better quality. Thus, the author concludes that equalizing access to quality education, in addition to specific policies, such as anti-discrimination laws, may reduce racial earnings inequality in Brazil.

[Giudici \[2018\]](#) identified a great horizontal inequality in Brazilian higher education, i.e., students from less privileged social status tend to focus on lower expected financial return courses. In addition, the author concludes that, although in recent years it has increased the participation of students from less privileged socioeconomic backgrounds, high horizontal inequality in college has remained.

[Reis and Machado \[2015\]](#) report that labor earnings inequality is remarkable among Brazilian workers with completed tertiary education. The authors explain part of these disparities by heterogeneous returns across fields of study and mismatches between the individuals' occupations and their fields of study.

[Martins and Machado \[2016\]](#) showed that the expected returns of careers influence the choice of the highest quartile of per capita household income, while the competition in the qualification process has greater impact on the choice of individuals in the lowest quartile of per capita household income distribution.

This paper is organized as follows. In Section 2 there's a brief discussion on Brazilian educational system, its segmentation in tertiary education and, finally, the human capital theory and the alternative ways in which education impacts labor market outcomes,

discussing the literature on this issue, specially for Brazil. In Section 3, we present our identification strategy, followed by a description in Section 3.1 of the data we used. Results are presented in Section 4, while section 5 concludes.

## 2 Tertiary Education and Labor Market in Brazil

### 2.1 Brazilian Institutional Background in Tertiary Education

Attending public tertiary education in Brazil has always been the privilege of elites, since their access has always been restricted and unequal. In 1992, for example, only 7.4 per cent of whites of college age were enrolled, while blacks and browns were only 1.4 per cent. In the last two decades, however the system of access to public universities underwent profound changes.

In 1998, the Federal Government created the National Examination of Secondary Education (ENEM), which became mandatory for accessing a scholarships program in 2004. In 2010, ENEM also became compulsory for applications in SISU (Unified Tertiary Education Selection System). The national quota system, created in 2012, completed the cycle of these last changes.

Currently, a large part of the selection process for public universities is done through SISU, with 235 thousand vacancies in universities, institutes and federal technology centers, a strong increase compared to the initial year (2010), where less than 50,000 vacancies were available by that system. In order to apply through SISU, the candidates have to make the ENEM and get a score higher than zero in writing. Some institutions require minimum scores to accept candidates, while others give different weights for scores in various areas, and others have mixed selection processes, combining SISU and their own entrance exam.

