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The Effects of Returns to Education on the Decision to Stay or to Leave Secondary School?: An Empirical Study of Brazil

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ABSTRACT:
I use the Mincerian wage equation to estimate the returns to education in Brazil from 2002 to 2008. I then use these estimates as variables that affect the decision made by potential students of whether to stay in school for one additional year. I use annually collected household survey data (PNAD) from the Brazilian Institute for Geography and Statistics (IBGE). Results indicate that returns to education have an effect on every student's decision. Although the relationship is positive, my analysis suggests that students make their decision to stay or leave school based on schooling degrees rather than on individual grades.

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1. Introduction

School attendance is a critical policy issue in developing countries in general and Brazil in particular. As in many developing nations, the Brazilian population has a mixed perception of the decision to invest in education. Menezes-Filho et al. (2006) show that since 1977 the average school years completed by Brazilians increased by at least two years, which indicates a positive perception of education. Moreover, the Institute for Applied Economics in Rio de Janeiro (2007) reports a constant decrease in the illiteracy rates from 1992 to 2005 for individuals of ages 15 and above and points out that there was substantial enrollment growth during the late 1990s. Nevertheless, by the time young students in Brazil reach the age of 14, they begin to abandon school and search for a job, and 24% of 15 years olds already have a steady job or are searching for one. At the age of 20, only 10% study without working and 43.5% are working.[1] These statistics call for a better understanding of how young Brazilians decide between either continuing or leaving school and the factors that influence their decision. This paper focuses on Becker's (1975) idea that returns to education affect the decision made by young individuals to stay in school for one additional year.

The existing literature on human capital can be sorted into studies that focus on the labor demand forces and those that focus on the labor supply forces. The former include policies or labor market conditions that affect the hiring decisions made by firms, while the latter include the household conditions and any other circumstances that influence the decisions made by individuals that are part of the labor force.

Referring specifically to effects that education has on the labor demand forces, Johnson (1970) states that the price of labor quality, which is related to the rate of return to schooling, does indeed influence the hiring decisions of individual business firms. He finds that the slope of

[1] According to the Household Survey carried out in 2005 by the National Institute of Geography and Statistics. Refer to the 'Education' section within the Official Summary of the 2005 Household Survey Report.

the aggregate labor demand curve depends on the degree to which firms are able to substitute less educated employees for more educated ones as well as the differences between firms to implement this substitution process of differently skilled employees. According to Spence (1970), this process is done through signaling. Since firms face the decision to invest in more productive workers while being uncertain of their productivity levels, firms interpret specific signals in order to hire the most productive individuals. These signals are the characteristics that individuals decide to alter, such as education degrees, in order to communicate to the firms a distinction between themselves and the rest of potential employees. There are other characteristics, such as sex, race, and age, that also affect the hiring decisions of firms, but these are not decided at the individual's discretion.

Additionally, Johnson (1970) highlights that firms that face unions have to make their hiring decisions differently since the wage levels are determined through negotiation between firms and unions. However, he concludes that such firms still attempt to replace less skilled workers with more skilled ones. Firms are simply less able to do it in the short run. In a country like Brazil, where, since the mid 1980s, labor unions have become increasingly more influential in the labor market, unions are very relevant to the establishment of wages (Amadeo and Camargo, 1996).

Also referring to literature concerning demand forces, Chernichovsky (1985) uses data from Botswana to show that there has been an increase in the demand of better-educated workers, which is part of a global trend in developing nations. In fact, studies concerning Brazil explain that the demand for better-educated individuals has increased overtime in all industries (Ramos, 1991) as well as in specific industries (Arruda, 2000).

A major difficulty suggested by some studies is the existence of a large informal economy in Brazil.[2] Capp et al. (2004) suggest that informal markets employ a large sector of the labor force in large urban centers and that workers employed formally are subject to competitive distortions that do not affect the informally employed in the same way. They argue that firms outside the law have an advantage in minimizing costs by avoiding taxes and ignoring product quality and safety regulations. Nevertheless, since individuals can move across different sectors it becomes one integrated economy and household survey data is an integrated dataset that gathers information from the entire market regardless of the formality of the sector for which individuals work.

Moving on to literature concerning forces that affect the labor supply, Angrist (2009) analyzes the behavior of US students who were offered support services, financial incentives, or a combination of both under the condition of improving their school performance. They find a positive relationship between students' performance and the incentives offered, which indicates that students do respond to changes that will increase their income if these are immediate. However, these do not explain how student behavior changes when facing returns to education that are in a more distant future.

Other examples of US-related studies analyze the effects of changes in the price of education (St. John, 1990) or policies that provide financial aid to help alleviate the costs of education (Dynarski, 2003; Kane, 1994) while also controlling for family background and household conditions. They all find that enrollment levels increase as the costs of education to individuals are directly reduced through these programs, independent of household conditions.

Considering only the studies concerning developing countries, empirical analyses have focused on the effects on enrollment caused by public scholarship programs (Cameron 2009),

[2] According to Capp et al. (2004), the informal economy accounts for about 40 percent of the gross national income in Brazil.

remittances (Acosta et al. 2007), and conditional cash transfers (Behrman et al. 2005). All of these studies conclude that effects are strongest on the enrollment levels of children that come from low-income families. Nevertheless, none of these studies track the changes of the returns to education over time and relate it to the school enrollment. [3]

Child labor also serves as an explanation for school desertion in the developing world (Ravallion and Wodon, 2000 and Edmonds, 2004). In fact, Schwarzman and Cossio (2007) suggest that a major explanation for desertion, particularly in Brazil, is the share of the household income that is brought in by the young individuals in the house. The authors emphasize that in families where the average household income is approximately USD $100, the contribution to the household brought in by the 15 to 17 year olds may well represent 22.3% of the entire household income. Additionally, when they are between the ages of 18 and 25, they are the main contributors to the household income.

Overall, most of the empirical work concerning enrollment levels in Brazil focuses on effects caused by public policy programs including conditional cash transfer programs and publicly funded scholarship programs to alleviate poverty (Shwartzman, 2007, and Menezes-Filho et al. 2006). These studies do not include returns to education as one of the variables that influence the decision to enroll. In fact, few studies, if any, focus exclusively on the effects that returns to education have on the decision to either stay in school or leave. This paper aims to fill that gap in the literature.

I use Brazilian National Household Survey Data to evaluate the relationship between returns to education and the decision made by young Brazilians to either continue or leave school.

[3] Other studies that focus on developing countries, such as Shwarzman and Cossio (2007), Kempner and Jurema (2002), and Menezes-Filho and Pazello (2005) share the view that education quality is an important factor that deserves attention, consequently, they all focus on analyzing the quality levels of education as a potential motivation or deterrent for youth considering investing in education. Although I recognize the importance of qualitative analyses, this paper will focus on using a quantitative approach while recommending including qualitative aspects in future analyses.

The Brazilian education system is divided into primary and secondary school. The first nine grades, 1st to 9th, are primary school and these are compulsory by law. The following three grades, 10th to 12th, are secondary school and they are the first non-compulsory grades according to Brazilian law so students may decide to not continue in school. This study focuses on the three grades of secondary school and includes students of ages 16 to 19.

The following two sections establish the theoretical framework and the two-step process used as the empirical strategy respectively. Section 4 discusses the data as well as the variables used, while Section 5 evaluates the results obtained from the estimation. Section 6 presents the robustness test. Finally, Section 7 summarizes and provides concluding remarks of this study.

2. Theoretical Framework

The decision to stay in school is analogous to a capital investment decision (Becker 1975). We can therefore follow Becker's (1975) utility-based model. Begin by assuming that individual students want to maximize utility, where utility (U) is a function of their expected lifetime income ($E(Y)$). The present value of the expected lifetime income ($E(Y)$) is the sum of the discounted individual's income (wages, w) during an individual's working years.

