

INSTITUTE FOR MOBILITY AND SOCIAL DEVELOPMENT

Causes and Consequences of School Abandonment and Dropout¹

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1. Introduction

Graduating from High School brings high financial and personal returns to students as they become adults. Available estimates of the average return for each year completed in High School range from 8% to 16% in developed countries (Oreopoulos, 2006a, 2007; Oreopoulos and Salvanes, 2011), and reach 15% (de Abreu Pessôa e de Holanda Barbosa Filho, 2008) in the Brazilian case. Given such a high average rate of return, it is quite surprising that more than 10% of students drop out of school each year in Brazil³, and that less than half of the poorest young people complete this stage of their studies (Pereira, 2022). In addition to pecuniary gains, High School graduation brings a number of other benefits, such as less chance of having a child during adolescence, less chance of committing crime and being arrested, better health, more general satisfaction with life, spillovers of productivity for the economy, in addition to better health and education rates for the next generation (Carneiro et al., 2013; Currie and Moretti, 2003; Milligan et al., 2004; Oreopoulos, 2006b, 2007; Oreopoulos and Salvanes, 2011; Plug, 2004). The harm caused by dropping out, therefore, is not only private, but social. The student himself loses for prematurely dropping out of school, but mainly society loses.

What are the consequences of dropout, and how can they be measured? Why does dropping out incur so much damage at the personal and at the collective level? Why do so many young people around the world drop out of school during their teen years? What are the factors behind dropping out of the school system? How do cognitive and socioemotional skills influence the decision of whether to stay in school or not? How can neuroscience help to understand the contradictory behavior of young people who drop out?

This paper aims to elucidate these issues through a review of the literature on the causes and consequences of school dropout, in the world and in Brazil. To understand the causes of dropout, our starting point is studies that correlate characteristics of young people, their families, and their schools with the probability of dropping out.

Dropout, however, is a complex phenomenon with multidimensional roots. Many of the characteristics with great potential to explain dropout are not captured by more traditional household surveys. This makes it difficult to explore alternative hypotheses such as those that suggest that young people may look upon the future less seriously or in an inconsistent way, or that young people are more risk-prone or more sensitive to peer pressure, or even that marginalization and lack of perspective on the part of some young people makes behaviors such as teenage pregnancy or dropping out of school acceptable.

³ According to data from the 2019 School Census.

To better investigate these hypotheses, this paper also makes a brief review of the recent literature on the neuroscience of the adolescent brain, which seems to be able to explain some of these matters.

This paper is organized as follows: in the first part, we discuss the existing evidence on the consequences of school dropout and its costs, whether private or public, bringing estimates to the Brazilian case. In the second part, we discuss factors associated with dropout. Given the relevance of socioemotional skills to explain dropout, the third part of the paper discusses recent literature on the neuroscience of the adolescent brain, which may raise interesting questions about the design of interventions to combat dropout. The conclusion brings the paper to an end.

2. The consequences of dropping out

Several studies, when comparing young people who graduate and those who do not graduate from High School, find that those who drop out lose opportunities for better wages throughout their lives. Identifying the causal effects of school dropout, however, is not trivial. Young people who drop out of school may differ from others in a number of ways that are difficult to observe, and these differences may matter in determining wages, making a simple comparison between the two groups insufficient to pinpoint the impact of completing High School.

To be able to measure the causal impact of completing High School, we need to compare groups of individuals who, according to some criteria, are on average very similar. This implies that we should compare individuals who dropped out of school and those who did not, both with similar characteristics. Some of these characteristics we can observe in the data. Others, however, are not measures, and can influence both a student's chances of dropping out of school and the outcomes we are interested in, such as job market performance or risk behavior.

One of the simplest ways to generate two samples that are similar in observable and unobservable characteristics would be through a draw that selects who drops out and who does not. Even if we cannot test whether the unobserved characteristics are balanced between the two groups, drawing increases our confidence that they are, as there would be no systematic reason why one group should differ from the other.

Draws of this kind, obviously, are just an exercise in fiction but help us understand under what circumstances we can trust that a study in fact is insulating the causal effect of school dropout. In practice, we need some program, policy, or event (which we call natural experiments) to increase the chance of some students to graduate from High School, while

others remain unaffected. One of the best examples of such natural experiments is the approval of laws that at some point have increased the age of compulsory education. Several countries such as the US, Canada, the UK, and Sweden, have passed laws throughout the 20th century increasing the minimum age at which a student may leave school. These laws have induced some cohorts to study a few years more than others, enabling a comparison between cohorts so as to identify the causal impact. Thus, those people who studied longer did so not on their own volition but because they lived in states that obliged them to. This way, the premises of a controlled experiment is guaranteed, even without the draw.

Several papers explore the passage of these laws to estimate the impact of having to stay a few more years in High School. These surveys show that students who drop out of school before completing High School have lower income when adults (Oreopoulos, 2006b) and greater chances of being unemployed (Oreopoulos, 2007). A greater likelihood of employment and, in addition, of working in better jobs, in turn, can jointly affect other non-financial well-being dimensions, such as the chance of depression and of having low self-esteem, since unemployment usually precedes worsening of mental health. Students who finish High School, for example, derive greater satisfaction from their work (Oreopoulos and Salvanes, 2011) and greater general satisfaction with life (Oreopoulos, 2007).

More years of High School education can also alter several behavioral patterns in young people - such as the practice of unprotected sex (and therefore exposure to the risk of maternity and paternity during adolescence); or involvement with crime - through distinct channels. Higher wages increase the cost in opportunity of such actions. In turn, education can reduce the impatience rate with which a young person discounts the future (Becker and Mulligan, 1997), as well as developing a series of socioemotional skills that contribute to bettering self-control and decision-making when adults (Fudenberg and Levine, 2006).

Also exploring the laws of compulsory education, it is possible to identify that young people who drop out of High School are more likely to get pregnant in adolescence (Black et al., 2008); have greater chance of smoking and drinking (Jensen and Lleras-Muney, 2012); greater mortality in adult life (Lleras-Muney, 2005); greater chance of committing crimes and ending up in prison (Hjalmarsson et al., 2015; Lochner and Moretti, 2004; Machin et al., 2011) and lower political engagement (Milligan et al., 2004).

Estimates of one-year impacts of more education in High School using the natural experiment of such laws range from: an 8%⁴ to 16%⁵ salary increase (Oreopoulos, 2007)

⁴ In Canada.

⁵ In the United States and the United Kingdom.

throughout life; a 6%⁶ increased rate of satisfaction with life; an 18%⁷ increased chance of going to the poles to vote; a 10%⁸ reduction of the chance of having had a child in adolescence; an 80%⁹ reduction in probability of social assistance dependence; a 22%¹⁰ reduced chance of going to prison and a 33% reduced chance of death over the following 10 years¹¹ (Oreopoulos and Salvanes, 2011). The next generation also benefits from the extent to which children have superior performance in language and mathematics exams, less behavioral problems (Carneiro et al., 2013), as well as a 16% lower probability of the eldest child being older than his peers in school¹² (Oreopoulos and Salvanes, 2011).

It is possible to identify the impacts of dropping out of High School by also exploring siblings who graduate or not from High School, including twin brothers who share not only the same family environment, but also the same genetic code¹³. Oreopoulos and Salvanes (2011) compare twin brothers with different schooling in Norway and find that one more year of education¹⁴ increases the individual's income¹⁵, and decreases his chance of unemployment¹⁶, his dependence on assistance programs¹⁷, his becoming a pensioner by invalidity¹⁸ and his having had a child during adolescence¹⁹. Still, one more year of studies leads individuals to marry more educated spouses²⁰ and decreases the chance of divorce²¹.

⁶ 4.8 percentage points compared to an average 86% in the US.

⁷ 9 percentage points compared to an average 49% in the US.

⁸ 0.8 percentage point compared to an average 7.8% in the US.

⁹ 1.5 percentage point compared to an average 1.9% in the US.

¹⁰ 0.6 percentage point compared to an average 2.7% in the US.

¹¹ 3.7 percentage points compared to an average 11% probability of death in the US.

¹² minus 3.2 percentage points, compared to an average 19.9% in the US.

¹³ The comparison between siblings, however, is a slightly more subtle point: what makes one brother study more than another, especially in the case of twins? For us to get an unbiased measure of this effect, it is necessary that the reasons why one brother undergoes more years of study than the other should influence the posterior performance measures in life only via better education. This would not be the case, for example, if a brother were already more patient than the other, and this would make him not only study more, but also be able to wait longer to get a good job, for example.

¹⁴ Although authors do not specifically estimate the marginal impact of one more year of schooling during High School, the mean years of study in the sample is 12 years, with a standard deviation of 3 years. The marginal impact of one year more of study, therefore, is estimated just around the completion of High School.