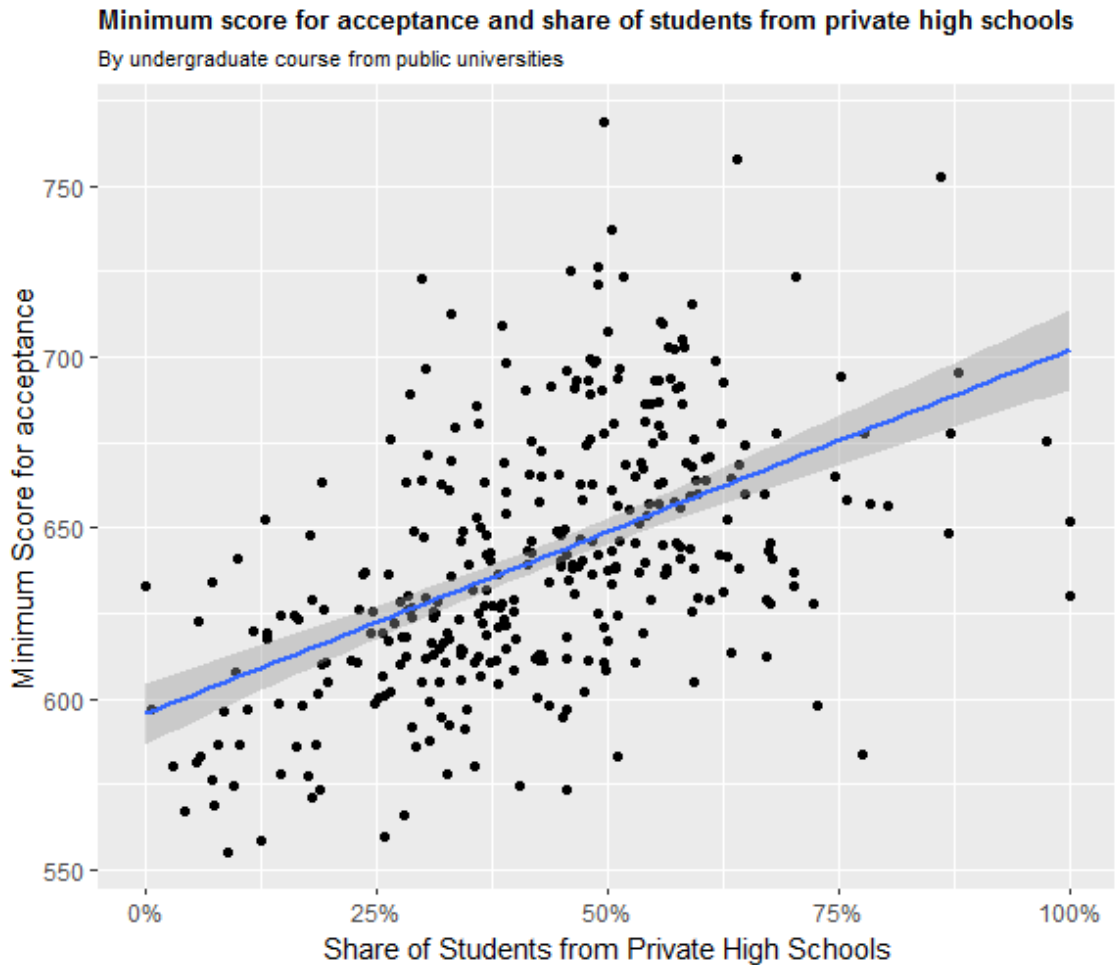
At the time of registration, the candidate can choose between the system of wide competition or affirmative action. Since 2012, 50% of the vacancies are reserved for students from public high schools and, within these vacancies, there are quotas for low-income students and for blacks and indigenous people.

On the day that SISU registration is open, all students can enroll in the courses of their choice by choosing two options in order of preference. At the end of each day, the student has access to the cutoff scores for acceptance into his two chosen courses, besides his classification in the first option. Also, the student can search the cutoff scores of all courses in the system and can change their choices or reverse the order of their options at any time. The final options are those recorded on the last day, when the system closes. Then, on a given date, SISU announces the classified applicants in each course, that must enroll in the tertiary institutions.

### 2.2 Evidences on Educational Stratification in Tertiary Education System

It's expected that undergraduate courses with a higher expected increase of income will attract more applicants seeking educational gains. Figure 1 shows the minimum score for acceptance by undergraduate course from public universities and the share of students from private high school in these courses. The scores above mentioned come from the SISU.

Figure 1



This Figure shows that the greater the minimum score for acceptance of the undergraduate course, the higher the share of students from private high schools. Since we may assume that individuals compete more for courses with higher expected increase in income, a greater minimum score can be seen as a proxy for higher expected increase in income.