Assuming perfect information, the individual decides to invest in one more year of education if the expected present value of the benefit attained from that extra year is greater than the expected present value of its cost. The difference between the expected wages obtained by not going to school ($w_t^{NoSchool}$) and the expected wages by going to school (w_t^{School}) is the benefit yielded by the returns to education. Since we know that the discount rate is the same for both

expected income possibilities and their costs (C) are the direct costs paid for schooling,[4] the decision is largely determined by the returns to education. Therefore,

$$E(Y_{School}) = \sum_{t=15}^{T}\left(\frac{E(w_t^{School}) - |C_t|}{(1+r)^{t-15}}\right) \quad (1)$$

where T is the time of expected retirement from the labor market and t represents time.[5] Equation (1) shows how the expected value of staying in school ($E(Y_{School})$) is the sum of all the wages obtained by an individual that went to school (w_t^{School}) from the time when they can begin to work (t) to the time of expected retirement from the labor market (T). Finally, this sum is adjusted for inflation to represent the present value (where r equals interest rates).

Similarly, Equation (2) defines the expected present value of not staying in school ($E(Y_{NoSchool})$) as the sum of the difference between the corresponding expected income ($E(w_t^{NoSchool})$) obtained from the period t to T. This value is then adjusted for inflation so that the sum represents only a sum of present values.

$$E(Y_{NoSchool}) = \sum_{t=15}^{T}\left(\frac{E(w_t^{NoSchool})}{(1+r)^{t-15}}\right) \quad (2)$$

Figure 1 illustrates the student's decision information. Both wages (w_t^{School} and $w_t^{NoSchool}$) are values that increase as t increases until they each reach their maximum value and from then, these values begin to decrease as t approaches T. The returns to education would represent the change from the '*no school*' track to the '*school*' track and their effect should theoretically suggest an increase in benefits over periods of long time since it would represent a longer period of time earning on a higher-wage track.

[4] Costs are negative while in school and they are zero otherwise as shown in Figure 1.
[5] We start t at 15 assuming that workers begin working at age 15.Although this value could be higher, it reflects the youngest age at which individuals are legally allowed to choose not to attend school and begin earning income.

In the end, a student decides to stay in school if area $a>b$: in other words, if the present value of benefits gained from attending school, represented by area a in Figure 1, is greater than the current present value of the costs, both direct and opportunity costs, represented by area b in Figure 1. A larger area a implies a positive relationship between the expected returns to education and the decision to stay in school. [6]

3. Empirical Strategy

In order to answer the question of how returns to education affect the enrollment decision of individuals, I use a two-step analytical process. This process includes, first, the estimation of grade-specific rate of returns, and, second, the inclusion of these grade-specific estimates as explanatory variables into an equation that determines the effect of such estimates in their enrollment decision. The effect of these return to education estimates show any increase in the probability that individual students will decide to enroll in school for the any of the three high school grades.

The first step is to estimate returns to education. For such purpose, this investigation includes a common concept – the Mincerian estimation of the returns to education – in the decision making process of private investment in human capital. I use the Mincerian wage equation since it is employed by most empirical work done on returns to education (Altonji 1995, Psacharopoulos 1993, Psacharopoulos & Patrinos 2004, Patrinos and Sakellariou 2005, Di Pietro and Pedace 2007). [7]I assume that individuals observe the returns to education in their society by looking into the future through their older peers.

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[6] For simplicity reasons, this model assumes that studying and schooling are exclusive decisions or that students that simultaneously work and study do not earn sufficient money at the high school level to change the structure of this model.

[7] Authors such as Bilkic et al. (2009) offer a theoretical alternative to the decision of either staying in school or beginning to work by explaining it with the returns to education. Yet they offer no empirical approach to such analysis and do not use the conventional Mincerian estimation.

I calculate the returns to education using the basic form of the Mincerian equation. This equation explains an individual's wage as a function of schooling and experience

$$(4) \qquad LogWage_i = \alpha + \theta_1 Schooling_i + \theta_2 Experience_i + \theta_3 Experience_i^2 + \varepsilon_i$$

in which *Wage* is the earnings of individual (*i*), *Schooling* is expressed as his/her number of years of schooling, *Experience* is the number of years of experience in the labor market, and ε_i is a random error.

'Potential' *Experience* is often calculated as the individual's age minus the first five years of their lives and the years they spent studying. It is also expressed with *age* as a proxy, which does not assume that they only studied while they were in school and represents a more realistic scenario for Brazil. For this reason, I use *age* as the proxy for experience. Also, *schooling* is calculated as the highest grade of school completed. Thus, the basic Mincerian equation, after controlling for more variables (expressed as χ [8]) that affect an individual's wages and deciding which specific proxies are used, becomes the following:

$$(5) \qquad LogWage_i = \alpha + \sum_{j=2}^{16} \beta_j Grades_{ji} + \beta_{17} Age_i + \beta_{18} Age_i^2 + \sum_{h=19}^{Q} \beta_h \chi_{hi} + \varepsilon_i$$

The coefficients from the *Grades* variables in this semi-log specification are interpreted as the average individual rate of return to each level (expressed as number of completed grades) of school relative to attaining zero years of school (the constant). For example, a coefficient of 0.5 for 9th grade means that the average individual that completed 9th grade earns a wage that is 50 percent higher than the average individual that completed zero years of schooling.

From the previous estimation I compute estimates for the difference between the coefficients for 10th and 9th, 11th and 10th, and 12th and 11th (as summarized in Table 8). The

[8] I control for Union membership, State, Industry and Occupation. I use four different models, each with different control variables: (i) Union membership, (ii) Union membership and state (iii) Union membership, state, and industry, and (iv) Union membership, state, industry, and occupation. The models that control for the first two variables (Union membership and State) are discussed in the results section while the latter two (Industry and Occupation) are discussed in the robustness checks section.

values of these variables represent the difference in returns created by attending only one extra year (eg, 11^{th} grade), after having completed the previous (e.g. 10^{th} grade).

Although various studies use schooling as a continuous variable, I treat it as a categorical variable in order to model the thought process that students go through every individual year of high school. This models the possibility of thinking at the margin and assumes that before each academic year begins, students decide whether to enroll in school. Given that the data are collected closer to the end of the academic year,[9] I assume that once they have made the decision to either stay or leave school, they see it through the rest of the year. [10]

In the second step, I include the grade-specific estimates into the following limited dependent variable model as an independent variable (*returnstoeducation*), which can alter the decision of either stay in school or not

$$StayInSchool_{ig} = \sigma + \varphi_1 returnstoeducation_{ig} + \varphi_2 HouseholdType_i + \varphi_3 HouseholdIncomeLevel_i + \varphi_4 Male_i + \varphi_5 Urban_i + \varphi_6 Unemployment_i + \varphi_7 Activity_i + \varphi_8 Occupation_i + \varepsilon_i \quad (6)$$

where *StayInSchool* distinguishes students (value of 1) from non-students (0), and the sub-index *(g)* separates cohorts into each corresponding grade of high school (*g* may be 10^{th}, 11^{th} or 12^{th} grade) depending on the cohort being used to estimate the returns. *HouseholdType, Male,* and *Urban* are dummy variables expressing whether the household is led by a couple (1) or single parent (0), whether the individual is male (1) or female (0) and whether the individual lives in an urban (1) or rural (0) setting correspondingly. Finally, *HouseholdIncomeLevel* is the total income earned by the household, and *Unemployment* is the estimated national unemployment rate for the month when the survey took place.

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[9] The household survey is typically carried out during the last two weeks of September each year. The academic year (*ano letivo* as referred to in Brazil) begins in January and ends in November/December with a mid-year break in July.

[10] There is a disincentive to begin classes late because of the increased difficulty in doing so. Similarly, leaving school once one has invested significant time in it seems counterproductive, especially if he/she decides to drop out more than halfway through the academic year.

4. Data

The data used are obtained from the National Household Sample Survey (Pesquisa Nacional por Amostra de Domicilios - PNAD), conducted annually by the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatísticas - IBGE). The data include general characteristics of the population, migration, education, labor, families, households and income. The data span from 2002 to 2008. The areas covered by the National Survey include the entire territory of the Federative Republic of Brazil, with the exception of rural areas in Rondônia, Amazonas, Roraime, Pará, and Amapá for the years 2002 and 2003.

After the conception of the survey in 1967, the structure and education variables in the survey have been kept relatively consistent. Nevertheless, in 2001 the survey underwent numerous changes because it had not specified whether minors were attending a public or private institution, pre-school and day care, or participating in the labor force. That year, the survey reduced the minimum age limit for interviewees from 15 to 10 and separated the child labor survey into a supplementary survey. Also, in 2007 the survey had to be slightly reformatted to adapt to Law no. 11.274 that increased primary school from eight years in 2005 to nine years in 2006. Nevertheless, the length of secondary school stayed at a minimum of three years.

