# " Texto

# para discussão

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**What is the best age to enter the labor market in Brazil?**

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# What is the best age to enter the labor market in Brazil?

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**Abstract**

This study investigate the effects of working at an early age on earnings in adult life in Brazil, and whether returns on schooling vary according to the age of the first job. Evidence was found of the negative effects of chidl labor on earnings. Moreover, from 10 years of schooling the earnings tend increase for each additional year as the age at which individuals enter the labor market increases.

## 1. Introduction

Unfortunately, even though child labor rates have been on the decline over the years, a large number of children are still working. Worldwide, about 152 million children aged between 5 and 14 were working in 2011 (IPEC, 2011).

It is plausible that working at an early age has a strong negative impact on future individual earnings and, consequently, on national income. This hypothesis seems to be widely accepted by academics and policymakers. However, there is little empirical evidence supporting it. There is extensive literature on the causes of child labor. However, according to Kassouf (2007) and Emerson and Souza (2011), only a few studies have been carried out on its hazards. According to the literature, the main ones are its negative impacts on health (see Kassouf et al., 2001; Odonnell et al., 2004) and education (see Heady, 2003), both of which are determinants of human capital and

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have a direct bearing on labor earnings in adult life (henceforth earnings).

Taking the Ben-Porath (1967) model seriously, both schooling and entry age in the labor market are endogenously and simultaneously decided. In order to claim causality from child labor to adult earnings, some treatment must be applied. In this sense, Emerson and Souza (2011) estimated a model using instrumental variables to arrive at more accurate estimates than those previously obtained by Emerson and Souza (2003) and Ilahi et al. (2001). The authors concluded that child labor is associated with lower adult earnings. Specifically, they observed a quadratic relationship between the age at which an individual started working and his or her earnings in adult life. Unfortunately, due to the specificities of the data set used by authors to build the instruments used in the estimations, it is hardly possible to apply the same kind of econometric modeling to come up with more evidences about the harms of child labor. Moreover, since information about the age at which the individuals started to work and about their family background is available only for heads of families or spouses, the sample used by the authors excludes all other individuals with a different status in the family.

This study is a attempt of measuring the negative effects of child labor on earnings in adult life for individuals who, regardless of having worked as a child or not, managed to complete the two most important levels of education: high school and university. For this we select two restricted samples. One is a sample of individuals aged 23 to 65 years old with high school education completed only. Another is a sample of 23 to 65 year old individuals with higher education only. Clearly, conditioning in one (endogenous) variable and running a regression of the other variable on earnings does not solve the endogeneity problem. But, can at least reduce the possiblity of the results to be contaminated. The central idea of using two restricted samples is that, regardless of any difficulties caused by working as a child or youth, all the individuals included in the samples managed to complete at least one or two levels of education, as other individuals with the same schooling who didn't work at an early age did. Our expectation is that individuals with the same schooling will have, on average, different earnings according to the age at which they entered the labor market. Among other reasons, this is a result of differences in the quality of their education and shortcomings in the learning process of those who, for instance, had to work during the day and study in the evening or vice versa. However, both aspects are reflected on the type of work one does as an adult.

We found evidence that, for people with the same schooling, the age at

which they got their first job had a bearing on their earnings. At this point, another question emerges: are the returns on education for adults equal for people who started working at different ages? As an attempt to find evidence in support of an appropriate answer to this question, earning equations were estimated with different samples, according to the age brackets in which people got their first job. So, this study also investigated whether the returns on education vary according to the age at which an individual started working.

This rest of paper is structured as follows. Section 2 presents a brief description of the data and samples utilized. Section 3 describes the methodological procedures – empirical models and estimator. Results are presents and discussed in Section 4; Section 5 concludes the study.

## 2. Data and Samples

Earnings have been on the rise in Brazil in recent years. We therefore opted for using pooled sample data covering a period marked by significant changes in the Brazilian labor market. The data set used in the estimations is made up of samples of the 2001-2009 and 2011 National Household Sample Survey (pooled cross-section) defined by the Brazilian Institute for Geography and Statistics (IBGE in Brazilian acronym).

In order to avoid current labor market participation selection bias problem and capture more accurately the impact of working earlier in life on adult earnings, the sample was restricted to workers aged 23-65 years old. We also excluded individuals with ill-defined occupations, and who were still studying or who worked but had no earnings, as well as observations with missings in any of the variables.

After applying the above-mentioned filters to the sample, we divided it into four sub-samples: i) women with full secondary education, ii) men with full secondary education, iii) women with higher education, and iv) men with higher education.[4]

Table 1 provides the proportion of individuals based on historical information about the age at which they started working in each of the nine years analysed here.

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[4]Individuals with a master's or doctor's degree were not included in the samples defined for higher education and college graduates were not included in the samples defined for secondary education.

Table 1: Proportion of Brazilian individuals by the age at which they started to work, gender, and survey.