¹⁵ At 4.76%.

¹⁶ At 6.4%, a drop of 0.47 percentage points compared to an average 7.3%.

¹⁷ At 12%, a drop of 0.28 percentage points compared to an average of 2.3%.

¹⁸ At 6%, a drop of 1 percentage point compared to an average 16.72%.

¹⁹ At 3.7%, a drop of 0.41 of a percentage point compared to an average 11.1%.

²⁰ The average schooling of the spouse increases by 0.23 per year of study, compared to an average 11.8 years of study.

²¹ 2.3%, a drop of 2.3 percentage points compared to an average 11.4%.

2.1. The costs of dropping out – estimates for Brazil

In Brazil, we still do not have robust measures derived from quasi-natural experiments identifying the effect of having finished High School. Despite the change promoted by Constitutional Amendment no. 59 having increased the minimum age for students to leave school, there was no abrupt upsurge in inclusion of young people from 15 to 17 years of age after the amendment. As can be seen below, the estimates for the High School Conclusion Award come from comparisons between individuals who have finished High School with those who have not, controlling the impact by means of some observable personal characteristics. In Brazil, two studies have led to quantifying the cost of High School dropouts (Fundação Brava et al., 2017; Paes de Barros et al, 2021), while another (Shirasu and Arraes, 2020) proposes to estimate the cost for the society of the so-called the young "neither-nor", those who neither study nor work.

The first of these studies (Fundação Brava et al., 2017) calculated the monetary impact of young people dropping out of school, using data from PNAD and imputing research estimates from other countries to the Brazilian case. The value lost individually due to higher likelihood of unemployment and worse wages was obtained through PNAD, comparing the income profile between High School graduates and those with only Elementary and Junior High School schooling. Assuming a discount rate of 5% per year, on average, the present value lost over a lifetime for not having completed High School would be R\$35,000²², but the impact varies greatly in relation to the individual's profile. Black women, for example, have fewer opportunities in the job market, reducing the return on finishing High School to R\$13,000. For a white man in a capital city in the Southeast, this difference is substantially higher, at R\$43,000.

The study also includes other indirect impacts of school dropout, such as more precocious formation of families, health conditions, violence, and victimization of these young people²³. According to the study, the worsening of violence and crime would cost society R\$18,000 per young person that does not graduate from High School, while worsening health conditions would add another R\$28,000. The study also computes the impact of young people failing to develop skills in the job market, since not having a degree makes job placement more precarious, and this cost would be R\$49,000. Altogether, the cost of not graduating from High

²² This is the difference between the present value of salaries throughout the life of someone who concludes High School against the present value of salaries throughout the life of those who concluded only the Elementary and Junior High School levels.

²³ The study takes as parameters the estimates of these impacts for the US through natural experiments. The study then adapts the values found for the US for the Brazilian case, considering the proportion of the Brazilian per capita income in relation to the American per capita income.

School would reach R\$130,000 per student, or R\$130 billion reais per year when we add up all the students who do not graduate from High School²⁴.

The second study, led by economist Ricardo Paes de Barros (Paes de Barros et al., 2021), follows a similar methodology to the first (Fundação Brava et al., 2017)²⁵. The evolution of the income profile throughout the life of those who graduate from High School and those who do not graduate can be seen in Figure 1. The study calculates that young dropouts spend 10% less of their productive life occupied, and with 20% to 25% lower remuneration, which leads to an accumulated personal loss of R\$159,000. The study also estimates that young people who have completed their High School studies will have 3 more years of life, and that those years would be healthier, which would lead to an additional gain of R\$131,000²⁶. The gains for society of having a more qualified worker would add up to another R\$54,000. Regarding violence, the study is based on a projection that each percentage point of dropout reduction leads to a reduction of 550 homicides per year, which would prevent society from losing R\$50,000 per young person who graduates from High School²⁷. Added together, these amounts reach R\$395,000 per young person who concludes their High School studies, which is equivalent to a loss of R\$220 billion per year, or 3.3% of the annual Brazilian GDP, or 81% of total spending of the 3 branches of government with basic education.

Finally, Shirasu and Arraes (2020) estimate the economic cost of idleness of young people who neither study nor work. The comparison of “neither-nor” youths with other youths is made using the Propensity Score Matching method. The authors include the costs arising from non-participation in the labor market, payments of assistance benefits, such as *Bolsa Família*, the loss of tax collection and other contributions, and reach a total cost of R\$36 billion per year in Brazil due to those young people who neither study nor work.

Therefore, depending on the public²⁸ or the dimensions analyzed²⁹, the present value of the cost incurred by Brazilian society of not having all its young people concluding High

²⁴ According to the study, 1 million young people in each cohort do not conclude High School.

²⁵ The study argues that, according to the changes brought by Constitutional Amendment No. 59, with the guidelines for the National Education Plan and the Sustainable Development Goals, the non-conclusion of basic education would configure a violation of the right to education.

²⁶ Generally, economists input the value of one year more of life extrapolating value estimates that people are willing to receive to incur larger risks of death. For example, through the salary premium received by workers of risky activities. The study considers a WHO calculation, according to which one year of life is equivalent to 3 times the annual income from work.

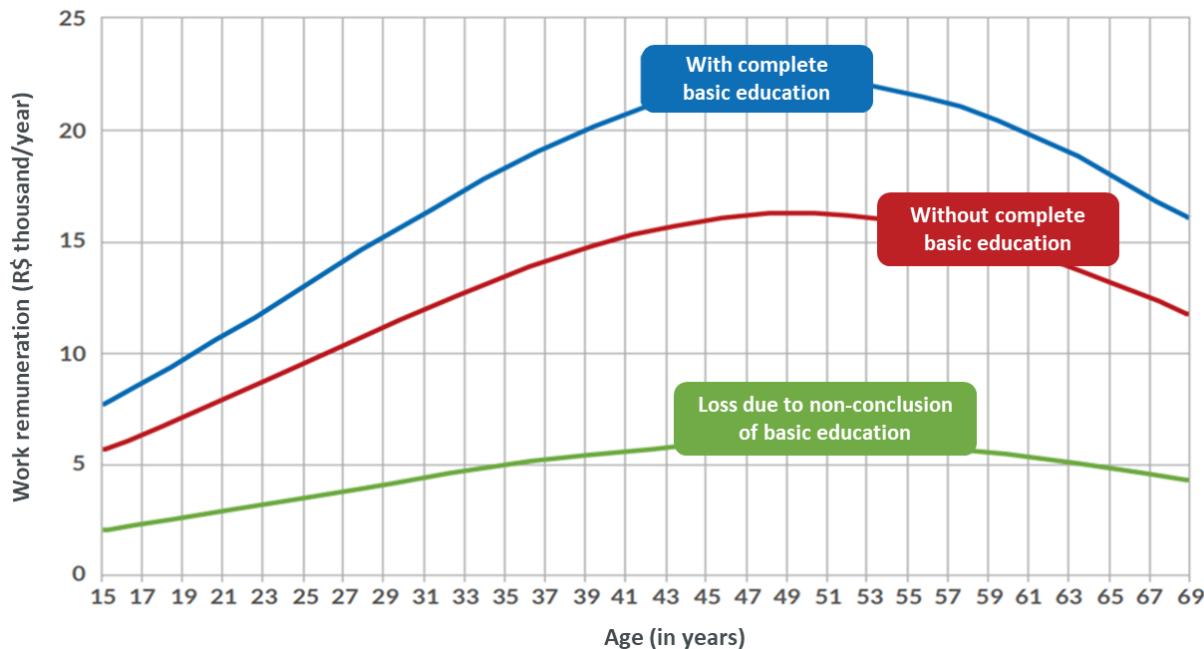
²⁷ The study considers a cost of R\$2.7 million per murder, avoiding a loss of R\$28 billion per year in Brazil. Divided by the 557,000 young people who would no longer conclude High School in 2020, the amount of R\$50,000 per young person due to the reduction of homicides.

²⁸ If only those who do not study and do not work or all who have dropped out of High School.

²⁹ If only monetary costs of salary loss, or costs due to violence, loss of productivity of partners, longevity, or social assistance costs.

School can vary between R\$36 billion per year, in the most conservative appraisal, to R\$220 billion per annum³⁰.

Figure 1 – Age profile of work remuneration of the working-age population without complete basic education and the corresponding profile they would have, had they completed basic education (= primary and secondary) – Brazil, 2018



Source: Paes de Barros et al, 2021, based on 2018 PNADC data.

3. The theory of human capital and school dropout

According to traditional economic models (Becker, 1964 and 1967; Ben-Porath, 1967; Mincer, 1958; Mincer, 1974), individuals invest in education to increase their future income, thus being able to make better consumption and leisure choices throughout their lives. Key factors in choosing when to stop studying include: perceived payback from each additional year of education and uncertainty about that payback, the direct cost of each additional year of study³¹, enjoyment in studying³² and the opportunity cost of studying for one more year, which are nothing more than the job market opportunities lost during that year³³.