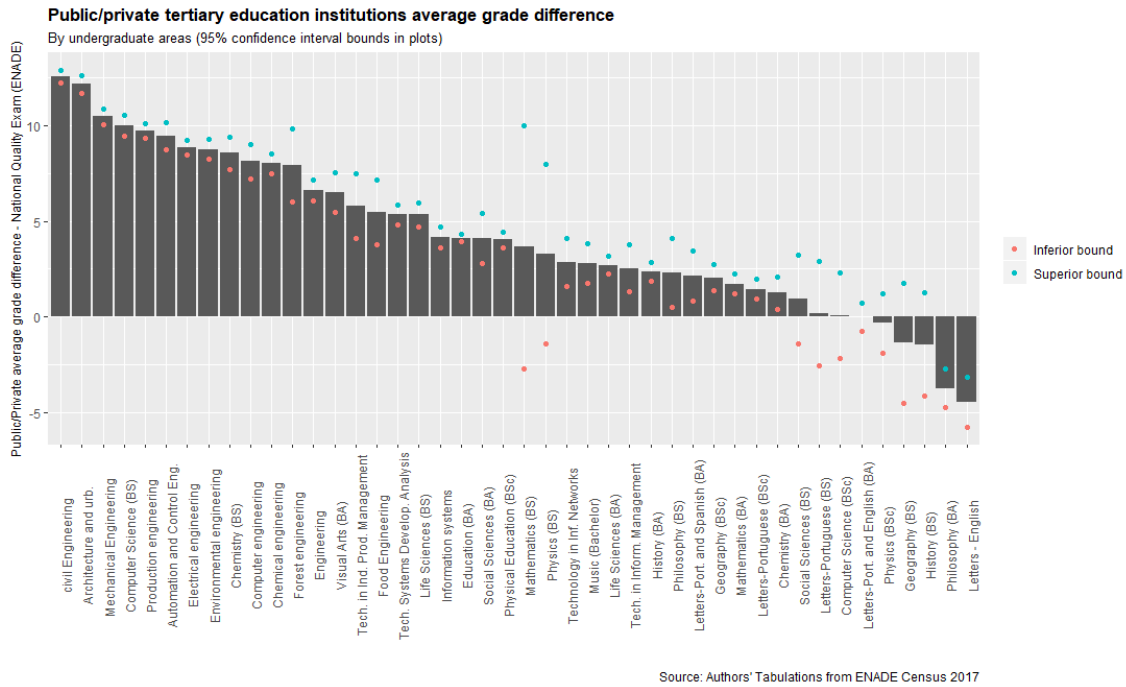
Carvalhoes and Ribeiro [2019], showed that, in Brazil, high school students from the upper socioeconomic groups - that usually attend private institutions at that level of schooling - were significantly more likely to enter in higher return courses (Medicine, Dentistry, Engineering, etc.) compared to students from the lower social status.

Students may also use their Enem grades to apply for the "Prouni" program. Prouni offers a full scholarship in private colleges to students who demonstrate family income per capita of up to three minimum wages. Students who have scored at least 450 points in the average of the Enem can be candidates for Prouni, in addition to a writing grade higher than zero. Scholarships are awarded according to the grades obtained by students at Enem.

However, in terms of evaluation, public tertiary institutions show in average greater scores than private ones, for almost every undergraduate area. Figure 2 shows the average grade difference in National Exam of Students Performance (Enade) between public and private tertiary education institutions by undergraduate areas. Enade is a written, compulsory and annual test that evaluates the performance of undergraduate students in relation to the programmatic contents, skills and abilities acquired in their training. The Anísio

Teixeira National Institute of Educational Studies and Research (INEP), which is a federal entity linked to the Ministry of Education (MEC), is responsible to the test application. Enade aims to follow the learning process and the academic performance of students in relation to the contents of the curricular guidelines of their undergraduate course. The Enade results report information by higher education institutions, academic organization, municipality, state, geographic region and Brazil.

Figure 2



As shown, in every area but two (Letters - English and Philosophy), average grade of public tertiary students is higher. Usually, this difference is pointed as an evidence of better quality of public tertiary institutions. Therefore, tertiary degree returns might be higher when individual has studied in private high school and public university in Brazil, due to its Educational System.

### 2.3 Evidences of Schooling Returns in Brazil

There are three primary channels by which education can impact labor income. The first one is by raising productivity via human capital accumulation (see [Schultz \[1961\]](#) and [Becker \[1994\]](#)). Not only does human capital lower cost of information acquisition [[Rosenzweig, 1995](#)], but also as workers acquire skills, experience and knowledge, a wider array of what they can produce, and how efficiently, becomes available. [Dustmann and Meghir \[2005\]](#) and [Ashenfelter and Krueger \[1994\]](#) provide some empirical evidence and rates of return of education.