I use two different data subsets for each step. Table 1 summarizes the values for each variable as well as their mean values and distribution in the first step. Each observation represents one interviewed individual. The values used in years of schooling were determined by the number of years that the student had previously completed successfully. Each approved grade counted as one year beginning with first grade (primeira série) in primary school. The values vary from 1 to 16, where 1 represents zero completed years and 16 represents 15 or more completed years of officially approved education.

A worker was defined as an individual in a paid occupation pertaining to (i) any goods and services industry or (ii) domestic service. The work done in the corresponding occupation can be remunerated in terms of money, products, or benefits. Regardless of the method of payment, the individual must be regularly active in this occupation for at least one hour per week. Income was considered to be the value in currency of the monthly money payment plus the monetary value of any benefits and products received by the worker. The variable representing wages used for the calculations was the aggregate income from all sources. It should be noted that the majority of the workers (over 80%) are part of a syndicate or a workers union, and this percentage remained constantly high across time.

The data also include information useful for additional controls: the states where the individuals resided, whether individuals are part of a workers' syndicate or union, the household type, location in regards to an urban center and unemployment. There are 27 different states including the Federal District of Brasilia. Workers can be part of any type of workers union (rural, state funded, or private).

Table 2 summarizes the statistics for data used in the second step. For the second step of my analysis, a student was defined as a person who is currently enrolled and regularly attends their corresponding grade, be it their 10^{th}, 11^{th}, or 12^{th} year of school. The mean value of schooling for the subset used in the second step gradually increased from 8.139 in 2002 to 9.055 in 2008, which shows that, on average, the Brazilian population is more educated in 2008 than it was six years before.

Household Type is classified into two groups: A household with a couple or a household with a single primary provider. Urban status is a value assigned and derived by the IBGE stating residential location in relation to urban centers, where one value is given to households in urban settings and the alternative is considered to be rural. Unemployment rates were also extracted

from the website database from the Geography and Statistics Brazilian Institute and are expressed as a national percentage value for the month during which the surveys took place.

5. Analysis

As briefly mentioned earlier, I apply a two-step estimation process. It includes, first, the estimation of rate of returns of each of the three grades of secondary school for each year from 2002 to 2008, as well as the estimation of the difference between the returns to education for the three grades of school (10^{th}, 11^{th}, and 12^{th}); and second, the incorporation of this estimate into a final equation, which will determine the effects of the returns to education on the decision to either stay in school or do otherwise.

I. Estimation Issues

The ideal data for the estimation of rates of return would include an exact number of years of experience in the labor market. The questionnaire does not provide such data, thus age is used as a proxy following the approach generally used by most authors. Additionally, the model does not represent accurately the option that a large number of students choose: to simultaneously work and study. This reality might also affect the estimation of the rates of returns. In this study, I consider students that simultaneously go to school and work as students.

Finally, one more challenge for the second step of my analysis is the degree of repetition that affects the education system in Brazil. Repetition serves as a deterrent and affects many students differently. Students repeat grades based on poor performance as well as poor attendance. Unfortunately the data do not include information regarding repetition.

I tested for heteroskedasticity in the first step and the results showed non-constant variance within years. I corrected the coefficients in each of the estimations that found this issue

by using White robust standard errors. I also tested for multicollinearity, but found no significant values in any of the years, except for the relationship between Age and Age^2. Nevertheless, theory suggests keeping both variables, because age has a non-linear effect that increases from time *t,* until it begins to diminish. Furthermore, as it approaches *T,* it actually reverses its effect. Therefore, no action was taken to correct for this issue.

II. Estimates

The subset of individuals that I use for the estimation of the rate of returns (the first of the two-step process) consisted of workers above age 18 who received income that year. I estimate returns to attaining each level (number of grades) of school for years 2002 to 2008.

The subset of data used for the second step (8) is summarized in Table 2. The individuals are divided into three cohorts prior to estimating the effects that returns to education have on their decision to continue or leave school. These cohorts are individuals who completed their 9^{th} grade and are 16 or 17 years old; individuals who completed their 10^{th} grade and are 17 or 18 years old; and individuals who completed their 11^{th} grade of school and are between 18 or 19 years of age. I use the limited dependent variable model described in Equation (6) in order to get the effects of returns to education that 10^{th}, 11^{th}, and 12^{th} grade have for each cohort respectively.

III. Results

I discuss my results in three separate parts: the discussion regarding the estimates obtained from the Mincerian wage equation, the grade-specific estimates, and, finally, the effect of these on the decision made by potential students.

a) Mincerian estimates of returns to education

The estimates of returns to education for each grade are interpreted as the percentage increase in the individual's wage compared to the wage of an individual with no education, as long as the grade in question is completed. The estimates of the returns to education for each grade using the Mincerian basic equation by year begin with Table 3. The coefficients relevant to our study are the coefficients for 10^{th}, 11^{th}, and 12^{th} grade. Table 3, where I use no control variables, shows that the coefficients for 11^{th} and 12^{th} represent have higher values in the returns compared to the values of the previous grade. Nevertheless, 10^{th} grade returns are lower than the ones for 9^{th} grade. In 2002, whereas returns to completing ninth grade represent wages that are 92% higher than an uneducated individual, the returns to tenth are only 90% higher. We see this same pattern occur for 10^{th} grade in all years and the values of the coefficients are statistically significant. This means that there is a decrease in returns immediately after finishing primary school and attending only 10^{th} grade is not beneficial, in terms of future wages.

Table 4, where I control for union membership, suggests a similar pattern. As individuals get more educated, their future wages increase. Also, in four of the seven years, the returns to attaining only 9^{th} grade were higher than attaining 10^{th}, which suggests again that it is not beneficial for 9^{th} grade students to only attend one more year of school. Table 5, where I control for Union membership and Location, illustrates a different set of results. The returns for each grade in all the years are increasing without any exceptions. Also the coefficients are statistically significant and, focusing on the coefficient of 12^{th} grade, the returns are higher than in the previous model.

Additionally, it should be noted that from 2002 to 2008 returns to education have generally decreased in Brazil. Compared to 2008, the returns were higher in 2002 by a significant percentage in all the models I used.

b) Grade-specific Point Estimates

Table 8 summarizes estimates that are values obtained from the difference between returns to education of one grade and its immediate previous grade.[11] It also includes their statistical significance. Most of the grade specific estimates created for 10th grade did not show statistical significance of 5%, except for model (*iii*). Overall, the 10th grade estimates show negative or very small returns, which would indicate again that attending only 10th grade is more costly than beneficial. For 11th grade estimates as well as for 12th grade estimates, most models result in high returns, and they are statistically significant in all of their values for all three models.

These results suggest that individuals see more rewards in finishing degrees rather than individual years of school. Also, the remuneration given to workers by the employees seem to suggest that employers, or in this case the demand side of the labor market, pay their employees for attained degrees rather than attained years of school, which would make the years in school of an incomplete degree to be less valuable the further away they are from the last year of that degree. This explains why the returns to education increase once individuals get closer to finishing their secondary school degree. These results would strengthen the aforementioned signaling model developed by Spence (1973), which explains the hiring decisions made by firms as a process of signaling where educational degrees serve as the signal for the individual's productivity capabilities.

When searching for general trends across the years, it can be noted that in most grade specific estimates show higher returns in the year 2002 than in 2008. Also, in all three models, 12th grade estimates have a decrease in the first year, followed by three years of increases, and finally two more years of decrease to a value lower than the initial value, the 2002 value.

c) Effects on the decision to continue or leave school

[11] I use the lincom command in STATA. It specifically calculates the difference between the returns to education coefficients from grades 10th and 9th, 11th and 10th, and 12th and 11th, while taking into account the standard deviations of each coefficient.

The results in Table 9 show the effects that each grade-specific estimate has on the decision to attend school for the following year. Given the binary nature of the dependant variable, I estimated the maximum-likelihood probit models.[12] Overall, the returns to 10^{th} grade show negative returns that are statistically significant in the first three models and not significant in the remaining two models. This means that the grade-specific estimate for 10^{th} grade serves as an incentive to not continue in school. The returns to 11^{th} and 12^{th} grade, on the other hand, show positive returns and serve as motivation to stay in school. 11^{th} and 12^{th} grade estimates are statistically significant to the 5% in all years. Moreover, although the values are only significant for the last year of school, the students who have finished 10^{th} and 11^{th} grade have a higher probability of enrolling in the corresponding grade that follows as the difference in returns to education increases. This seems close to what would be expected given that, as it is empirically shown earlier in the paper, students think in terms of degrees rather than on a per grade basis at the high school level.