Numerous circumstances can influence such factors. If the school in which the student is enrolled is bad, he will accumulate knowledge at a slow rate, and the return for each

³⁰ More specifically, by cohort, that is, for all those who were born in a given calendar year, according to Paes de Barros et al (2021).

³¹ The financial cost of enrollment and tuition, the social cost in terms of peer acceptance for studying (or not studying), among other direct costs.

³² Or displeasure, for some.

³³ In addition to these factors, one can also cite the cost of the opportunity of non-monetary work, such as housework, and the enjoyment of free time outside of school.

additional year of education will be low. If the student's network does not include anyone who has graduated from High School, they will have a harder time recognizing the financial benefit of graduating from High School (Jensen, 2010). If the student who strives is stigmatized by peers, the social cost of studying hard is greater. If a student has an innate facility for dealing with numbers, their personal return from education is greater (Willis and Rosen, 1979).

Since the conception of the human capital theory in the late 1950s, vast literature has focused on the return of completing each cycle of education and on the reasons why some individuals study more than others. More specifically, several studies aim to unravel the causes behind the paradox of living with high return rates for concluding High School and the high dropout rates in this segment³⁴. In Brazil, the returns on obtaining a High School diploma are quite high. According to (de Abreu Pessôa and de Holanda Barbosa Filho, 2008), the return rate on salary for those who graduated from High School was 14% per year in 2004. If this result remained relatively constant, one must ask: why are so many students missing out on this opportunity?

4. Credit constraint, expectations and motivation

One of the main theoretical explanations for the paradox of high return rates for High School completion and the high rate of dropouts are credit constraints. This would happen when, although worthwhile concluding their studies, students could not afford to stay on at school, even if they were willing to take money on loan.

If the student needs to work to help at home, he is putting aside future opportunities for income increase. If the return on graduating from High School is greater than the interest rate, it would be worth taking the money on loan. Why don't students then take money on loan to graduate, and repay the loan afterwards?

Credit constraints would be one of the possible explanations for this predicament. Due to several faults in the functioning of the credit market³⁵, the families of students would not be able to take out a student loan that would alleviate the pressure of their working during

³⁴ If each additional year of education provides high financial return, and this return is greater than leaving money in the bank, whoever stops studying before finishing High School is losing an opportunity to maximize their income. In a world with rational agents and perfect markets, this opportunity would not be lost, more people would graduate from High School, and the larger offer of qualified personnel would diminish little by little the financial return to conclude High School, to the point where the return to study one more year would be equal to the actual interest rate of the economy. The data, however, show that the Brazilian educational return is greater than the actual interest rate, which implies that several factors such as market failures, low quality teaching or individual and behavioral issues may be preventing young people and adolescents from optimally choosing when to stop studying.

³⁵ Such as informational asymmetry problems between banks and credit users, adverse selection of credit users and problems of moral risk and credit recovery.

High School. In this case, failing to finish their studies would be a decision that would not only be bad for society³⁶, but would also not be the best decision made from an individual point of view³⁷.

A wide range of literature analyzed the relationship between credit restrictions and the decision to continue studying. Although this literature focused on the decision of whether to attend or not higher education, the reflections arising from the findings of some papers helps us to better understand about the importance of credit restriction in explaining school dropouts. According to Carneiro and Heckman (2002), for example, the main restriction on which young Americans would be submitted would not be credit, but the restriction of not being able to "buy" as a child the family environment and the genes that would have formed the cognitive and socioemotional skills required to succeed in school³⁸.

Better cognitive development acquired during childhood and socioemotional development established by the end of adolescence would have left the individual better prepared to continue his studies. Going beyond these skills, better schooled parents can more effectively help children with homework assignments, can keep track of their children's progress at school and transmit to their children their values, preferences, and expectations for the future so that children are stimulated to finish High School and go on to university.

Incorporating skills, expectations, preferences, and motivation into an empirical model of choice between continuing studying or working is not easy, especially when such variables are not observed in the data. Eckstein and Wolpin (1999) developed a structural model in which the student decides simultaneously if he goes to school and/or how many hours he works per day, and numerically estimates the model through the data from the US NLSY³⁹ survey conducted in 1979. The estimation of the model allows them to understand better the profile of students who drop out and why they do so. The results indicate that dropouts are concentrated among young people with a low skill set in school, low motivation, low

³⁶ Due to High School graduation externalities.

³⁷ It is important to note here that we are not saying that interest rates would be so high that they would discourage the student from borrowing. The credit restriction happens when, even at a very high interest rate, it is still worthwhile borrowing money to pay back later, but the student is unable to access credit. Note that if the student were able to access credit but would still desist from borrowing because the interest rate would be very high, even so the optimal decision from the student's personal point of view would be not to give up on his studies.

³⁸ According to Carneiro and Heckman (2002), the relationship between family income and registration at the university, for example, virtually disappears when controlled by the skill set of the young student as measured through tests such as the entrance test in the Armed Forces – AFQT – and the Individual Peabody Achievement Test. At most 8% of young Americans would be in a credit-restriction situation. Only long-term factors captured by the grades on the exams matter to explain registration at a university.

³⁹ National Longitudinal Survey of Youth. U.S. Bureau of Labor Statistics.

expectation on the return of a high school diploma, greater skills required by professions that do not require High School level schooling, high preferences for leisure and those who do not derive much pleasure in attending school.

5. The reasons for dropping out as reported by students

Both in Brazil and in several other countries, household surveys directly question the student dropout about the reason for this choice. In the US, 30% of the dropouts interviewed in the National Longitudinal Survey of Youth of 1979 (NLSY⁴⁰ 1979) stated that they had dropped out because they didn't like the school, while 14% said they had gotten a job. In a more recent poll in the US, almost half of the young people said they had abandoned school because the classes were boring (Bridgeland et al., 2006). In Brazil, according to the educational supplement of the Continuous PNAD (PNADC) of 2019, among the young males who dropped out, the need to work was the main reason pointed out, followed by lack of interest. Among the young females, lack of interest was the main reason, followed closely by the need to work and by pregnancy (IBGE, 2020).

Several studies in Brazil sought to relate school abandonment and dropout to the socioeconomic characteristics of the students, their family setting, the housing region, and the school region. The lack of interest of the young student in the school is pointed out by Neri et al. (2009), Shirasu and Arraes (2015) and by Salata (2019) as the biggest motive for dropping out of school among Brazilian adolescents. Several authors, using different databases such as the demographic census, PNAD, and monthly employment survey (PME), find that the family background, including family income or parents' level of schooling, is highly correlated with the chance of dropping out of High School (de Leon and Menezes-Filho, 2002; de Souza et al., 2012; Golger and Rios-Neto, 2005; Riani and Rios-Neto, 2008; Rios-Neto et al., 2002; Salata, 2019). Moreover, regarding the influence of the labor market, Souza et al. (2012), using PME, have found that the attractiveness of the local labor market⁴¹ dissuades the likelihood of progression in studies. A similar conclusion is reached by Salata (2019) for young people from 15 to 17 years of age using PNAD data. In turn, Cardoso and Verner (2007), from primary data collected in poor areas of Fortaleza, have concluded that becoming a father or mother during adolescence and having undergone food deprivation in childhood are factors that contribute to dropping out of school, while the pressure to work would have had no impact on the decision to drop out.

⁴⁰ National Longitudinal Survey of Youth.

⁴¹ Measured by the average wage of young people, average salary of adults and employment rate of the relevant labor market.

Finally, Soares et al. (2015) investigated the factors behind school dropout with data from the Survey on School Abandonment (PSAE), applied to both students in school and dropouts of 46 schools in Minas Gerais. Being a survey specifically designed for the study of school abandonment, the questions are richer and specific about the decision to stop studying than those that allow us to infer about school dropout from PNAD, PNADC, PME, or the Census. According to the survey data, the factors with greater power to explain the decision to abandon or remain at school were difficulty with the subjects, the longing for a different type of school, the perception of better job opportunities with the continuity of studies and having been able to choose a school for its quality.

All Brazilian studies mentioned herein, however, use surveys that accompany individuals for a short period or which pool various cross-section surveys from certain years. This is so because it is rare to find Brazilian longitudinal studies that accompany individuals from early childhood⁴². Longitudinal databases combined with data on the educational trajectory of students would allow us to have a more detailed understanding of the dynamic relationship between parents' investments in early childhood, the quality of education throughout the school trajectory, the history of repetition, the economic cycles, the attractiveness of the labor market and other factors that could affect the decision to drop out of school before completing High School.