The second channel is through peer effects, both at firm and sector level. As more educated workers join a particular firm or sector, productivity for other workers rises [[Falk and Ichino, 2006](#)]. This can happen either due to direct learning from other workers or due to some sort of spillover effect, e.g. a recently-hired, more educated worker implementing cost-saving measures at his or her firm, thus increasing the other workers' and its sector productivity.

The third is through signaling [[Spence, 1978](#)]. The idea is that, due to labor markets'

asymmetric information, high school diplomas, college degrees and other forms of education certificates act as signals. As they're costly to acquire, these credible pieces of information make employers more willing to hire workers with more, better signals and also to do so for higher wages. [Hämäläinen and Uusitalo \[2008\]](#) and [Castagnetti et al. \[2005\]](#) provide some empirical evidence for this phenomenon.

Overall, education has very well documented, positive effects on wages [[Dickson and Harmon, 2011](#)] and positive externalities. [Wantchekon et al. \[2015\]](#) documents increases in political participation and standards of living not only for more educated people but local spillovers of the benefits (see [Moretti \[2004\]](#) for a comprehensive review of this topic).

The strong role of human capital in wage formation in Brazil is consensual ([Langoni \[1973\]](#), [Barbosa Filho et al. \[2010\]](#), [De Moura and Barbosa Filho \[2014\]](#)), and there is a vast empirical evidence on the country's labor returns of education. [Griffin and Edwards \[1993\]](#) estimates from a mincerian equation the rate of return to an additional year of schooling between 12.8 and 15.1%. [Stefani and Biderman \[2006\]](#), on the other hand, estimated a 28% increase in wages with data from 1996.

In most recent studies, [Marcelo and Wylie \[2006\]](#), making a sample selection correction procedure and including a measure for quality in education and a more direct measurement of experience, finds estimates between 13 and 14%, with additional 26-27% when considering good quality education. [Suliano and Siqueira \[2012\]](#) estimates the rate of return to education for two Brazilian regions that have strong socio-economic disparities: Northeast and Southeast, performing alternative forms of estimation of the OLS. They found that returns to schooling around 5% in both regions, despite their strong socio-economic disparities.

## 3 Methodology and Data

### 3.1 Data and Sample

All data we used in this paper comes from micro data of the National Continuous Household Sample Survey (PNADC) of 2017 and 2018, by Brazilian Institute for Geography and Statistics (IBGE). PNADC reports information about schooling, labor market and income. Since the survey visits the same household for five quarters, it is considered a household panel. IBGE publishes some additional topics in specific quarters of the year. We have used the additional education topic, which is published all second quarter of the year.

Specifically in this Supplementary Continuous PNADC, there is information on the type of institution where individuals have achieved their last educational degree. Therefore, for all Brazilians who have completed tertiary education, it is possible to identify whether it was on a public or private institution. In addition, in this data set it is also possible to identify the type of institution - public or private - where individuals got their secondary education. This particular set of information allows us to estimate heterogeneous impacts of a college degree on earnings.

### 3.2 Methodology

In this paper, the main aim is to understand how labor income responds to a tertiary degree, regarding different types of tertiary and secondary education institutions attended. So, our coefficients of interest will follow the equation below:

$$\frac{\partial Y}{\partial U_{niv}} = \beta_1 + \beta_2 \times Private2Ed + \beta_3 \times Public + \beta_4 \times Private2Ed \times Public \quad (1)$$

Where  $Y$  is the log labor income (but it may also be employment odds rate, hours in labor, etc...),  $U_{niv}$  is a dummy for holding tertiary degree,  $Private2Ed$  is a dummy for



holding a secondary education degree from a private institution and *Public* is a dummy for holding anyone highest education level degree from a public institution.