The results in Table 9 support the notion that young women are more likely to stay in school and attain higher education levels than young men. Results from the same table suggest that urban settings have a positive effect on individuals' decision to stay in school at all grades as well as belonging to a family with higher income levels. Urban settings are not as consistently significant as income levels.

6. Robustness Checks

I include two robustness checks in this section. The first check aims to make the estimation of the returns to education more accurate by adding two control variables and the

[12] I run dprobit to express the marginal effect in the probability for an infinitesimal change in each independent, continuous variable as well as the discrete change in the probability for dummy variables. Dprobit is used to adjust for the inclusion of the dummy variables (Male, Urban and Household type) in the equation.

second one aims to corroborate the conclusion that students think in terms of degrees when making their decision.

The primary concern regarding returns to education is the accuracy of the estimates. For this reason, I include two more control variables in the estimation: Industry and Occupation. Table 1 shows that the dataset has missing values for Industry and Occupation in years 2002-2004, which makes the comparison between regressions impossible. The analysis is then limited to only four years, 2005-2008. Table 6 summarizes the estimated values of the returns to education in all grades while controlling for industry. These results are similar to the ones shown in Table 5. An individual's wage increases with every grade that this individual attains. Looking at the grade-specific coefficients in Table 8, it is difficult to find patterns given the short number of years being analyzed. It should be noted whoever that when Industry is controlled for, 2008 no longer has the lowest returns to education and none of the 10^{th} grade coefficients are statistically significant. This is different from the previous three models. Finally, Table 9 shows very different effects on the decision to continue or leave school. Using the estimates that control for Industry yields positive returns for 10^{th} grade but negative returns for 11^{th} grade. Although the results are unexpected, these values are neither statistically significant nor large enough to actually have a strong influence in the decision made by students.

Table 7 summarizes the estimated values of the returns to education while controlling for Industry and Occupation. The values from this table are similar to the ones in Table 6 but slightly lower. It seems to be that as more variables are added, returns to education decrease. Tables 8 and 9 also show that results are similar in this model as they are for model (*iv*). Patterns or trends are difficult to identify on such a small sample and the effect on the decision to continue or leave school is also minimal.

These results call for further research with a more complete data set. More years are needed to make comparisons and also to find trends across time. Additionally, theory suggests the inclusion of Industries and Occupation as controls, especially in countries with a diversified economy, such as Brazil.

Given that results obtained with the grade-specific estimates suggest that potential students consider the returns to degrees of education rather than returns to each individual grade, in the second robustness check of this paper I use a single coefficient that represent the returns to a high school degree once the individual has completed 9^{th} grade. Additionally, I also use a university estimate, which represents the returns to acquiring four grades of education beyond 12^{th} grade, to see if potential students base their decision on the possible returns to a higher education rather than only a high school degree.

Table 8 summarizes the estimated values of both, the high school and the university degree coefficients, for each of the years. The estimated values of the high school estimates show statistical significance in all the models. This shows a clear difference from the grade-specific coefficients, which did not show a consistent level of statistical significance. These coefficients also seem to be consistent throughout all the years. Overall, any worker that decided to finish high school earns wages that are approximately 16 to 35 percent more than workers who decided not to finish high school. Finally, it should also be noted that the returns to a high school degree decreased over time. This is a trend we also observed at the grade specific level. Furthermore, as more control variables are included, the returns to education decrease more drastically. This becomes more evident as one compares models in one same year.

All the values of the university degree estimates are statistically significant and positive. When using no controls or controlling only for state, the estimates suggest an increase in wages for university graduates of approximately from 64 to 120 percent relative to workers that did not

attain a university degree. The only difference is that the estimates have a greater range and in some years it suggests that workers with a university degree earn wages up to nearly 175 percent higher than those without a university degree.

Table 10 summarizes the effects of the high school degree coefficients on the decision made by potential students. All estimates that find a positive relationship between returns to a high school degree and the decision to stay in school. In fact, students have a stronger motivation to stay in school as they get closer to finishing their degree, which is consistent with the results obtained from the grade-specific estimates.

Table 11 summarizes the effects of the university degree coefficients on the decision made by potential students. All the estimates show statistical significance and positive values, which agrees with theory. Also, the values are much higher in models that use estimates created with less controls.

Considering that these probit coefficients express the marginal effect, that is, the change in the probability of students attending school for one more grade, the smaller values obtained in the models that control for state and industry or state, industry and occupation suggest that the effects of these in the individual's decision do exist but they are minimal. This might be explained by the fact that individuals are able to see the returns to university degrees but, considering all costs, it is difficult for them to decide whether to attend 10^{th} or 11^{th} grade of high school based on returns that they would get from attending five or six more years of school.

7. Conclusion

Overall, the results reflect the notion that individuals respond to positive returns by going to school and do so at a degree level rather than as a per annum level. When using the grade-specific estimates that control for industry, occupation and state, the returns to education affect

the decision made by young individuals positively, as was predicted by theory. Nevertheless, the estimated values of the grade-specific values were not statistically significant. The decision to invest in oneself is, therefore, a combination of factors and so far results suggest that returns to education is one of them and it affects them positively during the last two years of secondary school.

Another notable result is that since 2002 the returns to education have been generally decreasing in Brazil. This may be explained in two ways. Perhaps wage inequality is being alleviated and the difference in wages that education yields are no longer as large as they used to be. In fact, Gonzaga et al. (2005) and Ferreira et al. (2007) show that trade liberalization did contribute to the observed reduction in inequality, which simultaneously means that obtaining education will not yield as high returns as it used to. This is an explanation that deserves further attention in the future. The other possibility is that there has been an increase in the supply of educated labor, namely high school graduates, which has caused competition to increase and ultimately affected the returns to education. Considering that Brazilians are deciding to educate themselves for more years, either of the two explanations is a positive sign for the country.

This study also concludes that the incentive to finish secondary school once faced with the question of whether or not to enroll in the last year, i.e. the 12^{th} year of school, students are affected much more by the returns to education than they are in the two previous years of secondary school independent from their gender, their location in relation to urban settings, their family income levels and whether their family is led by a couple or by one individual. Results from the robustness tests also suggest three main conclusions. First, once data become more available and complete, further research ought to be done in this topic utilizing estimates that control for Industry and Occupation. Theory suggests these control variables to be included. Second, the single estimate for high school degrees explains better the decision made by

potential students. Individuals do not only consider the returns for each grade attained but each degree of education attained. Third, after using university degree estimates it becomes clear that the effects of these returns in the individual's decision to stay in school do exist but are too small to actually influence individuals.

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Table 1. Summary Statistics for 2002-2008 of the subsets from which the estimates of return were estimated