| | Age started | | | | | Years | | | | | |
| | to work | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Woman | 9 | 12.28 | 12.37 | 11.93 | 11.23 | 11.32 | 10.75 | 8.93 | 10.12 | 8.93 | 7.55 |
| | 10 | 8.53 | 8.63 | 8.58 | 8.36 | 7.96 | 7.84 | 7.20 | 6.85 | 6.42 | 5.60 |
| | 11 | 3.00 | 2.87 | 2.89 | 3.05 | 2.63 | 2.81 | 2.80 | 2.66 | 2.74 | 2.31 |
| | 12 | 8.88 | 9.03 | 9.17 | 8.60 | 8.55 | 8.46 | 8.87 | 8.49 | 8.09 | 7.26 |
| | 13 | 6.22 | 6.09 | 6.07 | 6.23 | 6.18 | 5.95 | 5.91 | 5.99 | 5.65 | 5.30 |
| | 14 | 9.00 | 9.12 | 9.01 | 9.38 | 9.49 | 9.32 | 9.51 | 9.17 | 9.31 | 9.14 |
| | 15 | 9.73 | 9.89 | 9.66 | 9.85 | 9.98 | 10.08 | 10.12 | 10.04 | 10.29 | 10.03 |
| | 16 | 7.27 | 7.25 | 7.64 | 7.83 | 7.84 | 7.82 | 8.47 | 8.48 | 8.74 | 9.47 |
| | 17 | 6.01 | 5.86 | 6.17 | 6.36 | 6.40 | 6.52 | 6.69 | 7.01 | 7.12 | 7.66 |
| | 18 | 9.76 | 9.89 | 9.67 | 10.02 | 10.30 | 10.50 | 10.86 | 11.06 | 12.41 | 14.17 |
| | 19 | 3.50 | 3.58 | 3.66 | 3.54 | 3.64 | 3.64 | 3.75 | 3.63 | 3.98 | 4.40 |
| | 20 | 4.56 | 4.67 | 4.78 | 4.66 | 4.60 | 4.86 | 4.73 | 4.83 | 4.81 | 5.23 |
| | 21 | 1.77 | 1.60 | 1.87 | 1.96 | 1.80 | 1.81 | 1.85 | 1.81 | 1.91 | 1.95 |
| | 22 | 2.00 | 2.07 | 1.95 | 1.92 | 2.06 | 2.05 | 2.18 | 2.31 | 2.26 | 2.24 |
| | 23 | 1.48 | 1.52 | 1.47 | 1.46 | 1.51 | 1.58 | 1.47 | 1.56 | 1.48 | 1.59 |
| | 24 | 1.13 | 1.12 | 1.00 | 1.09 | 1.15 | 1.22 | 1.16 | 1.31 | 1.28 | 1.28 |
| | 25 | 1.29 | 1.09 | 1.16 | 1.14 | 1.15 | 1.21 | 1.13 | 1.18 | 1.23 | 1.28 |
| | 26 | 0.50 | 0.47 | 0.48 | 0.51 | 0.52 | 0.59 | 0.56 | 0.51 | 0.50 | 0.61 |
| | 27 | 0.38 | 0.33 | 0.37 | 0.37 | 0.31 | 0.38 | 0.37 | 0.47 | 0.39 | 0.42 |
| | 28 | 0.35 | 0.38 | 0.37 | 0.30 | 0.37 | 0.39 | 0.31 | 0.42 | 0.41 | 0.41 |
| | 29 | 0.23 | 0.21 | 0.24 | 0.21 | 0.22 | 0.22 | 0.23 | 0.21 | 0.23 | 0.26 |
| | 30 | 2.11 | 1.97 | 1.87 | 1.94 | 2.02 | 2.01 | 2.89 | 1.90 | 1.83 | 1.84 |
| Man | 9 | 19.46 | 18.66 | 17.95 | 17.04 | 16.73 | 16.04 | 14.16 | 14.56 | 13.68 | 11.59 |
| | 10 | 12.99 | 12.68 | 12.77 | 12.69 | 12.20 | 11.45 | 11.05 | 10.40 | 10.09 | 8.78 |
| | 11 | 3.52 | 3.26 | 3.27 | 3.27 | 3.19 | 3.23 | 3.28 | 3.24 | 3.12 | 2.73 |
| | 12 | 12.40 | 12.10 | 11.63 | 11.86 | 11.79 | 11.24 | 11.95 | 11.65 | 11.25 | 10.20 |
| | 13 | 6.61 | 6.70 | 6.73 | 6.68 | 6.65 | 6.54 | 6.58 | 6.58 | 6.49 | 6.06 |
| | 14 | 11.14 | 11.56 | 11.69 | 11.97 | 11.90 | 11.62 | 11.48 | 11.54 | 11.41 | 11.86 |
| | 15 | 9.07 | 9.22 | 9.53 | 9.45 | 9.58 | 9.96 | 10.04 | 10.30 | 10.52 | 11.04 |
| | 16 | 6.58 | 6.85 | 7.07 | 7.28 | 7.34 | 7.93 | 7.87 | 8.61 | 8.86 | 9.77 |
| | 17 | 4.45 | 4.62 | 4.65 | 4.94 | 5.10 | 5.34 | 5.40 | 5.81 | 5.84 | 6.98 |
| | 18 | 6.55 | 7.16 | 7.14 | 7.27 | 7.67 | 8.11 | 8.27 | 8.47 | 9.49 | 11.36 |
| | 19 | 2.02 | 2.02 | 2.03 | 2.15 | 2.06 | 2.30 | 2.43 | 2.44 | 2.64 | 2.87 |
| | 20 | 2.08 | 2.11 | 2.27 | 2.11 | 2.39 | 2.56 | 2.33 | 2.53 | 2.57 | 2.79 |
| | 21 | 0.75 | 0.79 | 0.84 | 0.85 | 0.80 | 0.90 | 0.91 | 0.99 | 0.95 | 0.90 |
| | 22 | 0.75 | 0.78 | 0.79 | 0.84 | 0.83 | 0.97 | 0.92 | 0.95 | 1.01 | 0.98 |
| | 23 | 0.52 | 0.50 | 0.52 | 0.54 | 0.56 | 0.59 | 0.62 | 0.58 | 0.58 | 0.61 |
| | 24 | 0.35 | 0.34 | 0.36 | 0.37 | 0.45 | 0.43 | 0.42 | 0.47 | 0.54 | 0.52 |
| | 25 | 0.34 | 0.29 | 0.37 | 0.28 | 0.37 | 0.39 | 0.36 | 0.42 | 0.43 | 0.44 |
| | 26 | 0.13 | 0.12 | 0.12 | 0.15 | 0.15 | 0.16 | 0.16 | 0.14 | 0.19 | 0.16 |
| | 27 | 0.08 | 0.10 | 0.08 | 0.07 | 0.08 | 0.08 | 0.09 | 0.10 | 0.09 | 0.11 |
| | 28 | 0.08 | 0.05 | 0.06 | 0.07 | 0.06 | 0.06 | 0.06 | 0.08 | 0.08 | 0.09 |
| | 29 | 0.04 | 0.02 | 0.02 | 0.02 | 0.03 | 0.02 | 0.02 | 0.04 | 0.04 | 0.05 |
| | 30 | 0.08 | 0.08 | 0.11 | 0.08 | 0.07 | 0.08 | 1.60 | 0.09 | 0.12 | 0.11 |

Notes: Data from the full sample (i.e. without excluding any observation).

## 3. Empirical Modelling

The model specification is a variant of the classical earnings equation in which the dependent variable is the natural logarithm of earnings (in Brazilian Reals in 2001) from the main job divided by the number of hours per week worked in this occupation.

Heckman's procedure (by maximum likelihood) was used to correct the sample selectivity bias in the earnings equations. Sample expansion factors associated to each observation were used and the characteristics of the sampling, designated as complex surveys, were taken into account. The sampling plan applied to the surveys is stratified and clustered and uses unequal selection probabilities. Ignoring the sample design may lead to biased estimates and usually underestimates the actual variance. The Taylor series linearization method was used to provide correct standard errors.[5]

In the basic model, the explanatory variable of interest is the ge at which individuals started working. This is done in two ways: ii) model A – using a dummy variable that assumes value 1 if the individual began working before the age of 16 and 0 if that was not the case (`Child labor`); and ii) model B – using a set of dummy variables to distinguish between age brackets at which the individuals entered the labor market (`Age started to work`, where for high school, the base age group is 17 years old and over, and for higher education, the base age is 23 years old and over). In the earnings equation the others control variables are:

a. Age of the individual (`Age`) in years and the square of this variable (`Age squared`);
b. A dummy variable for the individual's genders, which is 1 for males and 0 for females (`Man`);
c. Four dummy variables to distinguish between five skin colors – `White` (base group), `Black`, `Mulatto`, `Yellow` (Asian) and `Indigenous` people;
d. A dummy variable for residence location, which is 1 when the individual resides in an urban area and 0 if he or she resides in a rural area (`Urban area`);
e. A dummy variable for association to a labor union membership, which is 1 if the individual is member and 0 if not (`Labor union`);

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[5]Skinner et al. (1998), Pessoa and Silva (1998), and Silva et al. (2002) who give an introduction about complex surveys.

f. Five dummy variables to control for possible regional differences: North, South, Mid-West, Northeast, and Southeast (base group);

g. Nine dummy variables for year, to control for possible fixed time effects (2001 as the base group).