Following the equation above, the average treatment effect (ATE) of the tertiary degree from a private institution for those who attended public high schools on their income will be  $\beta_1$ , while for those who attended private high schools it will be  $\beta_1 + \beta_2$ . In addition, for those holding a tertiary degree from public institutions, having attended public schools, ATE will be  $\beta_1 + \beta_3$  and, finally, for those holding a tertiary degree from public institutions, having attended private schools, ATE will be  $\beta_1 + \beta_2 + \beta_3 + \beta_4$ .

Despite the usefulness of estimating tertiary degree returns, our main interest relies on  $\beta_4$ , for which we may attribute horizontal inequalities within public universities and colleges. We consider that, for  $\beta_4 > 0$ , these horizontal inequalities favour youngsters with higher socioeconomic background, while  $\beta_4 < 0$  represents the case in which there is progressiveness within these public institutions, favouring those who have not attended private high schools.

In order to estimate these coefficients, we perform a panel estimation technique, which permits greater flexibility in controlling the effects of omitted variables that vary between observation units and remain constant over time (and vice versa). Since Continuous PNAD Sample have five continuous quarterly surveys for each household, we set our panel to have the same individuals between the same quarter of two years, 2017 and 2018.

Continuous PNAD does not identify the individuals within households, but we use the date of birth (among other variables such as gender) as an individual identifier, removing twins from our sample. Therefore, we are able to obtain estimation results which derive from the same sample in different years. Since our data set is made up of only 2 years, however, we can only estimate short-run effects of schooling on wages.

Our model has the following specification:

$$Y_i = \beta_0 + \beta_1 Univ_i + \beta_2 Univ_i \times Private2Ed_i + \beta_3 Univ_i \times Public_i + \beta_4 Univ_i \times Public_i \times Private2Ed_i + \beta_5 Z_i + u_i + \gamma_i + \sigma_t + u_{i,t} \quad ,$$

$$i = 1, \dots, N; \quad t = 2017.II, \dots, 2018.II \quad (2)$$

where  $Y_{i,t}$  is the log labor income of individual  $i$  in the time  $t$ ;  $Univ_{i,t}$ ,  $Univ_{i,t} \times Public_{i,t}$  and  $Z_{i,t}$  are a vector of observed individual characteristics, such as complete tertiary education;  $\gamma_i$  is the individual time-invariant unobserved heterogeneity;  $\sigma_t$  is the time fixed-effect, which controls changes that have occurred to all groups; and  $u_{i,t}$  is the individual time-varying unobserved disturbance.

In our model,  $Z_i$  includes age; age squared; dummies of the period of time in the last job (when the dependent variable is not related to employment). We consider only anyone born between 1996 and 1958 in our sample.

Since we have only data for five quarters, one may interpret these estimates as the signalling effect of graduating. The equation specification, with individual fixed-effects combined with only tertiary education dummies, also reinforces this interpretation of results.

### 3.3 Descriptive Statistics

Table 1 shows some general information of our sample. There are around 40 thousand individuals, younger in average than 40 years, with average 10 years of study (less than completed Secondary Education). The standard deviation of Labor Income is higher than its mean, suggesting a high level of inequality.

Table 1: General Descriptive Statistics

2017-2	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Age	40,582	37.481	10.351	20	29	46	58
Schooling	40,582	10.199	4.262	0	7	12	16
Labor Income	35,184	1,908	2,756	4	937	2,000	100,000
2017-3	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Age	40,363	37.767	10.393	20	29	46	58
Schooling	40,363	10.242	4.250	0	7	12	16
Labor Income	35,047	1,905	2,953	6	937	2,000	200,000
2017-4	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Age	39,594	38.011	10.373	20	29	46	58
Schooling	39,594	10.262	4.264	0	7	12	16
Labor Income	34,707	1,942	2,851	8	937	2,000	150,000
2018-1	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Age	39,130	38.259	10.350	21	30	47	59
Schooling	39,130	10.320	4.257	0	7	12	16
Labor Income	33,938	1,979	2,885	5	954	2,000	150,000
2018-2	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Age	38,481	38.622	10.374	21	30	47	59
Schooling	38,481	10.345	4.278	0	7	12	16
Labor Income	33,635	2,002	2,865	6	954	2,000	150,000

Table 2 shows that the share of individuals with completed tertiary education increased from 19 to 20% of the sample. Regarding its composition, it shows that around 5% attended public institutions, and only around 2% also attended previously private high schools.