6. The quality of education: the role of the school and the teacher

What causes a student to have more chances of repeating a year or abandoning school? What is the role of the school in this process? Would the same student attending a better quality school have less chances of repeating a year and abandoning his studies? Evidence shows that yes. The teacher and school in which the student is enrolled play a key role in the likelihood of school dropout. In well-managed schools and well-prepared and motivated teachers, learning is higher and dropout rates are lower.

The parents of students in the public school system often have little to say about which school their children will study at, nor do they get to choose the teacher for their children. Despite this, the school may play a fundamental role in school dropout. There is plenty of heterogeneity in the quality of teaching being offered, even among municipalities with the same socioeconomic characteristics, but different school management. Take as an example the municipality of Cocal dos Alves, in the *Sertão* (semi-arid region) of Piauí. There, amid the

⁴² The cohorts of Pelotas from 1982, 1993 and 2004 are an exception to this situation (<http://www.epidemioufpel.org.br/site/content/cpe/historia.php>).

Caatinga (semi-arid shrublands), there is a treasure trove of national champions of the Brazilian school Olympics, including the Brazilian Olympics of Mathematics of Public Schools, OBMEP. According to the school census, the High School abandonment rate in Cocal dos Alves was only 1.6% in 2018. Still, in the neighboring municipality of Cocal, only 25 km away, the abandonment rate for students of the same state network, with similar family income and context was almost 10 times higher, at 15%. It is possible to repeat this exercise in various locations throughout Brazil, comparing students along the border between Pernambuco and Alagoas, Espírito Santo and Bahia, or Goiás and Tocantins.

According to (de Souza et al., 2012), students studying in municipalities with good teaching quality indicators⁴³ have a greater chance to progress in their studies, while (Riani and Rios-Neto, 2008) find correlation between school delay and the quality of human resources and the municipal school infrastructure where the student lives. (Shirasu and Arraes, 2015) use the longitudinal data between 2008 and 2011 of the State Proficiency Examination in Ceará, SPAECE⁴⁴. The authors estimate the likelihood of dropouts through a multilevel logistics model, which allows them to calculate the contribution of the school to the dropout rate in Ceará. The study shows that for most schools, contribution to school dropout is not statistically different from zero, but at the distribution tips, which involve between a quarter and a fifth of the schools, the effect can be substantial, increasing the probability of school abandonment in up to 6 percentage points.

Even within the same school, the teacher plays a key role in the future of the student. While the ability to measure the quality of teachers through repeated proficiency tests is not unanimous in academia⁴⁵, numerous authors and education networks use value-added measures to identify more efficient teachers (in terms of adding knowledge to students)⁴⁶. Value-added estimates found in the literature show that a good teacher⁴⁷ can raise a student's grades by 10% to 20% of standard deviation⁴⁸ (Chetty et al., 2014a; Hanushek and Rivkin, 2010;

⁴³ Measured through the main component of measure of supply of teachers, teachers' schooling, and teaching salary.

⁴⁴ Permanent Assessment System of Basic Education in Ceará.

⁴⁵ On the controversy about the validity of value-added measures of teachers, see (Chetty et al., 2014a, 2017; Kane and Staiger, 2008; Rothstein, 2010, 2017).

⁴⁶ There are several ways to calculate the added value of the teacher. The most common is simply regressing the students' grades from a teacher in year t, in the grades of the same students in year T-1. Another form explores the quasi-experiment caused by the migration of a teacher between schools (Chetty et al., 2014a): if a good teacher leaves a school and migrates to another, the grade of the school from which he leaves should decrease, and the grade of the school to which he goes to should increase.

⁴⁷ In this case, the good teacher would be the one whose added value is 1 standard deviation above the mean of the distribution of added values of teachers.

⁴⁸ In education, it is very common to use standardized grades in terms of standard deviation to be able to generate a common and comparable metric between studies. The standard deviation is a measure

Rockoff, 2004). Looking for long-term data, (Chetty et al., 2014b) show that a good teacher not only increases a student's grades, but also increases the student's chance to enter university, decreases the chance of early pregnancy and, consequently, increases the student's salaries in adult life (Chetty et al., 2014b).

In Rio de Janeiro, students who attend schools that have a greater concentration of more efficient teachers have less chance of failing at the end of the year or of abandoning the school. Cazulo (2020) estimates the amount that each teacher adds to a student's learning in High School and finds that students falling into the hands of good teachers get better grades and are less likely to fail at the end of the year and abandon the school. Specifically, if the student's teacher is a standard deviation above the mean value-added of state teachers, the student's grades increase by 20% of 1 standard deviation. Still, if the student enrolls in a school whose teachers are a standard deviation above the mean value-added of the state average, his chance of failing is 4 to 6 percentage points lower, while his chance of abandoning the school is 6 to 7 percentage points lower than average (which means a reduction of 82% in relation to the average abandonment rate at state schools).

7. The role of failure and repetition

In the late 1980s and early 1990s, the work of Sergio Costa Ribeiro, Phillip Fletcher, and Ruben Klein (Fletcher, 1997; Fletcher and Ribeiro, 1988, 1996; Klein and Ribeiro, 1991) showed that dropouts in Brazil did not occur in the first grades of the initial years, but in higher grades, among older students, who had already repeated grades a few times. Behind the low level of schooling in Brazil, therefore, would be the "repetition pedagogy", a reflection of a widespread culture throughout Brazil of mass failure and repetition since the first initial grades. Despite the strong evidence of the relationship between failure, repetition and subsequent dropout, the limitations of the PNAD did not allow establishing a causal relationship between one variable and the other.

Data from other countries, such as those compiled by Manacorda (2012), point to a negative relationship between the repetition rate in Elementary and Junior High School and High School enrollment. Longitudinal studies show that repeating students progress less throughout their school life than students promoted at the end of each year in Brazil (Correa, 2013). In a meta-analysis of longitudinal studies following the trajectory of students in the US (Jimerson et al., 2002) find that failure and repetition are the most powerful factors to explain dropout. The exact mechanism of this effect is not consensual among psychologists and

of dispersion of values of a random variable. If the grades of a particular population follow a normal distribution pattern, 68% of the grades are contained in the range between -1 and 1 standard deviation, and approximately 95% of the grades will be between -2 and 2 standard deviations.

pedagogues, though many agree that the experience of repeating grades can decrease students' self-esteem, separate them from their network of friends, lower their expectations and stigmatize them (Jimerson et al., 2002; Meisels and Liaw, 1993). However, we did not find any study that measured the causal impact of repetition on these dimensions.

To isolate the causal effect of repetition on abandonment, it is necessary to have a group of students for whom repetition was random or quasi-random. This happens, for example, when failure is based on a test grade. Whoever falls below the cut-off grade fails⁴⁹, and whoever falls above it passes. For grades very close to the cut, failure is a matter of luck or misfortune. A distraction, an annoyance, or a delay separates those who fail from the others. In Chicago, eighth graders who fall just below the cut-off grade and fail are more likely to abandon their studies and less likely to graduate from High School⁵⁰ (Jacob and Lefgren, 2009). In Uruguay, a student fails the 7th, 8th or 9th grade if he has grades below the cut-off point in more than 3 subjects. Comparing students who did not obtain the cut-off mark in 3 subjects (passing threshold) with students who did not reach the cut-off mark in 4 subjects (and, therefore, failed), Manacorda (2012) finds evidence that failure in fact induces the student to abandon and drop out earlier.

Something similar is happening in Louisiana, where students must pass the state Math and English exam to be promoted from 8th to 9th grade. Comparing students who almost passed with those who almost failed, (Eren et al., 2020) find that those who repeated a year end up migrating to classes with classmates with lower grades, and more absences and disciplinary infractions the following years, which suggests that repetition leads to lower investments in other skills not directly linked to school learning. In turn, repetition also increases the chance of students dropping out, decreases the total years of completed studies and decreases the probability of graduating from High School, which has serious consequences in the involvement of these young repeaters in crime. Although the impact on crimes committed during adolescence is low, repetition takes its toll later when the offender becomes an adult. The probability of conviction for crimes increases by 11%⁵¹.

In Brazil, Lopez de Leon and Menezes-Filho (2002) observe that repeating students have a lower probability of school progression, while (Pazello and Fernandes, 2005) find that

⁴⁹ Or there is strong likelihood of flunking out if the final decision is left up to the School Council.

⁵⁰ This effect is not found for children in the 6th year. Two other studies in Florida (Schwert et al, 2017; Greene Winters, 2007) also do not find impacts of repetition or dropout for 3rd graders in Elementary School, suggesting that repetition in the early years may have distinct impacts than those close to entry into High School.