The participation equation contains the all regressors cited above, except the labor union membership and age at which he or she began to work because both are only defined in the database if the person worked. We also included others personal and family characteristics:

a. A dummy variable for existence of some non-labor income (e.g., conditional cash transfer programmes), which is 1 if the individual receives and 0 if not.

b. A dummy variable for marital status, which is 1 if the individual is married and 0 if he or she is not;

c. A dummy variable for children living in the same household, which is 1 if there is and 0 if not;

d. A dummy variable for position in the family, which is 1 if the individual is the head of the household and 0 if he or she assumes other positions in the family;

## 4. Results and Discussions

In reading the results, one must consider that, unfortunately, it is not possible to distinguish jobs outside the home from work at home or in other family activities, to distinguish work during school breaks or on weekends from work during school hours, and to distinguish continuous employment from occasional or seasonal employment. The number of hours worked by an individual as a child is not known. It is only possible to know the age at which the individual started working. One should remember that the information about the first job age is related to the past of workers aged 23-63 years old.

Table A.1 show the full results of earnings equations estimated, and selection equation estimates are available upon request. Table 2 shows estimates of percentage marginal effects, by gender and schooling group, of the age at which Brazilians in the 23-65 age bracket began to work on earnings derived from changes in the values of the regressors of the model A and B, as evaluated at their means.

Table 2: Percentage marginal effects of the age bracket at which one started working on earnings, by level of education

| Age at which started working | High school | | Higher education | |
|---|---|---|---|---|
| | Woman | Man | Woman | Man |
| | | Model A | | |
| 15 or less | −12.14* | −7.46* | −19.31* | −20.89* |
| | (−12.85; −11.42) | (−8.19; −6.73) | (−20.52; −18.08) | (−22.24; −19.52) |
| | | Model B | | |
| 8 or less | −23.81* | −17.24* | −39.99* | −43.72* |
| | (−25.41; −22.17) | (−18.65; −15.80) | (−42.18; −36.95) | (−46.48; −40.81) |
| 9 − 10 | −22.05* | −14.91* | −36.77* | −39.79* |
| | (−23.37; −20.71) | (−16.13; −13.66) | (−39.19; −34.25) | (−42.45; −37.02) |
| 11 − 12 | −15.88* | −8.76* | −32.54* | −33.07* |
| | (−17.07; −14.68) | (−9.91; −7.59) | (−34.81; −30.20) | (−35.63; −30.42) |
| 13 − 14 | −7.72* | −2.54* | −23.4* | −26.42* |
| | (−8.75; −6.68) | (−3.57; −1.50) | (−25.44; −21.29) | (−28.64; −24.14) |
| 15 − 16 | −4.48* | −3.25* | −20.74* | −24.18* |
| | (−5.40; −3.55) | (−4.19; −2.30) | (−22.55; −18.88) | (−26.43; −21.87) |
| 17 − 18 | | | −14.7* | −16.36* |
| | | | (−16.45; −12.91) | (−18.66; −14.00) |
| 19 − 20 | | | −9.84* | −10.29* |
| | | | (−11.88; −7.75) | (−13.11; −7.39) |
| 21 − 22 | | | −2.05*** | 1.17 |
| | | | (−4.43; −0.39) | (−4.74; −2.54) |

Notes: The results of the estimations are shown in Table A.1. For high school, the base age group (omitted variable) is 17 years old and over. For higher education, the base age is 23 years old and over; * and *** refer to significance at 1% and 10% (Delta-method standard errors were used), respectively; 95% confidence interval in parentheses.

As for the other control variables, the results are similar to the ones usually observed in studies on earning determinants in the Brazilian labor market.

The results of model A show that, in the adult age bracket considered in the study (23-65 years old), regardless of gender, people who start working at the age of 15 or less have lower earnings than those who only do so after completing 16 years of age. But there is a difference in the magnitude of the harm of working at an early age between the two genders and according to the schooling level. For people who only completed high school, the harm is estimated at approximately 12.1% and 7.5% for women and men, respectively. For people who completed higher education, however, the harm for both genders is far greater than that suffered by those who only completed secondary education (19.3% and 20.9% for women and men, respectively). Moreover, there is such an inversion that the estimated negative effects on earnings are about 1.6 percentage points higher for men than for women.

The estimation results of model B corroborate the results of the first model, namely, that child labor reduces future earnings. However, it is once again observed that the harm is greater for people who manage to complete at least higher education. It is clearly observed that the negative effects of the age at which a person started working on his or her future earnings decrease according to when that person got his or her first job. For the group of people who only completed high school, it is estimated that the earnings of those who started working before completing 9 years of age (8 or less) as compared to those who entered the labor market after completing 17 years is about 23.8% and 17.2% lower for women and men, respectively. For people who began to work before the age of 9 and completed higher education, it is estimated that the reduction in earnings is approximately 40.0% and 43.7% for women and men, respectively.

It should be observed that both for high school and higher education, the negative effect on earnings in adult life decreases as the individuals enter the labor market later in their life and closer to the average age at which they graduated at either of those levels. For instance, for a man who began to work before the age of 9 and only completed high school, the estimated reduction in earnings is 17.5%, but it drops to 3.2% if he entered the labor market after the age of 15. For men who completed higher education, this reduction in earnings drops from 43.7% for those who started working at the age of 8 or less to zero (statistically null) if they started their first job at the age of 21.

Since the sample used in the estimations is composed of people with the same schooling, regardless of the age at which they began to work, the results indirectly reflect the quality of their learning, the lower learning ability of those who both worked and studied and, consequently, the type of job they had as adults.

At this point, another question emerges: are the returns on education for adults equal for people who started working at different ages? We estimated the same earning equations using different samples, according to the age brackets in which people got their first job in order to answer to this question.

Since the sample was not restricted to specific schooling-based groups, but rather to groups based on the age at which a person began to work, education was initially measured alternatively in the light of two aspects: a) years of schooling (S), ranging from 0 for no schooling or less than one year of schooling to 15 for those with 15 years of schooling or more; b) 15 dummy variables to distinguish 16 years of schooling, based on people without any schooling or who had only studied for less than one year.

An important note is that since the estimations were based on sample data for groups defined by the age bracket in which they got their first job, the age and age-squared variable are direct controls for work experience that are usually measured by the proxy defined by the difference between the actual age of the person and that at which he or she started working.

The results obtained with the second way of measuring education are show in Tables 5 and 6. The returns on schooling are positive, suggesting that increases in earnings are substantially higher from 10 years of schooling for both genders.[6] It should be noted that the first year of schooling yielding the highest return is the 11th grade, the last grade of high school. We also observed that the threshold effect (from 10 years of schooling) of education increases with the age at which one started to work. This is new evidence suggesting the negative effects of early work.

Therefore, we considered the existence of a threshold effect, besides the years of schooling variable, and included the variable $S^* = Z(S-\lambda)$ in the specification, where $\lambda$ is the threshold, i.e. the value of schooling from which the return on education increases, and $Z$ is a dummy variable that assumes value 0 for $S \leq \lambda$ and value 1 for $S > \lambda$. Using the variable $S^* = Z(S - 10)$

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[6]Evidence of the threshold effect of education as from 10 years of schooling was found by Hoffmann and Simão (2005) for the state of Minas Gerais, Brazil.

in the specification, the following percent conditional marginal effects were observed on earnings for each additional year of education from 10 years of schooling.