Table 2: Schooling descriptive statistics

2017-2	N	%
Individuals with completed tertiary education	4,225	18.8
Individuals with completed public tertiary education	1,051	5.1
Individuals with completed public tertiary education/private high school	263	1.9
2018-2	N	%
Individuals with completed tertiary education	4,467	19.9
Individuals with completed public tertiary education	1,108	5.4
Individuals with completed public tertiary education/private high school	241	1.7

## 4 Results

In order to analyze the tertiary education impacts on labor market outcomes, we estimate logit and fixed-effects regressions. Table 3 shows the results of our logit regressions, which

we perform using Having a Job, a Formal Job and a Prestigious Job as dependent variables.

Table 3: Results (1)

	<i>Dependent variable:</i>		
	Having a job	Having a formal job	Having a prestigious job
	(1)	(2)	(3)
Completed Tertiary	0.370*** (0.054)	1.558*** (0.025)	3.524*** (0.033)
Completed Tertiary*Private School	0.029 (0.095)	-0.312*** (0.042)	0.432*** (0.040)
Completed Tertiary*Public Institution	0.225** (0.104)	0.237*** (0.046)	0.283*** (0.038)
Completed Tertiary*Public Institution*Private School	0.095 (0.218)	0.246*** (0.092)	-0.028 (0.083)
Age	0.110*** (0.014)	0.011 (0.007)	0.067*** (0.012)
Squared "	-0.001*** (0.0002)	-0.0002** (0.0001)	-0.001*** (0.0001)
Constant	-0.007 (0.258)	-0.543*** (0.139)	-5.016*** (0.231)
Observations	68,942	65,529	65,529
Log Likelihood	-13,253.290	-41,643.030	-19,787.160
Akaike Inf. Crit.	26,520.580	83,300.050	39,588.320

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Estimates show that getting an undergraduate degree increases significantly the individual's likelihood of being employed. This probability increases if this one has completed his/her tertiary education in a public university. In contrast, having attended a private high school does not affect the chance to be employed.

The second regression estimates if an individual who get an undergraduate degree is more likely to be employed as a public or a formal in private sector worker over a year.

Our estimates show that an individual who completed his/her tertiary education in a public institution is more likely to be employed in these positions over a year. In contrast, having attended a private high, this probability decreases, unless there is an interaction between a private high school and a public tertiary education.

In our last logit regression, we test the heterogeneous impacts of graduating on the odds of having a job in an occupational group with higher average income and stability. In these groups are included managers, directors, among others.

Besides the fact that getting an undergraduate degree increases the likelihood to be employed in these occupational groups, estimates show an increase in this probability associated to both private high school and public institutions.

On table 4 we show fixed-effects regression estimates for short-run effect of tertiary schooling on labor income.

Table 4: Results (2)