⁵¹ To a large extent, due to an increase of almost 60% in the likelihood of conviction for committing violent crimes.

repetition and school delay have a significant influence on the probability of transition between Elementary and Junior High School and High School, increasing the probability of dropout in all grades. Gremaud et al (2011) show that: 1) low learning in Elementary and Junior High School, measured through standardized SARESP⁵² assessments, is correlated with the probability of failure during Elementary and Junior High School; 2) school delay, caused by repetition during Elementary and Junior High School, is highly correlated with the probability of dropout in High School; and 3) low learning during Elementary and Junior High School is also correlated with High School dropout, even after controlling the school delay effect.

A similar conclusion is found by de Souza et al. (2012). School delay influences the probability of passing and, in turn, continuation of studies is strongly linked to passing to the next grade. That is, repetition in lower grades increases the chance of repetition later, which also ends up increasing the chance of dropout later⁵³. On average, each year of school delay is associated with a decrease in the probability of passing, and this effect increases with each grade.

Figures 2 and 3, analyzed by (Fernandes, 2011)⁵⁴, show how the age-grade lag affects the dynamics of dropout throughout the school year according to data from the Monthly Employment Survey (PME), for both the total number of students and for only those students without age-grade lag, respectively. The figures show the total enrollment in the last year of Elementary and Junior High School and throughout High School, by month, over a 4-year period. Decline in the number of enrollments throughout the year is a sign of abandonment, and dropout occurs in the transition between academic years⁵⁵. For students without an age-grade lag, there is practically no abandonment throughout the year, and for them dropout occurs in the transition between grades. For those who have already repeated grades along their school trajectory, abandonment occurs throughout the school year (Fernandes, 2011). (Fernandes, 2011) also analyzes data from the Minas Gerais School Abandonment Survey (PSAE) and concludes that for each year of delay in entering High School, the risk of abandonment increases by 5%.

⁵² School Performance Assessment System of the State of São Paulo.

⁵³ Since students in Brazil start their studies at the correct age and the cases of students who drop out one year and re-enroll later are rare in Elementary and Junior High School, it is possible to attribute school delay throughout Elementary and Junior High School basically to repetition.

⁵⁴ That use the same data from PME analyzed by de Souza et al (2012).

⁵⁵ It is not possible, however, to accurately characterize dropout using these data due to students who repeat the year and who inflate the number of enrollments in the transition between grades, in addition to students who eventually abandon, or drop out, and return to school.

Correa (2013), in turn, using panel data from the GERES Project⁵⁶, a longitudinal study that followed students who entered Elementary and Junior High School in 2005 for 3 years, found that the learning curve of repeating students increases more slowly than that of students who progressively pass from one year to the next⁵⁷. The short panel does not allow one to observe effects on dropout. Another evidence of the association between repetition and future dropout comes from the work of Rios-Neto et al. (2002), who assess the evolution of school progression for cohorts born between 1945 and 1985. Using pooled data from the PNAD from the 1980s and 1990s, the authors find that 80% of gains in schooling among these cohorts are due to improvements in school flow in two key grades, the former 1st and 5th grades (2nd and 6th grades) of Elementary and Junior High School.

Despite the richness of information contained in all such research⁵⁸, none of them explores the causal effect of failing and having to repeat the year and its relation to posterior student dropout, as studied in Uruguay (Manacorda, 2012) and Louisiana (Eren et al., 2020). Although there is in Brazil no policy for failing based on standardized examinations that would allow one to use the same identification strategy used by these authors, it is possible to study the impact by making use of other strategies. For example, exploring the fact that some teachers systematically fail more students than others, or that some other teachers are more efficient in improving their students' learning curve, or even that some schools traditionally fail more students than others, and this for students with the same characteristics and same grades in standardized exams⁵⁹.

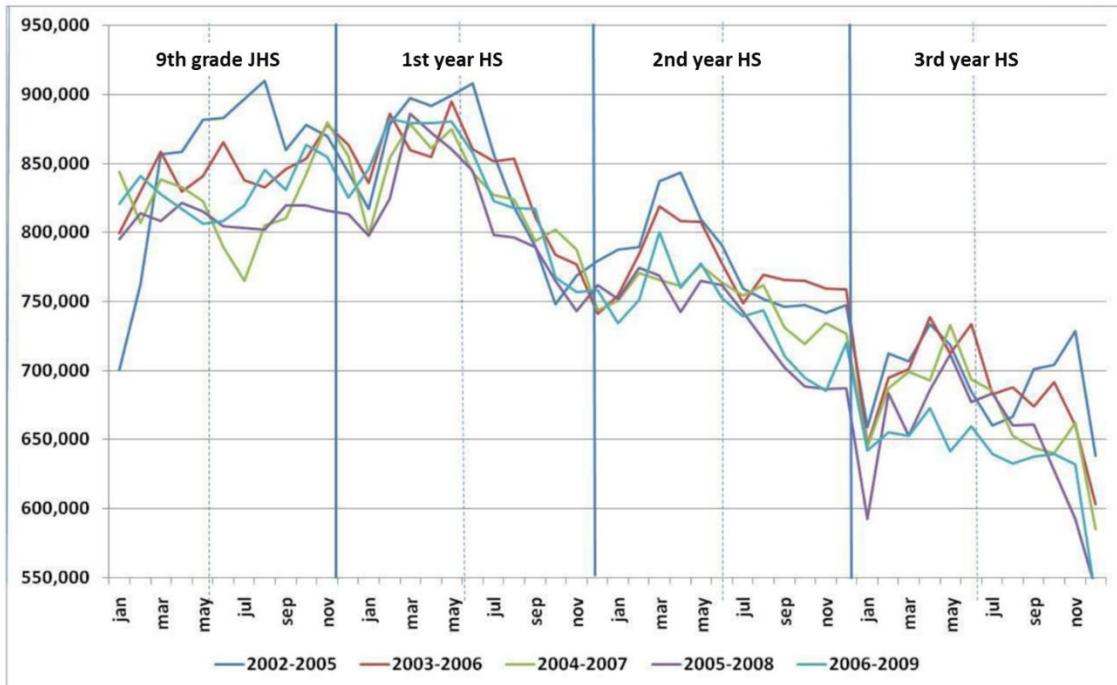
⁵⁶ The GERES Project is a longitudinal survey of the generation that entered Elementary and Junior High School in 2005. The survey followed the school performance of students from 303 schools in five Brazilian cities between 2005 and 2008 (<https://laedpucrio.wordpress.com/projetos/o-project-geres/>).

⁵⁷ This may be due to a selection effect of those who repeat, or a causal effect of repetition on students' later school performance.

⁵⁸ Even those who use longitudinal data like Correa (2013), Fernandes (2011), Gremaud et al. (2011) and Soares et al. (2015).

⁵⁹ Cazulo (2020) calculates the added value of teachers in State of Rio de Janeiro's High Schools and finds schools with high value-added teachers have lower rates of failure and school abandonment. The author, however, does not analyze the impact of repetition on dropout in subsequent years.

Figure 2 – Total number of enrollments per month and year/grade

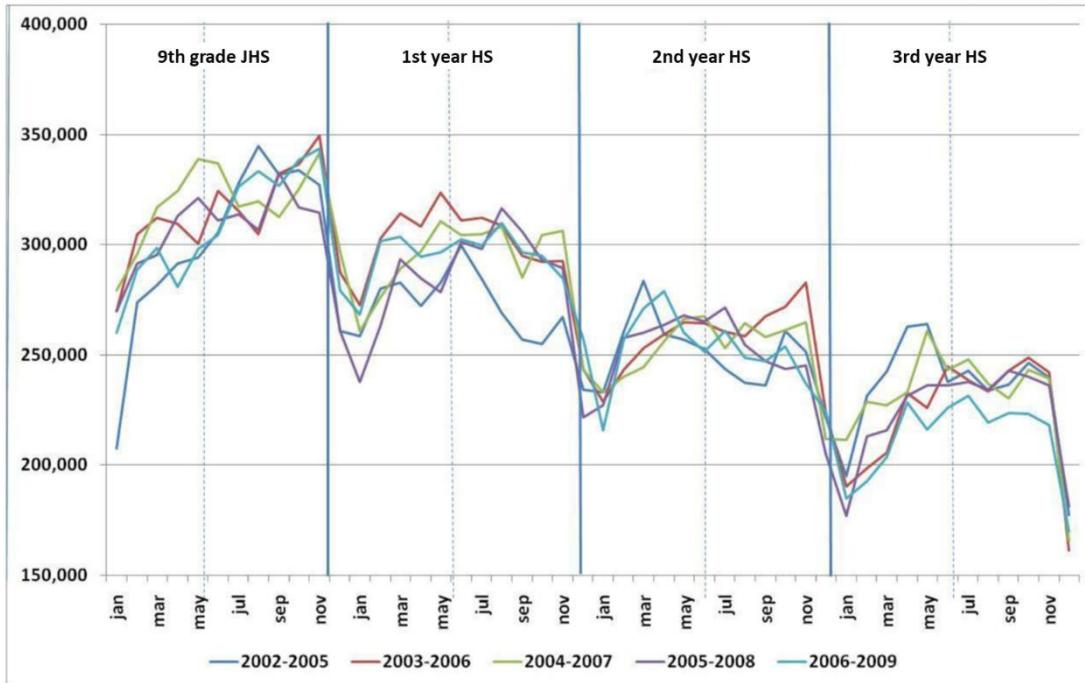


Source: Fernandes (2011), from PME data.