Table 3 shows the percentage marginal effects of years of schooling and the threshold effect (from 10 years of schooling) on earnings, by the age bracket in which one began to work. For both men and women, the percentage increase in earnings for each additional year of education after 10 years of schooling increases as the age at which they entered the labor market increases. This is indirect evidence that the negative effects of working at an early age on future earnings are caused, among other reasons, by the quality of the education received, which has both a direct and indirect bearing on the kind of work a person engages in. For men, for example, an additional year of education from 10 years of schooling yields a return of 26.7% for those who start working after the age of 23, while the return for those who have to work before reaching the age of 9 is 12.4%. It should be noted that, for both genders, the positive threshold effect on earnings increases steadily as people enter the labor market at a later age.

Table 3: Percentage marginal effects of years of schooling and threshold effect (from 10 years of schooling) on earnings, by the age bracket at which one started working

| Age at which | Woman | | Man | |
|---|---|---|---|---|
| started working | Years of schooling | threshold effect | Years of schooling | threshold effect |
| 8 or less | 5.26 | 9.61 | 6.82 | 12.36 |
| | (4.89; 5.64) | (8.48; 10.76) | (6.59; 7.05) | (10.98; 13.76) |
| 9 − 10 | 5.31 | 10.64 | 6.85 | 13.27 |
| | (4.99; 5.64) | (9.65; 11.64) | (6.64; 7.07) | (12.16; 14.39) |
| 11 − 12 | 5.12 | 11.78 | 6.85 | 13.16 |
| | (4.83; 5.42) | (10.93; 12.64) | (6.65; 7.06) | (12.18; 14.15) |
| 13 − 14 | 4.91 | 13.75 | 6.46 | 15.93 |
| | (4.67; 5.16) | (13.09; 14.40) | (6.27; 6.64) | (15.20; 16.66) |
| 15 − 16 | 5.61 | 15.04 | 6.22 | 15.82 |
| | (5.36; 5.85) | (14.37; 15.72) | (6.03; 6.42) | (15.20; 16.45) |
| 17 − 18 | 6.03 | 18.99 | 5.52 | 16.88 |
| | (5.72; 6.33) | (18.29; 19.69) | (5.30; 5.75) | (16.03; 17.33) |
| 19 − 20 | 6.01 | 21.25 | 5.37 | 18.79 |
| | (5.59; 6.43) | (20.18; 22.33) | (4.96; 5.78) | (17.89; 19.70) |
| 21 − 22 | 5.45 | 24.52 | 4.88 | 22.13 |
| | (4.76; 6.16) | (22.88; 26.18) | (4.15; 5.61) | (20.77; 23.50) |
| 23 or more | 3.65 | 28.04 | 4.79 | 26.73 |
| | (3.24; 4.06) | (26.23; 29.89) | (4.02; 5.57) | (25.71; 27.77) |

Notes: All marginal effects are statistically significant at 1% (Delta-method standard errors were used); 95% confidence interval in parentheses; The results of the estimations are shown in Table A.2 and A.3

We recognize that the our findings are not convincing that endogeneity issues were completely solved by simply restricting the sample to those who ultimately complete high-school or post-secondary education. Nonetheless, we were more convinced that child labor reduces earnings in adult life after applying estimations conditional to the years of schooling completed by the individuals. The results presents in Tables 4 and 5 reinforce those arrived at using the samples restricted to maximum level of education achieved. Since schooling is the same for all observations in each of the sixteen samples used in the estimation (0-15 years of schooling), the endogeneity between the age at which an individual began to work and his/her education is no longer a relevant problem, as it is much less likely.

Table 4: Earnings equation (models A and B) using Heckman's procedure for Brazilian individuals aged from 23 to 65 years old, by years of schooling

| Variables | Years of schooling | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Constant | 0.345* | 0.160*** | 0.290* | 0.144* | 0.102* | 0.0988** | 0.0725 | −0.00192 |
| | (0.0489) | (0.0882) | (0.0662) | (0.0538) | (0.0372) | (0.0444) | (0.0601) | (0.0577) |
| Age | 0.0203* | 0.0248* | 0.0205* | 0.0265* | 0.0297* | 0.0338* | 0.0397* | 0.0427* |
| | (0.00203) | (0.00381) | (0.00295) | (0.00245) | (0.00170) | (0.00218) | (0.00308) | (0.00294) |
| Age squared | −0.000224* | −0.000235* | −0.000171* | −0.000236* | −0.000238* | −0.000300* | −0.000368* | −0.000394* |
| | (0.0000231) | (0.0000441) | (0.0000343) | (0.0000289) | (0.0000201) | (0.0000270) | (0.0000400) | (0.0000383) |
| Man | 0.191* | 0.213* | 0.207* | 0.243* | 0.283* | 0.296* | 0.313* | 0.319* |
| | (0.00913) | (0.0139) | (0.0101) | (0.00793) | (0.00477) | (0.00580) | (0.00750) | (0.00729) |
| Mulatto | −0.00720 | 0.0821 | −0.0709 | −0.0935 | −0.0758** | −0.0754 | −0.121** | −0.0486 |
| | (0.0511) | (0.109) | (0.0778) | (0.0676) | (0.0385) | (0.0566) | (0.0594) | (0.0589) |
| Black | −0.0925* | −0.0899* | −0.0924* | −0.0998* | −0.124* | −0.101* | −0.104* | −0.111* |
| | (0.00705) | (0.0125) | (0.00899) | (0.00746) | (0.00496) | (0.00597) | (0.00800) | (0.00763) |
| Yellow | −0.0102 | 0.113 | −0.0127 | 0.0251 | 0.181* | −0.00823 | 0.183* | −0.0170 |
| | (0.0772) | (0.197) | (0.124) | (0.0744) | (0.0531) | (0.0624) | (0.0827) | (0.0853) |
| Indigenous | −0.0887* | −0.0617* | −0.0741* | −0.0983* | −0.129* | −0.105* | −0.129* | −0.128* |
| | (0.0108) | (0.0192) | (0.0137) | (0.0112) | (0.00792) | (0.00982) | (0.0123) | (0.0122) |
| Urban area | 0.303* | 0.307* | 0.285* | 0.294* | 0.279* | 0.235* | 0.205* | 0.221* |
| | (0.00923) | (0.0145) | (0.0113) | (0.0104) | (0.00838) | (0.0100) | (0.0135) | (0.0138) |
| Labor union | −0.00141 | 0.0434** | 0.0303** | 0.0577* | 0.124* | 0.116* | 0.131* | 0.156* |
| | (0.0101) | (0.0173) | (0.0139) | (0.0108) | (0.00711) | (0.00842) | (0.0104) | (0.00988) |
| Child labor | −0.178* | −0.137* | −0.118* | −0.102* | −0.0775* | −0.0394* | −0.0322* | −0.0305* |
| | (0.00844) | (0.0149) | (0.0104) | (0.00862) | (0.00544) | (0.00614) | (0.00765) | (0.00728) |
| ath $\hat{\rho}$ | −0.427* | −0.425* | −0.392* | −0.313* | −0.258* | −0.235* | −0.222* | −0.208* |
| | (0.0333) | (0.0479) | (0.0429) | (0.0291) | (0.0165) | (0.0184) | (0.0243) | (0.0186) |
| Number of obs. | 109471 | 27074 | 44615 | 62437 | 141002 | 89532 | 49495 | 52031 |

Notes: Linearized standard errors in parentheses; * , ** and *** denote significance at 1%, 5% and 10%, respectively; Four dummy variables to distinguish between the five Brazilian regions, and nine dummy variables to distinguish ten years were used; The selection equation estimates are available upon request.