	<i>Dependent variable:</i>			
	Log Income			
	default	robust	default	robust
	(1)	(2)	(3)	(4)
Completed Tertiary	0.104*** (0.015)	0.104*** (0.015)	0.100*** (0.015)	0.100*** (0.015)
Completed Tertiary*Private School	0.007 (0.017)	0.007 (0.020)	0.009 (0.017)	0.009 (0.020)
Completed Tertiary*Public Institution	-0.016 (0.015)	-0.016 (0.014)	-0.015 (0.015)	-0.015 (0.014)
Completed Tertiary*Public Institution*Private School	0.068** (0.031)	0.068* (0.037)	0.071** (0.031)	0.071* (0.037)
Up to a year in the last job			0.107*** (0.011)	0.107*** (0.019)
Up to 2 years in the last job			0.091*** (0.012)	0.091*** (0.019)
More than 2 years in the last job			0.103*** (0.012)	0.103*** (0.020)
Age			0.070*** (0.013)	0.070*** (0.014)
Squared "			-0.001*** (0.0002)	-0.001*** (0.0002)
Log of weekly worked hours	0.372*** (0.006)	0.372*** (0.012)	0.369*** (0.006)	0.369*** (0.012)
Observations	64,022	64,022	64,022	64,022
R <sup>2</sup>	0.072	0.072	0.075	0.075
Adjusted R <sup>2</sup>	-0.207	-0.207	-0.202	-0.202

Source: PNADC

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

On our first regression, our estimates show that having a completed tertiary education is associated with an labor income around 10% higher. Both  $\beta_2$  and  $\beta_3$  are not significantly different from 0.  $\beta_4$  is positive in 6.8% at a 90% confidence level.

The following regression, added all variables, shows a completed tertiary education returns of 10%. The coefficient  $\beta_2$ , attributed to the interaction between completed tertiary education and private high school, is not significantly different from 0. The same occurs with coefficient  $\beta_3$ , attributed to the interaction between completed tertiary education and public institution.

On the other hand, the coefficient attributed to the interaction between completed tertiary education, public institution and private high school,  $\beta_4$ , is positive in 7.1% at a 95% confidence level in default regression and at a 90% confidence level in robust regression.

Thus, if the individual has attended a public high school and a private university, the short-term impact of the tertiary education on labor income is 10%. The expected increase is the same for one who has attended a private high school and a private university and for who has attended a public high school and a public university. If the individual, however, has attended a private high school and a public university, the tertiary education returns increase to around 17%.

The following table shows estimates for the tertiary education impact on weekly worked hours.

Table 5: Results (3)

	<i>Dependent variable:</i>			
	Log of Weekly Worked Hours			
	default	robust	default	robust
	(1)	(2)	(3)	(4)
Completed Tertiary	-0.0004 (0.011)	-0.0004 (0.011)	-0.001 (0.011)	-0.001 (0.011)
Completed Tertiary*Private School	-0.009 (0.013)	-0.009 (0.012)	-0.008 (0.013)	-0.008 (0.012)
Completed Tertiary*Public Institution	-0.010 (0.011)	-0.010 (0.010)	-0.010 (0.011)	-0.010 (0.010)
Completed Tertiary*Public Institution*Private School	0.053** (0.024)	0.053** (0.026)	0.054** (0.024)	0.054** (0.026)
Up to a year in the last job			0.087*** (0.009)	0.087*** (0.016)
Up to 2 years in the last job			0.084*** (0.009)	0.084*** (0.017)
More than 2 years in the last job			0.090*** (0.009)	0.090*** (0.017)
Age			0.016 (0.010)	0.016 (0.011)
Squared "			-0.0001 (0.0001)	-0.0001 (0.0001)
Observations	65,529	65,529	65,529	65,529
R <sup>2</sup>	0.0001	0.0001	0.003	0.003
Adjusted R <sup>2</sup>	-0.295	-0.295	-0.292	-0.292

Source: PNADC

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Results show that there is no impact on short term associated to getting a undergraduate degree, unless the individual have gotten a degree in a public tertiary institution, having attained private secondary education. In that case, our estimates point to an increase in hours in labor.

On table 6 we perform regressions to estimate the tertiary education impact on labor income per worked hour.