Note: The figure shows the total number of enrollments over 4 years, always beginning with the first year of the series. For example, for the blue line, the first point of the horizontal axis corresponds to the month of January 2002, while the last point, for the same line, corresponds to the month of December 2005. For red line, the first point would be the month of January 2003, and so on.

JHS stands for Junior High School and HS stands for High School.

Figure 3 – Total number of enrollments per month and year/grade - Only for students without age-grade distortion



Source: Fernandes (2011), from PME data.

Note: The figure shows the total number of enrollments over 4 years, always beginning with the first year of the series. For example, for the blue line, the first point of the horizontal axis corresponds to the month of January 2002, while the last point, for the same line, corresponds to the month of December 2005. For red line, the first point would be the month of January 2003, and so on.

JHS stands for Junior High School and HS stands for High School.

8. Teenage Pregnancy

In addition to the other factors already mentioned, a highly correlated factor related to the dropout of girls is teenage pregnancy, occurring before the ideal age for the termination of basic education, until 19 years of age⁶⁰. According to date from the Information System on Live Births (SINASC), 15% of children born in 2018 in Brazil are from mothers under 19 years of age. The rate reaches 23% in the Northern Region of the country (Fundação Abrinq, 2021). According to the National Survey on Demography and the Health of Children and Women (PNDS) of 2006, almost 70% of mothers in the Northeast get pregnant before the age of 19 (Cruz et al., 2016; IBGE, 2016). Recently, contrary to the fall in the fertility rate in Brazil, there has been a relative increase in the number of children per woman under 19 years of age (Cruz

⁶⁰ There is no universally accepted age limit to define adolescence. We will use here the age of 19 to mark the end of adolescence, the age limit of indicator 3.7.2 of the Sustainable Development Goals (United Nations' SDGs) for the number of living births of adolescent mothers. The age of 19 also corresponds to the age limit to finish High School without age-grade distortion (2 years above the correct age for the year/grade).

et al., 2016). Women are bearing children earlier and, when they reach 25 years of age, already having had the number of children desired, undergo definitive control of fecundity through sterilization (Cavenaghi, 2015).

Pregnancy in adolescence is strongly linked to school dropout. Pregnancy removes part of the mother's available time to study (Becker, 1965), and can increase the need to complement income to support the child. However, estimating the impact of pregnancy during adolescence on the likelihood of completion of basic education is not a simple task. According to data from the National School Health Survey of 2019 (PENSE, IBGE, 2021), 37% of students from 13 to 17 years of age from the public network had initiated their sexual life, against 23% from the private network. Among the female pupils of the public network in the same age group and that had already begun sexual life, there is an 8.4% likelihood of their having gotten pregnant at some point, against 2.8% of those from the private network, a difference 3 times greater (IBGE, 2021). According to the National Survey of Demography and Health of Women and Children (PNDS) of 2006, the probability of pregnancy is more concentrated among women of low schooling, from the Northern Region, who were not brought up in Catholic or Evangelical churches and who did not use any contraceptives during their first sexual intercourse (Cruz et al., 2016). The same survey also shows that 67% of 15 to 19 year old females with 2 to 4 years of study had already become pregnant, against only 2% of young females with more than 12 years of study (Ministério da Saúde and Centro Brasileiro de Análise e Planejamento, 2008). Since lower income may be correlated with more precocious sexual initiation, less access to information on contraceptive methods and less access to abortion, it is difficult to separate what is only correlation with poverty and with the family environment, what is the impact of pregnancy on schooling, or what is the impact of schooling on teenage pregnancy.

Several studies have focused on isolating the causal impact of teenage pregnancy on the chance of finishing basic education using the most diverse techniques⁶¹. Some of these studies use variables that would determine the chance of pregnancy without necessarily affecting the adolescent's incentive to study, such as greater or lesser access to contraceptives, age at menarche⁶², access to family planning clinics or natural abortions (Ashcraft et al., 2013; Cantet, 2019; Diaz and Fiel, 2016; Herrera and Sahn, 2013; Kassouf et al., 2020; Klepinger et al., 1997). Estimates of the impact of teenage pregnancy range from a loss of 2.6 years of schooling in the US (Klepinger et al., 1997) to a loss of 1.3 years of schooling in Brazil (Kassouf et al., 2020). Regarding the chance of dropout, Cantet (2019) finds a 27% increase in South

⁶¹ Such as by propensity score matching, using fixed effects or instrumental variables.

⁶² The first menstruation.

Africa, and Herrera and Sahn (2013) estimate a 42% increase in Madagascar, while Diaz and Fiel (2016) estimate a 15 percentage point reduction in chance of graduating from High School in the US.

In addition to the careful study conducted by Kassouf et al. (2020), other studies sought to establish the relationship between teenage pregnancy and dropout in Brazil, using, however, less robust techniques of causal identification. According to Fernandes (2011), PSAE data in Minas Gerais point to an increase in the risk of school abandonment among female adolescents by more than 3.8 times with pregnancy. According to Santos and Pazello (2012), teenage pregnancy reduces the probability of their continuing their studies by 20 percentage points.

There is much controversy about what could explain such high numbers of teenage pregnancy, given the negative consequences it can have, such as school dropout and worse insertion in the labor market. There are at least 4 groups of explanations, which are not mutually exclusive. The first would be the relatively lower access of the poorer social classes to information on reproductive health and contraceptive methods (Berquó and Cavenaghi, 2005). The second factor, which we will discuss in more detail later, is the stage of cognitive and socioemotional development of adolescents, which would cause them to place a disproportionate value on momentary happiness in relation to future well-being and would distort the perception of risk and return on their actions. And a third factor could be added to this, namely, low female empowerment, which would make female adolescents, when negotiating with their partner, accept having unprotected sex more easily.

The fourth factor that could explain the phenomenon of teenage pregnancy is the lack of perspective of the poorest adolescents and the lack of alternative life projects to motherhood, causing motherhood and the formation of a family to increase the status of the young woman in society. Kearney and Levine (2014) argue that the quest for status among adolescents would explain the fact that teen pregnancy is concentrated among the poorest young women in the US. According to Clark's (1965) observation, in American ghettos, teenage pregnancy would not be frowned upon, as in the middle class. There is no pressure to abort. For these girls, pregnancy would not close many doors, as the doors would already be closed to them. Pregnancy will not make it difficult for them to make a good marriage or get ahead in life, because they feel like they wouldn't make it anyway. On the other hand, having a child would bring them status and recognition as adult women. Culturally, therefore, having a child could be a relevant factor for the formation of the identity of these adolescents (Akerlof and Kranton, 2010), and the evidence brought by neuroscience is that a young person is especially sensitive to acceptance by peers (Armstrong, 2016).

According to Kearney and Levine (2014), the search for status through pregnancy among the poorest girls would explain the fact that, in the US, the proportion of poor pregnant adolescents is positively correlated with income inequality in each state. The authors show that empirically explaining this stylized fact is not the greatest likelihood of pregnancy among poor teenagers of very unequal places, but the lowest chance of abortion⁶³. The greater the inequality, the lower the perception of ascending social mobility, and the greater the dismay of poor teenagers, making them keep the baby once pregnant⁶⁴.

9. Socioemotional skills

Scientific literature on human development during childhood and adolescence and its connection with well-being indicators during the rest of their lives has had enormous growth in the last 20 years. One of the main findings of these surveys is that various skills, whether cognitive or socioemotional, have a bearing in determining participation in the labor market, wages, involvement in illicit activities, health, and even general satisfaction with life (Heckman et al., 2006; Murnane et al., 1995).

In addition to the skills of reasoning and knowledge acquired at school, other socioemotional skills also influence the chances of completing High School. When studying the profile of young people who choose to do the High School supplementary exam in the US⁶⁵, Heckman et al. (2010) and Heckman and Rubinstein (2001) find that both cognitive skills and other skills, such as locus of control⁶⁶ and self-esteem, predict which students will abandon and which will try to do the supplementary examination.