Table 5: Earnings equation (models A and B) using Heckman's procedure for Brazilian individuals aged from 23 to 65 years old, by years of schooling

Continued from previous table.

| Variables | Years of schooling | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| Constant | 0.204* | 0.0384 | −0.132*** | 0.162* | 0.550* | 0.296*** | 0.480* | 0.841* |
| | (0.0356) | (0.0750) | (0.0764) | (0.0259) | (0.123) | (0.160) | (0.122) | (0.0520) |
| Age | 0.0384* | 0.0535* | 0.0611* | 0.0553* | 0.0429* | 0.0642* | 0.0679* | 0.0540* |
| | (0.00174) | (0.00375) | (0.00398) | (0.00129) | (0.00615) | (0.00750) | (0.00565) | (0.00242) |
| Age squared | −0.000332* | −0.000517* | −0.000595* | −0.000459* | −0.000354* | −0.000582* | −0.000639* | −0.000423* |
| | (0.0000219) | (0.0000490) | (0.0000528) | (0.0000171) | (0.0000791) | (0.0000971) | (0.0000705) | (0.0000303) |
| Man | 0.324* | 0.315* | 0.346* | 0.326* | 0.415* | 0.323* | 0.335* | 0.364* |
| | (0.00438) | (0.00952) | (0.00919) | (0.00284) | (0.0155) | (0.0169) | (0.0146) | (0.00515) |
| Mulatto | −0.106* | −0.227** | −0.101 | −0.135* | −0.0970 | −0.182 | −0.354*** | −0.141** |
| | (0.0376) | (0.0911) | (0.0703) | (0.0330) | (0.143) | (0.118) | (0.183) | (0.0585) |
| Black | −0.133* | −0.116* | −0.134* | −0.150* | −0.228* | −0.177* | −0.131* | −0.231* |
| | (0.00499) | (0.0105) | (0.00997) | (0.00352) | (0.0188) | (0.0200) | (0.0171) | (0.00759) |
| Yellow | 0.123* | 0.415* | 0.191** | 0.123* | 0.138*** | −0.0383 | 0.159** | 0.0615** |
| | (0.0406) | (0.110) | (0.0935) | (0.0259) | (0.0741) | (0.0704) | (0.0724) | (0.0270) |
| Indigenous | −0.147* | −0.148* | −0.145* | −0.178* | −0.251* | −0.208* | −0.107* | −0.278* |
| | (0.00766) | (0.0166) | (0.0160) | (0.00552) | (0.0315) | (0.0378) | (0.0327) | (0.0152) |
| Urban area | 0.233* | 0.190* | 0.211* | 0.187* | 0.324* | 0.297* | 0.219* | 0.419* |
| | (0.0112) | (0.0207) | (0.0213) | (0.00994) | (0.0369) | (0.0595) | (0.0390) | (0.0218) |
| Labor union | 0.156* | 0.162* | 0.166* | 0.195* | 0.298* | 0.236* | 0.222* | 0.211* |
| | (0.00573) | (0.0122) | (0.0116) | (0.00371) | (0.0179) | (0.0180) | (0.0143) | (0.00557) |
| Child labor | −0.0425* | −0.0283* | −0.0291* | −0.0723* | −0.158* | −0.0529* | −0.140* | −0.231* |
| | (0.00450) | (0.00957) | (0.00950) | (0.00319) | (0.0156) | (0.0179) | (0.0148) | (0.00675) |
| ath $\hat{\rho}$ | −0.174* | −0.205* | −0.158* | −0.199* | −0.235* | −0.271* | −0.219* | −0.269* |
| | (0.0107) | (0.0230) | (0.0226) | (0.00892) | (0.0459) | (0.0475) | (0.0576) | (0.0232) |
| Number of obs. | 131859 | 27952 | 30943 | 332814 | 13062 | 10869 | 14121 | 134395 |

Notes: Linearized standard errors in parentheses; * , ** and *** denote significance at 1%, 5% and 10%, respectively; Four dummy variables to distinguish between the five Brazilian regions, and nine dummy variables to distinguish ten years were used; The selection equation estimates are available upon request.

One would believe that even after performing separate estimations for years of schooling, the difference in earnings in adult life is due to negative effects on the learning of children or youths who studied and also worked during part of the day. This does not hold when we look at the effect estimated for people with zero years of schooling, i.e. with no schooling. Even in this group, we found evidence that child labor has a negative bearing on earnings in adult life. In our point of view, these results are more robust, as they eliminate any worries with the potential endogeneity of education.

According to Emerson and Souza (2011) the impact of entering the labor market is negative for young children (in the sample used) and that negative effects turn positive between the ages of 12 and 14. Specifically, a concave down parabola was observed that assumes a maximum value at the age of 13-14. In our opinion, even taking into account that child labor occurred several years before, this age is very low. Two points in this important study should be considered when interpreting its results. First, the authors used a set of instrumental variables that do not vary among individuals, only among geographical units (in this case, states). Second, no control is applied for the number of hours worked in the main job. In this regard, it is interesting to observe, in Figure 1, the averages of the logarithm of earnings and number of hours worked per week in main job according to the age at which one started to work (7 to 25 years old) for Brazilian males aged from 25 to 55 years old.[7] This figure shows that the number of hours worked per week decreases as the age at which an individual enters the labor market increases. In the earnings equation, one can clearly see that controlling for the number of hours worked by an individual today (i.e. in his or her adult life) is key, especially if the objective is that of isolating the effect of working at an early age in the past. However, this figure may lead one to think that it depicts an unreal situation, due to differences in the number of individuals in each first job age group. Indeed, the proportion of children who start working before the age of 14 today is relatively small as compared to later age groups. The same can be said for people who start working after they are 25 years old in relation to those who do so at the age of 14-18, for example. One should consider, however, that the information about the first job age is related to the past of individuals who are at least 25 years old. Table 1 show the proportion of Brazilian individuals by the age at which they started to work, gender, and

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[7]The same survey years used by the authors were applied here to build the figure.