Year	Variable	Observations	Mean	Std. Deviation	Min	Max
2002	Grade	141349	8.258403	4.500707	1	16
	Age	141349	37.25001	11.42035	20	65
	State	141349	16.89532	6.261501	1	27
	Income	141349	695.2766	1211.67	1	50000
	Income (log)	141349	5.956637	1.031615	0	10.81978
	Sindicate/Union	141349	0.8180107	0.385837	0	1
	Activity	0				
	Occupation	0				
2003	Grade	142521	8.408578	4.493914	1	16
	Age	142521	37.34466	11.45307	20	65
	State	142521	16.87807	6.286144	1	27
	Income	142521	739.2308	1252.661	1	51750
	Income (log)	142521	6.036773	1.031277	0	10.85418
	Sindicate/Union	142521	0.8103227	0.3920471	0	1
	Activity	1631	5.076027	2.403037	1	10
	Occupation	142521	6.064931	3.440924	1	13
2004	Grade	152314	8.482228	4.496909	1	16
	Age	152314	37.45376	11.46415	20	65
	State	152314	16.57334	6.52343	1	27
	Income	152314	784.3673	1418.983	1	120000
	Income (log)	152314	6.103577	1.023832	0	11.69525
	Sindicate/Union	152314	0.8090786	0.3930285	0	1
	Activity	2283	5.616732	2.19908	1	10
	Occupation	152314	6.026084	3.471878	1	13
2005	Grade	158535	8.636118	4.490883	1	16
	Age	158535	37.52803	11.54362	20	65
	State	158535	16.51777	6.508109	1	27
	Income	158535	859.6513	1625.827	1	230194
	Income (log)	158535	6.206615	1.002948	0	12.34668
	Sindicate/Union	158535	0.8043208	0.3967239	0	1
	Activity	158535	5.456581	2.169148	1	10
	Occupation	158535	6.012338	3.449412	1	13
2006	Grade	163006	8.838736	4.461594	1	16
	Age	163006	37.68963	11.52206	20	65
	State	163006	16.52686	6.526497	1	27
	Income	163006	941.1725	1643.977	1	131900
	Income (log)	163006	6.308591	0.9907139	0	11.7898
	Sindicate/Union	163006	0.8026637	0.3979895	0	1
	Activity	163006	5.41831	2.175026	1	10
	Occupation	163006	6.078807	3.464461	1	13
2007	Grade	158386	9.011295	4.449543	1	16
	Age	158386	37.82569	11.56308	20	65
	State	158386	16.53791	6.526364	1	27
	Income	158386	1017.616	1775.159	1	120480
	Income (log)	158386	6.412361	0.9566759	0	11.69924
	Sindicate/Union	158386	0.8137904	0.389277	0	1
	Activity	158386	5.414052	2.167417	1	10
	Occupation	158386	6.114575	3.428553	1	13
2008	Grade	160200	9.197097	4.444133	1	16
	Age	160200	37.98438	11.61487	20	65
	State	160200	16.53922	6.500349	1	27
	Income	160200	1108.416	1913.944	1	150000
	Income (log)	160200	6.505401	0.9517555	0	11.91839
	Sindicate/Union	160200	0.8098689	0.3924057	0	1
	Activity	160200	5.422665	2.186473	1	10
	Occupation	160200	6.137609	3.438429	1	13

Table 2. Summary statistics for variables used to estimate the effect of returns to education in the decision made by Brazilian youth in high school of whether to continue in school.

	Variable	Observations	Mean	Std Deviation	Min	Max
Grade 10th	Student	21181	0.952	0.213	0	1
	Age	21181	16.411	0.492	16	17
	Male	21181	0.441	0.497	0	1
	Household type	21181	0.791	0.407	0	1
	Urban	21181	0.904	0.295	0	1
	State	21181	16.93	6.38	1	27
	Family Income	21181	7.097	0.941	1.946	10.821
	Ret10 *	21181	-0.005	0.014	-0.029	0.01
	Ret10 **	21181	0.037	0.028	0.002	0.077
	Ret10 ***	18366	-0.207	0.389	-1.088	0.023
	Ret10 ****	18366	-0.236	0.619	-1.663	0.116
Grade 11th	Student	19129	0.93	0.255	0	1
	Age	19129	17.426	0.495	17	18
	Male	19129	0.434	0.496	0	1
	Household type	19129	0.783	0.412	0	1
	Urban	19129	0.91	0.286	0	1
	State	19129	17.067	6.321	1	27
	Family Income	19129	7.171	0.932	2.303	11.513
	Ret11 *	19129	0.081	0.021	0.053	0.11
	Ret11 **	19129	0.051	0.035	-0.00006	0.094
	Ret11 ***	16792	0.2	0.347	-0.132	0.992
	Ret11 ****	16792	0.322	0.604	-0.138	1.727
Grade 12th	Student	25123	0.3017952	0.496	0	1
	Age	25123	18.564	0.459	18	19
	Male	25123	0.42	0.494	0	1
	Household type	25123	0.782	0.417	0	1
	Urban	25123	0.928	0.258	0	1
	State	25123	17.261	6.228	1	27
	Family Income	25123	7.303	0.908	0	11.69
	Ret12 *	25123	0.241	0.014	0.211	0.258
	Ret12 **	25123	0.264	0.014	0.244	0.283
	Ret12 ***	22005	0.338	0.041	0.247	0.378
	Ret12 ****	22005	0.364	0.116	0.246	0.619

Notes: the coefficients Ret10, Ret11 Ret12 were estimated using different control variables as explained below.

*(no control

**(control State)

***(control State and Activity)

****(control State, Activity and Occupation)

Table 3. Estimates of basic Mincerian equation for each school grade in Brazil, 2002-2008 using model (*i*) - without control variables.

VARIABLES	2002	2003	2004	2005	2006	2007	2008
2nd Grade	0.161***	0.145***	0.139***	0.115***	0.165***	0.107***	0.088***
	(0.016)	(0.016)	(0.016)	(0.015)	(0.015)	(0.014)	(0.016)
4th Grade	0.373***	0.341***	0.320***	0.314***	0.303***	0.270***	0.244***
	(0.011)	(0.012)	(0.012)	(0.011)	(0.011)	(0.012)	(0.012)
6th Grade	0.640***	0.606***	0.579***	0.569***	0.561***	0.513***	0.492***
	(0.010)	(0.011)	(0.011)	(0.010)	(0.010)	(0.010)	(0.011)
8th Grade	0.802***	0.777***	0.722***	0.716***	0.705***	0.659***	0.613***
	(0.012)	(0.013)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
10th Grade	0.901***	0.881***	0.839***	0.835***	0.828***	0.756***	0.683***
	(0.015)	(0.014)	(0.014)	(0.013)	(0.013)	(0.013)	(0.013)
12th Grade	1.257***	1.212***	1.178***	1.155***	1.138***	1.048***	1.000***
	(0.009)	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
14th Grade	1.733***	1.652***	1.612***	1.604***	1.553***	1.436***	1.392***
	(0.019)	(0.018)	(0.017)	(0.016)	(0.016)	(0.015)	(0.015)
16th Grade	2.309***	2.226***	2.194***	2.160***	2.136***	2.010***	1.944***
	(0.010)	(0.011)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Observations	149798	150881	160996	167590	172431	167407	169443
R-squared	0.372	0.351	0.348	0.351	0.355	0.343	0.328

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Note: the population used to estimate these coefficients include only individuals with age> 18. No control variables were used in these estimates.

Table 4. Estimates of basic Mincerian equation for each school grade in Brazil, 2002-2008 using model (*ii*) - controlling only for variable Union Membership.

VARIABLES	2002	2003	2004	2005	2006	2007	2008
2nd Grade	0.162***	0.154***	0.143***	0.112***	0.173***	0.108***	0.0875***
	(0.0166)	(0.0176)	(0.0167)	(0.0166)	(0.0159)	(0.0158)	(0.0173)
3rd Grade	[illegible]	0.233***	0.231***	[illegible]	0.214***	0.151***	0.171***
	[illegible]	(0.0144)	(0.0138)	[illegible]	(0.0136)	(0.0143)	(0.0139)
4th Grade	0.385***	0.354***	0.327***	0.330***	0.316***	0.275***	0.253***
	(0.0118)	(0.0124)	(0.0123)	(0.0120)	(0.0122)	(0.0125)	(0.0127)
5th Grade	[illegible]	0.529***	0.501***	[illegible]	0.491***	0.424***	0.384***
	[illegible]	(0.0102)	(0.0100)	[illegible]	(0.00971)	(0.0101)	(0.00998)
6th Grade	0.648***	0.617***	0.588***	0.586***	0.580***	0.524***	0.507***
	(0.0108)	(0.0112)	(0.0111)	(0.0109)	(0.0107)	(0.0109)	(0.0110)
7th Grade	[illegible]	0.706***	0.686***	[illegible]	0.666***	0.592***	0.563***
	[illegible]	(0.0133)	(0.0130)	[illegible]	(0.0126)	(0.0130)	(0.0130)
8th Grade	0.805***	0.784***	0.729***	0.731***	0.724***	0.671***	0.626***
	(0.0126)	(0.0130)	(0.0128)	(0.0122)	(0.0121)	(0.0124)	(0.0126)
9th Grade	[illegible]	0.889***	0.846***	[illegible]	0.830***	0.755***	0.718***
	(0.0101)	(0.0104)	(0.00991)	[illegible]	(0.00983)	(0.00987)	(0.00973)
10th Grade	0.901***	0.887***	0.844***	0.849***	0.851***	0.761***	0.692***
	(0.0151)	(0.0150)	(0.0145)	(0.0139)	(0.0137)	(0.0138)	(0.0137)
11th Grade	[illegible]	0.972***	0.934***	0.922***	0.896***	0.819***	0.802***
	[illegible]	(0.0144)	(0.0138)	(0.0135)	(0.0130)	(0.0132)	(0.0129)
12th Grade	1.240***	1.199***	1.164***	1.149***	1.137***	1.040***	0.994***
	(0.00895)	(0.00914)	(0.00875)	(0.00864)	(0.00854)	(0.00880)	(0.00862)
13th Grade	[illegible]	1.497***	1.510***	[illegible]	1.443***	1.283***	1.224***
	[illegible]	(0.0168)	(0.0160)	[illegible]	(0.0155)	(0.0151)	(0.0146)
14th Grade	1.700***	1.626***	1.587***	1.593***	1.548***	1.422***	1.383***
	(0.0195)	(0.0178)	(0.0171)	(0.0162)	(0.0159)	(0.0156)	(0.0151)
15th Grade	1.747***	1.699***	1.656***	[illegible]	1.640***	1.484***	1.444***
	(0.0191)	(0.0182)	(0.0175)	[illegible]	(0.0158)	(0.0156)	(0.0149)
16th Grade	2.250***	2.174***	2.144***	2.123***	2.106***	1.978***	1.910***
	(0.0109)	(0.0110)	(0.0105)	(0.0103)	(0.0101)	(0.0103)	(0.0102)
Constant	[illegible]	4.040***	4.132***	[illegible]	4.319***	4.539***	4.762***
	[illegible]	(0.0251)	(0.0241)	[illegible]	(0.0229)	(0.0232)	(0.0229)
Observations	141,349	142,521	152,314	158,535	163,006	158,386	160,200
R-squared	0.378	0.358	0.354	0.356	0.359	0.345	0.332