Figures 4 and 5 show the distribution of cognitive and socioemotional skills⁶⁷ of students who decide to drop out of school having only completed Elementary and Junior High School, those who achieve High School certification through the supplementary examination and those who graduate normally from High School. The figures suggest a selection profile between the 3 groups. First, it is possible to notice through Figure 4 that the significant

⁶³ According to data from PENSE 2015, it is not true that in the Brazilian case the chance of pregnancy is the same according to social class. The probability of pregnancy among adolescents in public schools, conditional on having already initiated sexual relations, is triple the probability among students in private schools.

⁶⁴ Kearney and Levine (2016) note that the same pattern between state income inequality and teenage pregnancy is also true for High School dropout rates. The higher the inequality and the lower the probability of upward social mobility, the lower the chance of completing High School.

⁶⁵ GED – General Education Development.

⁶⁶ The ability to believe that the person has control over his life, as opposed to external events out of his sphere of influence.

⁶⁷ Cognitive skills are measured through the aptitude test for entrance in the Armed Forces, the AFQT, present in the NLSY 1979 data. Socioemotional skills, however, are measured through the Rosenberg self-esteem scale, and Rotter's locus of control test.

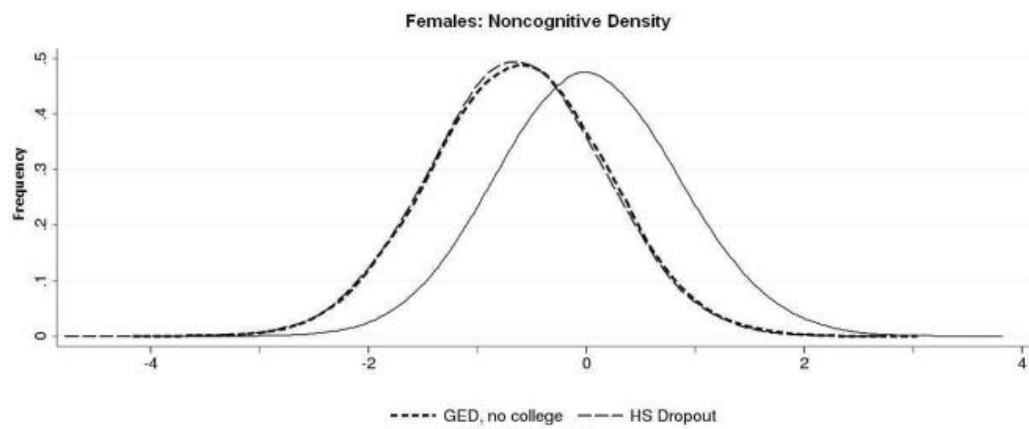
difference between those who graduate normally from High School, those who opt to drop out of school, and those who conclude High School via the supplementary examination, are the socioemotional skills. Second, the figures show that students who opt for the supplementation are as intelligent as those graduating normally from High School. Among two equally smart individuals, what makes one opt for the supplement, while the other choose to stay at school, are precisely the least developed socioemotional skills, such as lack of perseverance, low self-esteem, low self-efficacy⁶⁸, and high propensity towards risky behavior (Heckman et al., 2010).

The authors also show that those who graduate from High School via the supplementary exam have lower labor market performance than those that graduate normally. As both are equally intelligent types, it is concluded that the difference between the two groups is due to socioemotional skills, and that the labor market somehow values such skills.

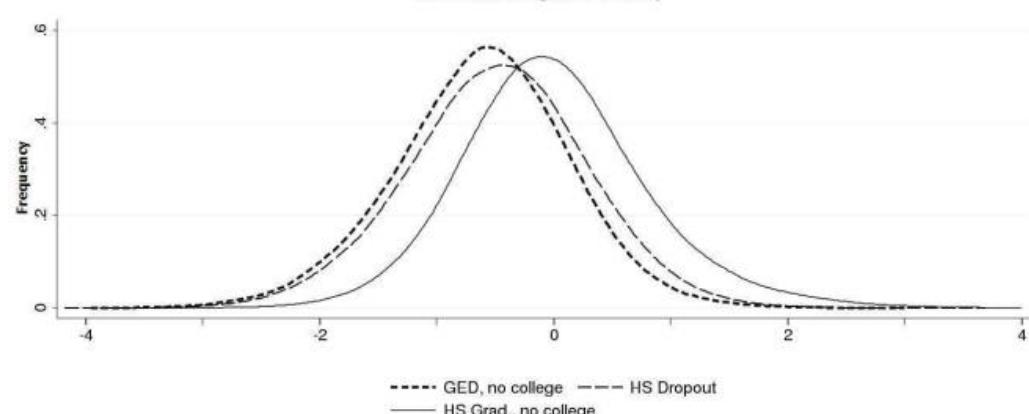
⁶⁸ Self-efficacy is the conviction that the person can control events and perform a specific task.

Figure 4 – Distribution of socioemotional skills among individuals who graduated from regular High School, those who completed High School certification, and those who only concluded

Elementary and Junior High School

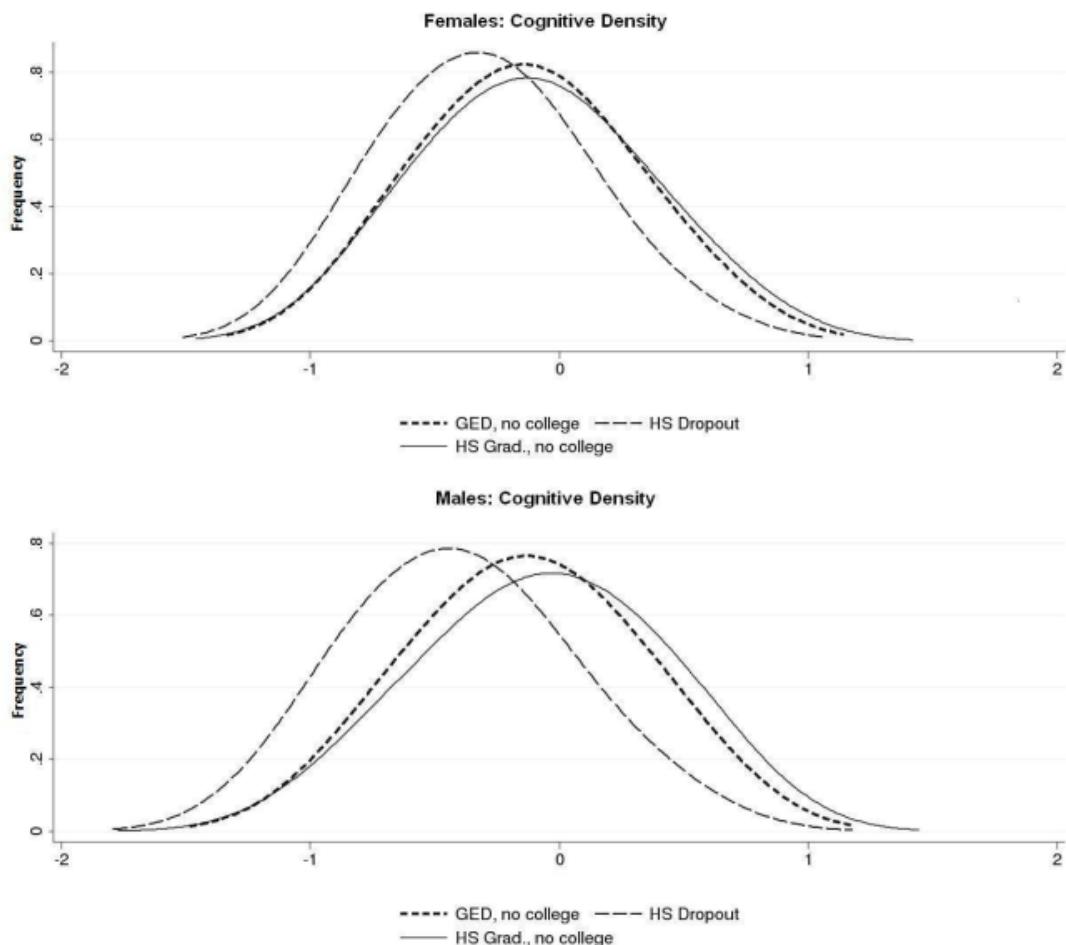


Males: Noncognitive Density



Source: Heckman et al., 2010, from NLSY 1979 data.

Figure 5 – Distribution of cognitive skills among individuals who graduated from regular High School, those who completed High School certification, and those who only concluded Elementary and Junior High School



Source: Heckman et al., 2010, from NLSY 1979 data.