survey (2001-2009 and 2011). The high rates of men in the 25-55 age bracket who started working before they were 14 years old is not surprising, as child and adolescent labor was common in the past, especially in agriculture.
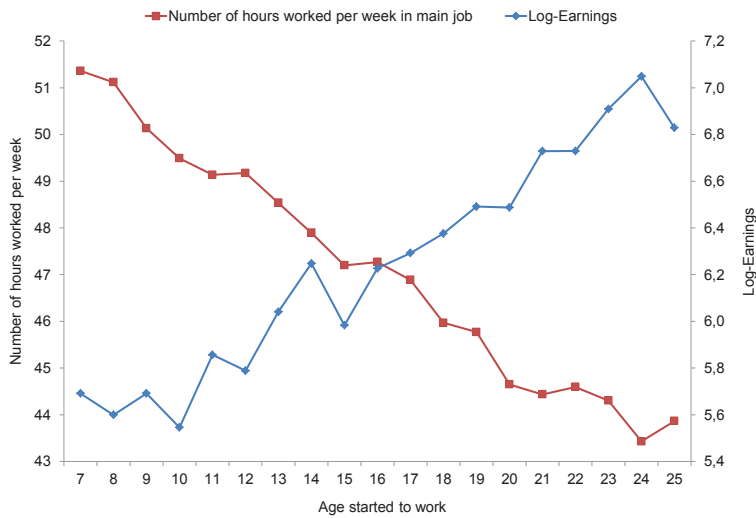


Figure 1: Averages of the logarithm of earnings and number of hours worked per week in main job according to the age at which an individual started to work, for Brazilian males aged from 25 to 55 years old, 1988 and 1996 (pooled data).

In this context, we estimated models using the same data sets and model regressors whose results are reported in Tables A.2 and A.3, but without conditioning according to the age one began to work and using this variable and its square as regressors of the logarithm of hourly earnings and of the logarithm of earnings. Table 6 presents the results of this empirical exercice. Again, the selection equation estimates are available upon request.

For the models with the logarithm of hourly earnings, we obtained an effect that peaks at around the age of 27 and 22 years old (age at which one started working) for males and females, respectively. Even though we have not managed to solve the alleged endogeneity of education and of the age at which one started working, it seems to us that these figures are more

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Table 6: Earnings equation using Heckman's procedure for Brazilian individuals aged from 23 to 65 years old, by gender

| Variables | Log of hourly earnings | | Log of earnings | |
|---|---|---|---|---|
| | Women | Men | Womem | Men |
| Constant | −0.832* | −0.845* | 4.283* | 4.390* |
| | (0.0282) | (0.0206) | (0.0268) | (0.0207) |
| Age | 0.0418* | 0.0597* | 0.0348* | 0.0655* |
| | (0.00105) | (0.000751) | (0.00101) | (0.000747) |
| Age squared | −0.000356* | −0.000566* | −0.000334* | −0.000650* |
| | (0.0000127) | (0.00000918) | (0.0000127) | (0.00000908) |
| Mulatto | −0.0512** | −0.114* | −0.0616* | −0.146* |
| | (0.0218) | (0.0221) | (0.0238) | (0.0217) |
| Black | −0.126* | −0.145* | −0.136* | −0.155* |
| | (0.00299) | (0.00271) | (0.00323) | (0.00274) |
| Yellow | 0.113* | 0.103* | 0.174* | 0.128* |
| | (0.0209) | (0.0190) | (0.0225) | (0.0183) |
| Indigenous | −0.125* | −0.165* | −0.121* | −0.178* |
| | (0.00477) | (0.00408) | (0.00510) | (0.00408) |
| Schooling | 0.0483* | 0.0618* | 0.0542* | 0.0635* |
| | (0.000677) | (0.000529) | (0.000680) | (0.000528) |
| S* | 0.165* | 0.149* | 0.140* | 0.125* |
| | (0.00169) | (0.00189) | (0.00175) | (0.00192) |
| Urban | 0.175* | 0.303* | 0.293* | 0.328* |
| | (0.00870) | (0.00626) | (0.0108) | (0.00685) |
| Labor union | 0.183* | 0.142* | 0.247* | 0.145* |
| | (0.00394) | (0.00323) | (0.00420) | (0.00316) |
| Age started to work | 0.0545* | 0.0296* | 0.0695* | 0.0275* |
| | (0.00130) | (0.00148) | (0.00137) | (0.00148) |
| Age started to work squared | −0.00121* | −0.000542* | −0.00168* | −0.000622* |
| | (0.0000361) | (0.0000498) | (0.0000377) | (0.0000492) |
| Earnings is maximized at age to work | 22.6 | 27.3 | 20.6 | 22.1 |
| Number of obs. | 519181 | 752491 | 519181 | 752491 |

Notes: Linearized standard errors in parentheses; *, ** and *** denote significance at 1%, 5% and 10%, respectively; Four dummy variables to distinguish between the five Brazilian regions, and nine dummy variables to distinguish ten years were used; The selection equation estimates are available upon request.

consistent with the reality of the Brazilian labor market. We believe so because individuals usually complete their higher education at about this age bracket. It is at this stage of one's life that entering the labor market is a must for those who are not working yet, except if they continue to study, for example, in a postgraduate program. The same type of nonlinearity is observed when the logarithm of earnings is used as response variable. But the point estimate of the maximum of the parabola is lower than that obtained when the hours worked per week are considered. The results were 22 and 20 years old for males and females, respectively. For men (which is the gender they considered), the difference between controlling for hours or not is of about 5 years. Once again, it's worth remembering that such information relates to the past of adults and that, in the past, people used to complete their higher education at a later age as compared to today. This results suggests that no controlling for the number of hours worked per week might yields downward bias in the estimate of the maximum point for age started to work. The results shown in Table 6 suggest that the effect of the age at which one began to work on labor earnings remains negative much beyond the age of 14.

## 5. Final Remarks

We have reached the conclusion that working at an early age has a negative effect on one's earnings as an adult, regardless of the gender and schooling.

Relevant and valid instrumental variables in order to control for the potential endogeneity of the schooling and age started to work in the earnings equations are seldom available in the databases commonly used in empirical studies of the consequences of child labor. Controlling for educational attainment does not remove all concerns about the source of endogeneity of having worked as a child in an earnings equation, but it is very likely to reduce this possibility. Nonetheles, our inferences of causality are only suggestive and tentative.

We recognize that our results cannot be compared with those from Emerson and Souza (2011). There are differences between them that make the comparison difficult, especially because in that study instrumental variables were used in order to control for the potential endogeneity of the aged started to work and schooling variables. Nonetheless, the main conclusion is convergent: there are negative impacts of working earlier in life on adult earnings.

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In this sense, child labor is harmful! But, an important question emerges: what is the best age to enter the labor market in Brazil? Emerson and Souza, using a more apropriate empirical methodology, concluded that is about 14 years old. Our results suggest that the effect of the age at which one began to work on labor earnings remains negative much beyond of this age. Is need to advance in this issue.

If child labor results in lower earnings in adult life, then the presence of children and adolescents in the labor market today implies, *ceteris paribus*, reductions in national income in the future. Therefore, child labor is much more than just a social issue. It is also a serious economic problem to be addressed by policymakers. Countries must ensure the rights of their children and adolescents, as they are an invaluable national asset.