Robust standard errors in parentheses

**** p<0.01, ** p<0.05, * p<0.1*

Note: the population used to estimate these coefficients include only individuals with ages 20 to 65. These estimates control for the individual's Syndicate membership status. Only schooling variables are reported.

Table 5. Estimates of basic Mincerian equation for each school grade in Brazil, 2002-2008 using model (*iii*) - controlling for variables Union Membership and State.

VARIABLES	2002	2003	2004	2005	2006	2007	2008
2nd Grade	0.124***	0.126***	0.112***	0.0823***	0.136***	0.0963***	0.0663***
	(0.0158)	(0.0169)	(0.0159)	(0.0158)	(0.0152)	(0.0150)	(0.0165)
4th Grade	0.273***	0.245***	0.226***	0.234***	0.226***	0.200***	0.179***
	(0.0113)	(0.0118)	(0.0118)	(0.0114)	(0.0116)	(0.0119)	(0.0121)
6th Grade	0.501***	0.465***	0.438***	0.448***	0.451***	0.410***	0.396***
	(0.0105)	(0.0108)	(0.0107)	(0.0105)	(0.0103)	(0.0105)	(0.0106)
8th Grade	0.650***	0.627***	0.579***	0.584***	0.589***	0.548***	0.504***
	(0.0121)	(0.0125)	(0.0123)	(0.0117)	(0.0117)	(0.0119)	(0.0121)
10th Grade	0.754***	0.743***	0.703***	0.709***	0.719***	0.647***	0.584***
	(0.0146)	(0.0143)	(0.0139)	(0.0134)	(0.0132)	(0.0133)	(0.0131)
12th Grade	1.079***	1.029***	0.998***	0.989***	0.982***	0.901***	0.860***
	(0.00871)	(0.00886)	(0.00854)	(0.00835)	(0.00831)	(0.00846)	(0.00834)
14th Grade	1.500***	1.406***	1.381***	1.393***	1.364***	1.250***	1.210***
	(0.0193)	(0.0177)	(0.0168)	(0.0159)	(0.0157)	(0.0153)	(0.0149)
16th Grade	2.052***	1.960***	1.946***	1.924***	1.914***	1.799***	1.738***
	(0.0107)	(0.0108)	(0.0104)	(0.0102)	(0.00995)	(0.0101)	(0.00997)
Observations	141,349	142,521	152,314	158,535	163,006	158,386	160,200
R-squared	0.425	0.409	0.402	0.404	0.405	0.395	0.380

Robust standard errors in parentheses

**** p<0.01, ** p<0.05, * p<0.1*

Note: the population used to estimate these coefficients include only individuals with age>18. These estimates control for the individual's Union Membership status and Location. Only schooling variables are reported.

Table 6. Estimates of basic Mincerian equation for each school grade in Brazil, 2002-2008 using model (*iv*) - controlling only for variablse Union Membership, State and Industry.

VARIABLES	2003	2004	2005	2006	2007	2008
2nd Grade	-0.023	-0.038	0.052***	0.089***	0.074***	0.036**
	(0.174)	(0.113)	(0.014)	(0.014)	(0.013)	(0.015)
3rd Grade	[illegible]	0.008	[illegible]	[illegible]	0.076***	[illegible]
	[illegible]	(0.011)	[illegible]	[illegible]	(0.012)	[illegible]
4th Grade	0.331***	0.233***	0.169***	0.151***	0.147***	0.125***
	(0.125)	(0.083)	(0.010)	(0.011)	(0.011)	(0.011)
5th Grade	[illegible]	0.174**	[illegible]	[illegible]	0.220***	[illegible]
	[illegible]	(0.072)	[illegible]	[illegible]	(0.009)	[illegible]
6th Grade	0.584***	0.348***	0.325***	0.311***	0.304***	0.281***
	(0.152)	(0.102)	(0.010)	(0.010)	(0.010)	(0.010)
7th Grade	[illegible]	0.353***	[illegible]	[illegible]	0.353***	[illegible]
	[illegible]	(0.121)	[illegible]	[illegible]	(0.012)	[illegible]
8th Grade	0.693***	0.386***	0.422***	0.410***	0.408***	0.357***
	(0.145)	(0.135)	(0.011)	(0.011)	(0.011)	(0.011)
9th Grade	[illegible]	0.329***	[illegible]	[illegible]	0.452***	[illegible]
	[illegible]	(0.090)	[illegible]	[illegible]	(0.009)	[illegible]
10th Grade	1.036***	0.457***	0.501***	0.491***	0.469***	0.402***
	(0.183)	(0.147)	(0.013)	(0.012)	(0.012)	(0.012)
11th Grade	[illegible]	0.655***	[illegible]	[illegible]	0.498***	[illegible]
	[illegible]	(0.109)	[illegible]	[illegible]	(0.012)	[illegible]
12th Grade	1.229***	0.691***	0.701***	0.677***	0.652***	0.592***
	(0.127)	(0.090)	(0.009)	(0.008)	(0.008)	(0.008)
13th Grade	[illegible]	0.886***	[illegible]	[illegible]	0.730***	[illegible]
	[illegible]	(0.123)	[illegible]	[illegible]	(0.014)	[illegible]
14th Grade	1.734***	1.335***	0.985***	0.936***	0.885***	0.806***
	(0.207)	(0.247)	(0.016)	(0.016)	(0.015)	(0.015)
15th Grade	[illegible]	0.929***	[illegible]	[illegible]	0.919***	[illegible]
	[illegible]	(0.210)	[illegible]	[illegible]	(0.015)	[illegible]
16th Grade	2.302***	1.915***	1.432***	1.408***	1.348***	1.252***
	(0.140)	(0.132)	(0.012)	(0.012)	(0.011)	(0.012)
Constant	[illegible]	6.415***	[illegible]	[illegible]	6.000***	[illegible]
	[illegible]	(0.571)	[illegible]	[illegible]	(0.024)	[illegible]
Observations	1748	2518	167590	172431	167407	169443
R-squared	0.633	0.576	0.464	0.467	0.455	0.450

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Note: the population used to estimate these coefficients include only individuals with age>18. These estimates control for the individual's Union Membership status, Location and Industry. Only schooling variables are reported.

-Results from this model are discussed in the robustness section.

Table 7. Estimates of basic Mincerian equation for each school grade in Brazil, 2002-2008 using model (v) - controlling only for variablse Union Membership, State, Industry and Occupation.