Two Brazilian studies investigate the role of socioemotional skills in relation to the chances of school dropout. The first is a survey that interviewed approximately 1500 young people in Recife in 2018 with the objective of tracing the socioeconomic and socioemotional profile of young people who work and study, only study, only work, or neither work nor study ("neither-nor"). The research, coordinated by the researchers Joana Costa, Enid Rocha and Claudia Silva, has collected non-usual information in Brazilian home surveys, such as results in cognitive testing, risk aversion, impatience, perception on wage returns upon conclusion of High School, negative experiences in life, locus of control, self-efficacy, self-esteem, the big five personality traits⁶⁹, perseverance and depression. Although they do not have causal

⁶⁹ These are 5 basic personality traits: openness to new experiences, conscientiousness (good control of impulses and directed behavior to reach goals), extraversion, agreeableness (signs of trust, altruism,

character, the results of the study show that socioemotional skills are closely related to study and work decisions. The young "neither-nor" people have less locus of control, lower self-efficacy indexes, lower confidence in their ability to achieve goals, less passion for achieving long-term goals and more episodes of depression (Costa et al, 2018).

In the second study, Caluz (2018) uses data from a panel survey of students who were in the 2nd year of Elementary School in 2008 in the city of Sertãozinho, in the interior of São Paulo. In data collections of 2008 and 2012, students answered questionnaires about the big five personality traits, social skills, and locus of control. Subsequently, the data were crossed with the administrative records of students from the cities of Sertãozinho and Ribeirão Preto to know which of those students had dropped out. The study found that some socioemotional skills are strongly correlated to the likelihood of permanence in High School. Among them, conscientiousness (which implies the desire to perform a task well, being careful, responsible, and having self-discipline), kindness (ability to value relationships with colleagues, to rely on them and be cooperative) and locus of control positively correlated with permanence in school, while extroversion has a negative correlation.

Not by coincidence, socioemotional skills are the characteristics most valued by employers in Argentina, Brazil, and Chile, even more than knowledge about the specific activities of the industry. In professions that require contact with clients, attitudes such as courtesy, empathy and adaptability, as well as responsibility and commitment are the most sought after by employers (Bassi et al, 2012).

Such studies corroborate the view that socioemotional skills can be crucial to determine abandonment and dropout and introduce the importance of better understanding how teenagers make their decisions. It is particularly interesting to note the presence of the locus of control as a skill linked to the decision of abandonment in both studies. Low capacity of self-control can lead youngsters to make decisions that may not be the best for themselves. In fact, the evidence brought by the approval of laws that force youngsters to remain at school until a certain age indicates that the decision to drop out is not made optimally by the adolescent. Young people who conclude High School only due to the passing of legislation claim that the completion of High School was the correct decision to make. Now, if such young people just graduated from High School because the Law forced them to, then, by definition, they had not thought that graduating from High School was the best option for them at that moment, which is apparently a contradiction.

empathy, and affection) and neuroticism (tendency to have negative emotions as sadness, anger, anxiety or depression). In English, these five traits are known by the acronym OCEAN. They are also commonly referred to as the Big Five.

Likewise, according to a survey among student dropouts (Bridgeland et al., 2006), 74% said they were sorry for having had to experience school abandonment and would change their decision if they could go back. Of the two, it is: either the individual did not have complete information on the educational return when he was young, and so underestimated the return (Jensen, 2010), or he tends to focus on the present only, ignoring projects whose return would be in a very distant future. In fact, recent advances of neuroscience show that young people are particularly predisposed to present such myopic behavior in relation to future gratuities. Other changes in a teenager's brain can also explain the riskier behavior during such a period of life. The next section is dedicated to exploring the reasons why this may occur.

10. The Teenage Brain

Adolescence is marked by various behavioral changes. Obviously, such behaviors differ depending on the cultural context in which the adolescent is inserted, but there are three changes in a robust way that occur not only among different cultures, but also among animals: a) the increase in the search for innovation and experimentation, b) the increase in the tendency to take risks and c) the increase in the search for peer interactions and social acceptance (Spear, 2000).

The period of adolescence is marked by numerous hormonal and metabolic changes, but also by profound changes in the brain. For a long time, the most common explanation for the risky and erratic behavior of adolescents was the frenzy of hormones to which they would be exposed during puberty. Little was spoken about the transformations that occurred in the teenage brain. By the end of the 1990s, for example, it was common belief among neuroscientists that brain development would be practically finished at 5 or 6 years of age, when the brain already reaches around 95% of its adult volume (Armstrong, 2016).

This perception, however, has been modified with new research made possible by the advancement of magnetic resonance techniques, allowing an entirely new understanding of the development of the brain during adolescence. Although the association between magnetic resonance imaging and certain behaviors is far from automatic and simple (Johnson et al., 2009), the advancement of these techniques has allowed for the complexity of the origins of certain typical teen behaviors to be understood more precisely.

Basically, adolescence is marked by two major phenomena in the brain. On the one hand, neurons pass through a process of consolidating the myelin sheath⁷⁰, a layer of fat that

⁷⁰ Such a process is known as myelinization.

coats the axons⁷¹, giving greater speed of transmission of information⁷² and allowing a more efficient coordination of impulses (P. Anderson, 2002; V. A. Anderson et al., 2001) involved in activities such as judging actions, socializing and long-term planning (Giedd, 2015a, 2015b). On the other hand, the teenage brain goes through a specialization process⁷³, in which less used connections come undone (Gogtay et al., 2004), as if the brain were being carved, and sculpted from a marble block (Giedd, 2015b). This process of specialization, however, does not occur in a linear and uniform way in all regions of the brain. The pre-frontal cortex is the last area of the brain to go through this phenomenon (Sowell et al., 2001, 2003; Toga et al., 2006), and this is precisely the region that coordinates more complex cognitive processes and cognitive skills necessary for conscious control of our actions and thoughts, also called executive functions⁷⁴.

On the other hand, areas responsible for emotions and sensations related to reward⁷⁵ are already developed from puberty (Cunningham et al., 2002). According to some authors, this mismatched development of different brain areas (Casey et al., 2008; Dahl et al., 2018; Steinberg, 2010), allied to the higher speed of impulse transmission and greater integration of different parts of the brain would be behind the emergence of adolescence behaviors such as the quest for innovation, the sharp leaning towards risk and the search for social interactions with peers. While the adolescent is especially sensitive to the search for sizeable and immediate rewards, they still have difficulty in reflecting before making decisions impulsively (V. A. Anderson et al., 2001). As the cognitive maturation process advances in the transition to adulthood, there is an increase in the ability to make choices involving long-term rewards, such as graduating from High School or entering university (V. A. Anderson et al., 2001).

Recent evidence brought by magnetic resonance studies shows that external stimuli influence the dynamics of brain transformations of the adolescent. External stimuli, such as passage through certain experiences, sleep deprivation and toxic stress, can act intensifying neural activity in certain regions. Since the pre-frontal cortex is the last part of the brain to specialize, and as this process is dynamic and subject to the influence of external factors, a window of opportunities opens up for adolescent interventions. Even if such interventions are

⁷¹The axon is the most elongated projection of the neuron and is responsible for conducting electrical impulses.

⁷²Consequently, increasing the amount of information transmitted per second.

⁷³Such a process is known as synaptic pruning.

⁷⁴One of these skills is the ability to create hypothetical scenarios of the consequences of the actions taken: "- And if I were to abandon school, what would happen?"; "What if I got involved with drug dealers?" The proper functioning of the executive functions allows the individual to maintain the focus, avoid distractions, plan and perform long-term projects, reflect before acting, control impulses, reflect on different opinions, remake plans and correct mistakes.

⁷⁵Specifically, the areas that make up the limbic system.

not able to improve the development of cognitive skills of logical reasoning or school content learning, it is possible to strengthen the development of socioemotional skills, which are linked not only to the decision to abandon school and enter the labor market, but also to take risks, undergo early pregnancy and involvement with criminal groups and violent activities.

The more we understand the particularities of adolescent behavior and their roots, the greater the chances of designing interventions that can help youngsters change their attitudes, avoiding taking unnecessary risks, and entering positive life trajectories. Cases of successful interventions in avoiding high school dropout are the theme of another paper in this series.

11. Conclusion

This paper sought to compile literature on the causes and consequences of school dropout in Brazil and in the world. Estimates indicate that the cost to the Brazilian society of not guaranteeing the right to students' learning in High School can reach 395 billion reais per year or more than 80% of the education budget for the 3 branches of government in Brazil. Dropout is correlated with poverty of families, Black or Mixed-race skin color, poor quality of the school, low efficacy of the teacher, school delay, and with the history of past repetitions. Socioemotional skills also contain the power to explain dropout, especially those skills linked to executive functions, which include self-control and responsibility. Recent advances of neuroscience show that it is during adolescence that some socioemotional skills, such as executive functions, are developed, in a concomitant process of myelinization and synaptic pruning, which occurs late in the pre-frontal cortex. The development trajectory of these skills is influenced by the environment, which opens opportunities for interventions to help young people exert more control over their actions, thus avoiding making decisions that may harm their future.

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