Table 6: Results (4)

	<i>Dependent variable:</i>			
	Log of Income per Worked Hour		default	robust
	default	robust	default	robust
	(1)	(2)	(3)	(4)
Completed Tertiary	0.105*** (0.016)	0.105*** (0.016)	0.101*** (0.016)	0.101*** (0.016)
Completed Tertiary*Private School	0.011 (0.019)	0.011 (0.021)	0.013 (0.019)	0.013 (0.021)
Completed Tertiary*Public Institution	-0.009 (0.017)	-0.009 (0.016)	-0.008 (0.017)	-0.008 (0.016)
Completed Tertiary*Public Institution*Private School	0.036 (0.034)	0.036 (0.044)	0.038 (0.034)	0.038 (0.044)
Up to a year in the last job			0.054*** (0.013)	0.054*** (0.020)
Up to 2 years in the last job			0.042*** (0.014)	0.042** (0.020)
More than 2 years in the last job			0.051*** (0.013)	0.051** (0.020)
Age			0.062*** (0.015)	0.062*** (0.016)
Squared "			-0.0005*** (0.0002)	-0.0005*** (0.0002)
Observations	64,022	64,022	64,022	64,022
R <sup>2</sup>	0.001	0.001	0.002	0.002
Adjusted R <sup>2</sup>	-0.299	-0.299	-0.297	-0.297

Source: PNADC

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

The results show an increase in labor income per worked hour around 10% associated to getting a undergraduate degree. However, income per worked hour seems not to change with the educational institutions on short term, that is, there is no additional returns, on short term, associated to or getting a degree in a public university or have completed secondary education in a private high school.

One should notice that any impact on income per worked hour is probably due mainly to signalling, since productivity hardly increases much in 5 quarters. So, tertiary degree seems to generally increase income via signalling. However, the impacts on income of public tertiary institutions and private secondary education on short term seem only to work through hours in labor.

As exposed, our main interest relies on  $\beta_4$ , for which we may attribute horizontal inequalities within public universities and colleges. This coefficient is significantly different from 0 when we use labor income as dependent variable, showing that, on short term, these horizontal inequalities favour youngsters with higher socioeconomic background. Thus, our first fixed-effects regression express the fact that there is little evidence suggesting that the tertiary education returns is affected by the institution of secondary and tertiary education on short term.

## 5 Conclusion

In this paper, we have examined the tertiary education premium for Brazil in 2017, using data from the supplement of the Brazilian National Continuous Sample Household Survey

(PNADC), a special survey conducted by the Brazilian Institute of Geography and Statistics (IBGE) every quarter. We also have explored heterogeneity between public/private institutions.

We identified horizontal inequalities in Brazilian public universities, since private high school students are more likely to enter in higher economic returns courses. Besides, students from public universities have higher average grade on Enade than those from private universities in most areas. Due to these results, we discuss the possibility of tertiary degree returns being higher over a year when individual has studied in private high school and public university.

Using logit regressions, we identified that getting an undergraduate degree increases the person's probability to be employed, to be employed in higher income occupational groups and to be employed as a public or a formal in private sector worker over a year. Besides, in all these cases the likelihood is higher when the one has attended a public tertiary education. In contrast, private high school increases the chance to be employed and to be employed as a formal or a public worker, however it decreases the chance to be employed in higher income occupational groups.

Our first fixed-effect regression results estimate a  $\beta_4 > 0$ , which indicates that horizontal inequalities favour higher socioeconomic background individuals. As it's possible to see on table 4, our second fixed-effects regression estimates a  $\beta_4 > 0$ , which confirms our first result. It may evidence that private high school and public university students are more likely to benefit from tertiary education on short term.

Our estimates showed that holding an undergraduate degree increases labor income in around 10% over a year. We explored horizontal inequalities in Brazilian universities. Due to Brazilian Educational System, tertiary degree returns on short term is significantly higher when individual has attended a private high school and a public university in Brazil.

Summarizing, our results sustain two conclusions: first, there are horizontal inequalities in Brazilian Educational System associated to the fact that private high school students are more likely to enter public universities and that public tertiary institutions have a better quality than private tertiary institutions. Secondly, because of these horizontal inequalities, on short term labor market remunerates more workers who have attended private secondary education and public tertiary education.

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