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**AppendixA.**

Table A.1: Earnings equation (models A and B) using Heckman's procedure for Brazilian individuals aged from 23 to 65 years old, by level of education and gender

| Logarithm of hourly earnings | Model A | | | | Model B | | | |
|---|---|---|---|---|---|---|---|---|
| | High school | | Higher education | | High school | | Higher education | |
| | Woman | Man | Woman | Man | Woman | Man | Woman | Man |
| Constant | 0.175* | 0.108* | 0.843* | 0.753* | 0.183* | 0.121* | 0.916* | 0.842* |
| | (0.0348) | (0.0310) | (0.0594) | (0.0747) | (0.0347) | (0.0309) | (0.0592) | (0.0746) |
| Age | 0.0517* | 0.0697* | 0.0575* | 0.0676* | 0.0520* | 0.0697* | 0.0604* | 0.0706* |
| | (0.00180) | (0.00156) | (0.00290) | (0.00332) | (0.00179) | (0.00156) | (0.00291) | (0.00331) |
| Age squared | −0.000410* | −0.000608* | −0.000507* | −0.000543* | −0.000409* | −0.000605* | −0.000541* | −0.000573* |
| | (0.0000239) | (0.0000207) | (0.0000368) | (0.0000406) | (0.0000238) | (0.0000206) | (0.0000369) | (0.0000404) |
| Mulatto | −0.132* | −0.187* | −0.0559 | −0.273* | −0.121* | −0.181* | −0.0326 | −0.267* |
| | (0.0374) | (0.0441) | (0.0759) | (0.0975) | (0.0371) | (0.0437) | (0.0763) | (0.0960) |
| Black | −0.172* | −0.175* | −0.197* | −0.238* | −0.172* | −0.172* | −0.188* | −0.225* |
| | (0.00481) | (0.00437) | (0.00858) | (0.0109) | (0.00482) | (0.00435) | (0.00850) | (0.0109) |
| Yellow | 0.107* | 0.169* | 0.132* | 0.0420 | 0.109* | 0.173* | 0.127* | 0.0393 |
| | (0.0369) | (0.0301) | (0.0329) | (0.0359) | (0.0371) | (0.0299) | (0.0327) | (0.0353) |
| Indigenous | −0.179* | −0.206* | −0.200* | −0.325* | −0.199* | −0.200* | −0.192* | −0.310* |
| | (0.00717) | (0.00686) | (0.0161) | (0.0224) | (0.00766) | (0.00687) | (0.0166) | (0.0224) |
| Urban area | 0.107* | 0.267* | 0.294* | 0.502* | 0.0875* | 0.247* | 0.265* | 0.467* |
| | (0.0105) | (0.0115) | (0.0186) | (0.0339) | (0.0104) | (0.0112) | (0.0184) | (0.0332) |
| Labor union | 0.256* | 0.201* | 0.204* | 0.212* | 0.256* | 0.201* | 0.206* | 0.207* |
| | (0.00515) | (0.00450) | (0.00657) | (0.00823) | (0.00512) | (0.00448) | (0.00656) | (0.00819) |
| Child labor | −0.129* | −0.0776* | −0.215* | −0.234* | | | | |
| | (0.00415) | (0.00405) | (0.00770) | (0.00878) | | | | |
| Age started to work: 8 or less | | | | | −0.272* | −0.189* | −0.511* | −0.575* |
| | | | | | (0.0108) | (0.00877) | (0.0252) | (0.0257) |
| 9 − 10 | | | | | −0.249* | −0.161* | −0.458* | −0.507* |
| | | | | | (0.00869) | (0.00741) | (0.0199) | (0.0230) |
| 11 − 12 | | | | | −0.173* | −0.0917* | −0.394* | −0.402* |
| | | | | | (0.00725) | (0.00647) | (0.0174) | (0.0198) |
| 13 − 14 | | | | | −0.0804* | −0.0258* | −0.267* | −0.307* |
| | | | | | (0.00570) | (0.00542) | (0.0138) | (0.0156) |
| 15 − 16 | | | | | −0.0458* | −0.0330* | −0.232* | −0.277* |
| | | | | | (0.00494) | (0.00499) | (0.0118) | (0.0153) |
| 17 − 18 | | | | | | | −0.159* | −0.179* |
| | | | | | | | (0.0106) | (0.0142) |
| 19 − 20 | | | | | | | −0.104* | −0.109* |
| | | | | | | | (0.0117) | (0.0163) |
| 21 − 22 | | | | | | | −0.0207*** | −0.0117 |
| | | | | | | | (0.0126) | (0.0188) |
| ath ρ̂ | 0.921* | −0.209* | 0.890* | −0.345* | 0.927* | −0.211* | 0.878* | −0.342* |
| | (0.0235) | (0.00870) | (0.0447) | (0.0298) | (0.0236) | (0.00879) | (0.0444) | (0.0297) |
| Number of obs. | 186083 | 219149 | 75395 | 58147 | 186083 | 219149 | 75395 | 58147 |

Notes: Linearized standard errors in parentheses; *, ** and *** denote significance at 1%, 5% and 10%, respectively; Four dummy variables to distinguish between the five Brazilian regions, and nine dummy variables to distinguish ten years were used; The selection equation estimates are available upon request.

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Table A.2: Earnings equation (models A and B) using Heckman's procedure for Brazilian males aged from 23 to 65 years old, by level of education