VARIABLES	2003	2004	2005	2006	2007	2008
2nd Grade	-0.002	-0.027	0.011***	0.085***	0.073***	0.036**
	(0.173)	(0.112)	(0.014)	(0.013)	(0.013)	(0.015)
4th Grade	0.344***	0.208**	0.165***	0.149***	0.145***	0.124***
	(0.125)	(0.081)	(0.010)	(0.010)	(0.011)	(0.011)
6th Grade	0.585***	0.325***	0.317***	0.303***	0.297***	0.275***
	(0.152)	(0.102)	(0.010)	(0.010)	(0.010)	(0.010)
8th Grade	0.714***	0.393***	0.406***	0.396***	0.394***	0.344***
	(0.151)	(0.134)	(0.011)	(0.011)	(0.011)	(0.011)
10th Grade	1.084***	0.455***	0.481***	0.466***	0.447***	0.380***
	(0.186)	(0.147)	(0.012)	(0.012)	(0.012)	(0.012)
12th Grade	1.189***	0.678***	0.674***	0.645***	0.619***	0.562***
	(0.128)	(0.090)	(0.009)	(0.008)	(0.008)	(0.008)
14th Grade	1.769***	1.374***	0.952***	0.895***	0.848***	0.763***
	(0.212)	(0.253)	(0.016)	(0.015)	(0.015)	(0.015)
16th Grade	2.253***	1.816***	1.400***	1.369***	1.314***	1.206***
	(0.142)	(0.134)	(0.012)	(0.012)	(0.011)	(0.012)
Observations	1748	2518	167590	172431	167407	169443
R-squared	0.643	0.591	0.479	0.483	0.472	0.466

Robust standard errors in parentheses

**** $p<0.01$, ** $p<0.05$, * $p<0.1$*

Notes: the population used to estimate these coefficients include only individuals with age>18. These estimates control for the individual's Union Membership status, Location, Industry, and Occupation. Only schooling variables are reported.

-Results from this model are discussed in the robustness section.

Table 8. Point estimates for different rates of returns to education for last three years of high school, high school as a degree, and University degrees in Brazil, 2002-2008

(i) Estimates without control variables

	2002	2003	2004	2005	2006	2007	2008
10th Grade	-0.022	-0.004	-0.005	0.005	0.010	0.006	-0.029**
	(0.014)	(0.014)	(0.013)	(0.013)	(0.013)	(0.012)	(0.012)
11th Grade	0.110***	0.086***	0.093***	0.07***	0.053***	0.055***	0.106***
	(0.017)	(0.017)	(0.016)	(0.015)	(0.015)	(0.015)	(0.015)
12th Grade	0.246***	0.245***	0.246***	0.250***	0.258***	0.236***	0.211***
	(0.012)	(0.012)	(0.012)	(0.011)	(0.011)	(0.011)	(0.010)
High School Degree	0.335***	0.326***	0.334***	0.326***	0.320***	0.297***	0.288***
	(0.008)	(0.008)	(.008)	(0.007)	(0.007)	(0.007)	(0.007)
University Degree	1.052***	1.014***	1.016***	1.005***	0.998***	0.963***	0.944***
	(0.009)	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
No. of Obs	149798	150881	160996	167590	172431	167407	169443

(ii) Estimates controlling for Syndicate

	2002	2003	2004	2005	2006	2007	2008
10th Grade	-0.025*	-0.006	-0.006	0.004	0.010	0.005	-0.030**
	(0.014)	(0.014)	(0.016)	(0.013)	(0.013)	(0.012)	(0.012)
11th Grade	0.108***	0.084***	0.089***	0.069***	0.050***	0.054***	0.103***
	(0.017)	(0.016)	(0.016)	(0.015)	(0.015)	(0.015)	(0.015)
12th Grade	0.236***	0.234***	0.236***	0.240***	0.247***	0.227***	0.202***
	(0.012)	(0.012)	(0.011)	(0.011)	(0.011)	(0.011)	(0.010)
High School Degree	0.319***	0.312***	0.319***	0.313***	0.307***	0.286***	0.276***
	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
University Degree	1.015***	0.980***	0.984***	0.976***	0.972***	0.942***	0.920***
	(0.009)	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)	(0.007)
No. of Obs	149798	150881	160996	167590	172431	167407	169443

(iii) Estimates controlling for Syndicate and State

	2002	2003	2004	2005	2006	2007	2008
10th Grade	0.003	0.031**	0.025**	0.036***	0.039***	0.036***	0.000
	(0.013)	(0.013)	(0.013)	(0.012)	(0.012)	(0.012)	(0.012)
11th Grade	0.091***	0.064***	0.072***	0.053***	0.039***	0.434***	0.082***
	(0.016)	(0.016)	(0.015)	(0.015)	(0.014)	(0.014)	(0.014)
12th Grade	0.241***	0.228***	0.228***	0.232***	0.233***	0.213***	0.197***
	(0.012)	(0.012)	(0.011)	(0.011)	(0.010)	(0.010)	(0.010)
High School Degree	0.334***	0.323***	0.325***	0.321***	0.311***	0.292***	0.280***
	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
University Degree	0.980***	0.940***	0.955***	0.941***	0.937***	0.903***	0.884***
	(0.009)	(0.009)	(0.008)	(0.008)	(0.008)	(0.007)	(0.007)
No. of Obs	149798	150881	160996	167590	172431	167407	169443

Standard Errors in parenthesis

***p<0.01 **p<0.05 *p<0.1

Note: the population used to estimate these coefficients include only individuals with age> 18.

-The grade specific estimates represent returns to achieving the specified grade, either 10th, 11th or 12th Grade, having completed the previous year, 9th, 10th or 11th Grade respectively.

-The degree estimates represent the returns to attaining the degree, either high school or University, having completed 9th grade.

-Models (iv) and (v) are discussed in the robustness section.

Table 8. (*continued*) **Point estimates for different rates of returns to education for last three years of high school, high school as a degree, and University degrees in Brazil, 2002-2008**

(iv) Estimates controlling for Syndicate, State and Industry

	2002	2003	2004	2005	2006	2007	2008
10th Grade		0.394*	-0.078	0.011	0.018	0.016	-0.016
		(0.201)	(0.149)	(0.011)	(0.011)	(0.011)	(0.011)
11th Grade		-0.245	0.298*	0.037***	0.019	0.029**	0.058***
		(0.223)	(0.156)	(0.014)	(0.013)	(0.013)	(0.013)
12th Grade		0.437**	-0.064	0.164***	0.166***	0.154***	0.132***
		(0.170)	(0.102)	(0.010)	(0.009)	(0.010)	(0.009)
High School Degree		0.587***	0.156*	0.212***	0.204***	0.199***	0.175***
		(0.141)	(0.093)	(0.007)	(0.007)	(0.006)	(0.006)
University Degree		1.073***	1.223***	0.731***	0.731***	0.696***	0.660***
		(0.112)	(0.120)	(0.009)	(0.009)	(0.008)	(0.009)
No. of Obs		1748	2518	167590	172431	167407	169443

(v) Estimates controlling for Syndicate, State, Industry and Occupation

	2002	2003	2004	2005	2006	2007	2008
10th Grade		0.439**	-0.078	0.014	0.017	0.015	-0.018*
		(0.203)	(0.150)	(0.011)	(0.011)	(0.011)	(0.011)
11th Grade		-0.236	0.304*	0.031**	0.018	0.023*	0.054***
		(0.224)	(0.157)	(0.014)	(0.013)	(0.013)	(0.013)
12th Grade		0.341**	-0.082	0.161***	0.160***	0.149***	0.127***
		(0.170)	(0.104)	(0.010)	(0.009)	(0.009)	(0.009)
High School Degree		0.544***	0.145	0.206***	0.196***	0.188***	0.164***
		(0.140)	(0.093)	(0.007)	(0.007)	(0.006)	(0.006)
University Degree		1.064***	1.138***	0.726***	0.724***	0.695***	0.644***
		(0.110)	(0.120)	(0.009)	(0.009)	(0.008)	(0.009)
No. of Obs		1748	2518	167590	172431	167407	169443

Standard Errors in parenthesis

***p<0.01 **p<0.05 *p<0.1

Note: the population used to estimate these coefficients include only individuals with age> 18.

-The grade specific estimates represent returns to achieving the specified grade, either 10th, 11th or 12th Grade, having completed the previous year, 9th, 10th or 11th Grade respectively.

-The degree estimates represent the returns to attaining the degree, either high school or University, having completed 9th grade.

-Models (iv) and (v) are discussed in the robustness section.

Table 9. Coefficients for factors that affect the decision made by young Brazilians to either stay in school as a student (1) or otherwise (0) using 2002-2008 data

	(i) No controls			(ii) Controlling Union Membership			(iii) Controlling Union and State		
VARIABLES	10th Grade	11th Grade	12th Grade	10th Grade	11th Grade	12th Grade	10th Grade	11th Grade	12th Grade
Male	-0.002	-0.011***	-0.040***	-0.002	-0.011***	-0.040***	-0.002	-0.011***	-0.040***
	(0.002)	(0.003)	(0.006)	(0.002)	(0.003)	(0.006)	(0.002)	(0.003)	(0.006)
Hometype	-0.002	0.002	-0.039***	-0.002	0.002	-0.039***	-0.002	0.002	-0.039***
	(0.003)	(0.004)	(0.007)	(0.003)	(0.004)	(0.007)	(0.003)	(0.004)	(0.007)
Urban	0.007	0.000	0.120***	0.007	0.000	0.120***	0.007	0.000	0.117***
	(0.006)	(0.006)	(0.011)	(0.006)	(0.006)	(0.011)	(0.006)	(0.006)	(0.010)
Inclvl	1.84e-05***	1.79e-05***	7.21e-05***	1.87e-05***	1.79e-05***	7.21e-05***	1.84e-05***	1.79e-05***	7.29e-05***
	(1.06e-06)	(1.22e-06)	(1.38e-06)	(1.06e-06)	(1.21e-06)	(1.38e-06)	(1.06e-06)	(1.21e-06)	(1.39e-06)
Ret 10th	0.238***			0.238***			0.238***		
	(0.081)			(0.081)			(0.081)		
Ret 11th		0.149**			0.148**			0.197**	
		(0.072)			(0.072)			(0.086)	
Ret 12th			1.768***			1.768***			2.564***
			(0.205)			(0.205)			(0.217)
Observations	21,181	19,129	25,123	21,181	19,129	25,123	21,181	19,129	25,123

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

	(iv) Controlling Union, State, and Industry			(v) Controlling Union, State, Industry, and Occupation		
VARIABLES	10th Grade	11th Grade	12th Grade	10th Grade	11th Grade	12th Grade
Male	-0.002	-0.012**	-0.037***	-0.037***	-0.037***	-0.037***
	(0.002)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Hometype	-0.003	0.002	-0.032***	-0.032***	-0.032***	-0.032***
	(0.003)	(0.004)	(0.008)	(0.008)	(0.008)	(0.008)
Urban	0.007	0.002	0.117***	0.117***	0.117***	0.117***
	(0.006)	(0.006)	(0.011)	(0.011)	(0.011)	(0.011)
Inclvl	1.87e-05***	1.74e-05***	6.72e-05***	6.72e-05***	6.72e-05***	6.72e-05***
	(1.14e-06)	(1.29e-06)	(1.40e-06)	(1.40e-06)	(1.40e-06)	(1.40e-06)
Ret 10th	0.238***					
	(0.081)					
Ret 11th		-0.007				
		(0.009)				
Ret 12th			0.075***	0.075***	0.075***	0.075***
			(0.020)	(0.020)	(0.020)	(0.020)
Observations	18,366	16,792	22,005	22,005	22,005	22,005

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: the population used for the estimation of these coefficients include individuals of Ages 16 and 17 for 10th grade, 17 and 18 for 11th grade and 18 and 19 for 12th grade. All coefficients for control variables are reported.
-Results from models (iv) and (v) are discussed in the robustness section.

Table 10. Coefficients for factors that affect the decision, including a single coefficient for returns to achieving a high school degree, made by young Brazilians to either stay in school as a student (1) or otherwise (0) using 2002-2008 data

	(i) No controls			(ii) Controlling Syndicate			(iii) Controlling Syndicate and State		
VARIABLE	10th Grade	11th Grade	12th Grade	10th Grade	11th Grade	12th Grade	10th Grade	11th Grade	12th Grade
Hometype	-0.002	0.002	-0.040***	-0.002	0.002	-0.040***	-0.002	0.001	-0.040***
	(0.003)	(0.004)	(0.007)	(0.003)	(0.004)	(0.007)	(0.003)	(0.004)	(0.007)
Inclvl	1.89e-05***	1.85e-05***	7.34e-05***	1.88e-05***	1.85e-05***	7.34e-05***	1.89e-05***	1.85e-05***	7.36e-05***
	(1.06e-06)	(1.22e-06)	(1.39e-06)	(1.06e-06)	(1.22e-06)	(1.39e-06)	(1.06e-06)	(1.22e-06)	(1.39e-06)
Observations	21181	19129	25123	21181	19129	25123	21181	19129	25123

Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

	(iv) Controlling Syndicate, State, and Industry			(v) Controlling Syndicate, State, Industry, and Occupation		
VARIABLE	10th Grade	11th Grade	12th Grade	10th Grade	11th Grade	12th Grade
Hometype	-0.003	0.001	-0.033***	-0.003	0.001	-0.033***
	(0.003)	(0.004)	(0.008)	(0.003)	(0.004)	(0.008)
Inclvl	1.88e-05***	1.77e-05***	6.76e-05***	1.88e-05***	1.77e-05***	6.77e-05***
	(1.14e-06)	(1.29e-06)	(1.41e-06)	(1.14e-06)	(1.29e-06)	(1.41e-06)
Observations	18366	16792	22005	18366	16792	22005

Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Note: the population used for the estimation of these coefficients include individuals of Ages 16 and 17 for 10th grade, 17 and 18 for 11th grade and 18 and 19 for 12th grade. All coefficients for control variables are reported.
-Results from this table are discussed in the robustness section.

Table 11. Coefficients for factors, including a single coefficient for returns to achieving a university degree, that affect the decision made by young Brazilians to either stay in school as a student (1) or otherwise (0) using 2002-2008 data

	(i) No controls			(ii) Controlling Syndicate			(iii) Controlling Syndicate and State		
VARIABLE	10th Grade	11th Grade	12th Grade	10th Grade	11th Grade	12th Grade	10th Grade	11th Grade	12th Grade
[illegible]									
Hometype	-0.002	0.002	-0.040***	-0.002	0.002	-0.040***	-0.002	0.002	-0.040***
	(0.003)	(0.004)	(0.007)	(0.003)	(0.004)	(0.007)	(0.003)	(0.004)	(0.007)
[illegible]									
Inclvl	1.89e-05***	1.85e-05***	7.36e-05***	1.89e-05***	1.85e-05***	7.35e-05***	1.89e-05***	1.85e-05***	7.34e-05***
	(1.06e-06)	(1.22e-06)	(1.39e-06)	(1.06e-06)	(1.22e-06)	(1.39e-06)	(1.06e-06)	(1.22e-06)	(1.39e-06)
[illegible]									
Observations	21181	19129	25123	21181	19129	25123	21181	19129	25123

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

	(iv) Controlling Syndicate, State, and Activity			(v) Controlling Syndicate, State, Activity, and Occupation		
VARIABLE	10th Grade	11th Grade	12th Grade	10th Grade	11th Grade	12th Grade
[illegible]						
Hometype	-0.003	0.001	-0.033***	-0.003	0.001	-0.033***
	(0.003)	(0.004)	(0.008)	(0.003)	(0.004)	(0.008)
[illegible]						
Inclvl	1.89e-05***	1.79e-05***	6.81e-05***	1.89e-05***	1.79e-05***	6.82e-05***
	(1.14e-06)	(1.29e-06)	(1.41e-06)	(1.14e-06)	(1.29e-06)	(1.41e-06)
[illegible]						
Observations	18366	16792	22005	18366	16792	22005

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Note: the population used for the estimation of these coefficients include individuals of Ages 16 and 17 for 10th grade, 17 and 18 for 11th grade and 18 and 19 for 12th grade. All coefficients for control variables are reported.
-Results from this table are discussed in the robustness section.

Figure 1 – Graphic illustration of the difference in wage tracks caused by the increase in returns to Education.