| Variables | | Age started to work | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 8 or less | 9–10 | 11–12 | 13–14 | 14–16 | 17–18 | 19–20 | 21–22 | 23 or more |
| Constant | −0.428* | −0.284* | −0.336* | −0.404* | −0.426* | −0.381* | −0.525* | −0.941* | −1.029* |
| | (0.0450) | (0.0391) | (0.0367) | (0.0355) | (0.0349) | (0.0415) | (0.0721) | (0.129) | (0.131) |
| Age | 0.0492* | 0.0451* | 0.0483* | 0.0565* | 0.0577* | 0.0601* | 0.0662* | 0.0846* | 0.0843* |
| | (0.00204) | (0.00180) | (0.00176) | (0.00171) | (0.00166) | (0.00199) | (0.00341) | (0.00617) | (0.00577) |
| Age squared | −0.000488* | −0.000436* | −0.000454* | −0.000525* | −0.000523* | −0.000523* | −0.000583* | −0.000770* | −0.000743* |
| | (0.0000239) | (0.0000216) | (0.0000218) | (0.0000214) | (0.0000210) | (0.0000255) | (0.0000436) | (0.0000792) | (0.0000699) |
| Mulatto | −0.0826 | −0.109 | −0.143* | −0.189* | −0.120* | −0.0161 | −0.154*** | −0.530** | 0.187 |
| | (0.0542) | (0.0676) | (0.0443) | (0.0487) | (0.0401) | (0.0550) | (0.0866) | (0.259) | (0.146) |
| Black | −0.128* | −0.127* | −0.146* | −0.154* | −0.152* | −0.137* | −0.145* | −0.167* | −0.157* |
| | (0.00676) | (0.00652) | (0.00567) | (0.00528) | (0.00504) | (0.00579) | (0.00987) | (0.0169) | (0.0179) |
| Yellow | 0.132** | 0.106** | 0.176* | 0.146* | 0.0755** | 0.0369 | 0.0627 | 0.136 | 0.114*** |
| | (0.0554) | (0.0468) | (0.0502) | (0.0423) | (0.0383) | (0.0470) | (0.0682) | (0.104) | (0.0627) |
| Indigenous | −0.128* | −0.130* | −0.167* | −0.186* | −0.173* | −0.175* | −0.195* | −0.156* | −0.200* |
| | (0.0119) | (0.00997) | (0.00910) | (0.00794) | (0.00825) | (0.00916) | (0.0160) | (0.0305) | (0.0318) |
| Years of schooling | 0.0660* | 0.0663* | 0.0663* | 0.0626* | 0.0604* | 0.0538* | 0.0523* | 0.0476* | 0.0468* |
| | (0.00110) | (0.00103) | (0.000958) | (0.000901) | (0.000939) | (0.00110) | (0.00198) | (0.00354) | (0.00377) |
| S* | 0.0918* | 0.101* | 0.111* | 0.129* | 0.140* | 0.174* | 0.193* | 0.219* | 0.247* |
| | (0.00530) | (0.00460) | (0.00390) | (0.00293) | (0.00301) | (0.00299) | (0.00454) | (0.00678) | (0.00729) |
| Urban area | 0.342* | 0.317* | 0.300* | 0.267* | 0.242* | 0.165* | 0.163* | 0.178* | 0.157* |
| | (0.00935) | (0.00834) | (0.00844) | (0.00957) | (0.0106) | (0.0140) | (0.0246) | (0.0405) | (0.0439) |
| Labor union | 0.0861* | 0.0873* | 0.116* | 0.171* | 0.171* | 0.175* | 0.203* | 0.225* | 0.210* |
| | (0.00824) | (0.00819) | (0.00708) | (0.00571) | (0.00575) | (0.00625) | (0.0106) | (0.0168) | (0.0168) |
| ath $\hat{\rho}$ | −0.278* | −0.305* | −0.231* | −0.204* | −0.266* | −0.238* | −0.325* | −0.394* | −0.379* |
| | (0.0210) | (0.0194) | (0.0156) | (0.0124) | (0.0122) | (0.0126) | (0.0294) | (0.0424) | (0.0505) |
| Number of obs. | 86397 | 116150 | 110128 | 130787 | 135131 | 107508 | 37584 | 13618 | 15188 |

Notes: Linearized standard errors in parentheses; *, ** and *** denote significance at 1%, 5% and 10%, respectively; Four dummy variables to distinguish between the five Brazilian regions, and nine dummy variables to distinguish ten years were used; The selection equation estimates are available upon request.

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Table A.3: Earnings equation (models A and B) using Heckman's procedure for Brazilian women aged from 23 to 65 years old, by level of education

| Variables | Age started to work | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 8 or less | 9–10 | 11–12 | 13–14 | 14–16 | 17–18 | 19–20 | 21–22 | 23 or more |
| Constant | −0.341* | −0.203* | −0.0480 | −0.115** | −0.556* | −0.706* | −0.962* | −0.880* | −0.111 |
| | (0.0873) | (0.0645) | (0.0622) | (0.0520) | (0.0483) | (0.0499) | (0.0702) | (0.102) | (0.0787) |
| Age | 0.0362* | 0.0311* | 0.0287* | 0.0364* | 0.0493* | 0.0573* | 0.0651* | 0.0678* | 0.0380* |
| | (0.00391) | (0.00293) | (0.00282) | (0.00233) | (0.00223) | (0.00234) | (0.00334) | (0.00485) | (0.00360) |
| Age squared | −0.000323* | −0.000258* | −0.000232* | −0.000317* | −0.000432* | −0.000498* | −0.000575* | −0.000592* | −0.000277* |
| | (0.0000458) | (0.0000349) | (0.0000340) | (0.0000287) | (0.0000282) | (0.0000303) | (0.0000431) | (0.0000631) | (0.0000439) |
| Mulatto | 0.0184 | 0.0122 | −0.0173 | −0.0208 | −0.154* | −0.196* | 0.00871 | −0.0289 | −0.128*** |
| | (0.0767) | (0.0720) | (0.0664) | (0.0555) | (0.0470) | (0.0461) | (0.0675) | (0.120) | (0.0752) |
| Black | −0.101* | −0.0953* | −0.119* | −0.125* | −0.143* | −0.140* | −0.117* | −0.173* | −0.132* |
| | (0.0107) | (0.0852) | (0.00785) | (0.00674) | (0.00612) | (0.00656) | (0.00891) | (0.0139) | (0.00984) |
| Yellow | 0.116 | 0.0901 | 0.146** | 0.0955*** | 0.101* | 0.0605 | 0.0542 | 0.144** | 0.204* |
| | (0.0752) | (0.0761) | (0.0635) | (0.0527) | (0.0385) | (0.0438) | (0.0529) | (0.0585) | (0.0611) |
| Indigenous | −0.100* | −0.0621* | −0.110* | −0.139* | −0.131* | −0.156* | −0.134* | −0.157* | −0.159* |
| | (0.0170) | (0.0145) | (0.0123) | (0.0103) | (0.0102) | (0.0105) | (0.0146) | (0.0250) | (0.0174) |
| Years of schooling | 0.0513* | 0.0518* | 0.0500* | 0.0480* | 0.0545* | 0.0585* | 0.0583* | 0.0531* | 0.0358* |
| | (0.00183) | (0.00156) | (0.00145) | (0.00120) | (0.00118) | (0.00148) | (0.00203) | (0.00338) | (0.00201) |
| S* | 0.117* | 0.125* | 0.124* | 0.148* | 0.147* | 0.154* | 0.172* | 0.200* | 0.237* |
| | (0.00631) | (0.00502) | (0.00445) | (0.00321) | (0.00276) | (0.00284) | (0.00389) | (0.00571) | (0.00416) |
| urban | 0.196* | 0.188* | 0.180* | 0.153* | 0.165* | 0.108* | 0.145* | 0.0261 | 0.0723* |
| | (0.0154) | (0.0143) | (0.0140) | (0.0135) | (0.0145) | (0.0157) | (0.0227) | (0.0327) | (0.0220) |
| Labor union | 0.120* | 0.0978* | 0.147* | 0.195* | 0.212* | 0.205* | 0.222* | 0.210* | 0.214* |
| | (0.0145) | (0.0130) | (0.0117) | (0.00822) | (0.00722) | (0.00653) | (0.00918) | (0.0131) | (0.0110) |
| ath $\hat{\rho}$ | −0.175* | −0.170* | −0.172* | −0.0806** | 0.673* | 0.895* | 0.885* | 0.893* | −0.204* |
| | (0.0466) | (0.0351) | (0.0385) | (0.0394) | (0.0448) | (0.0372) | (0.0346) | (0.0415) | (0.0355) |
| Number of obs. | 36143 | 54066 | 57456 | 75367 | 93253 | 93070 | 46604 | 21412 | 41810 |

Notes: Linearized standard errors in parentheses; *, ** and *** denote significance at 1%, 5% and 10%, respectively; Four dummy variables to distinguish between the five Brazilian regions, and nine dummy variables to distinguish ten years were used; The selection equation estimates are available upon request.