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Households' education expenditures in Brazil during the first decade of the century: issues and evidence

Resumo: Este estudo analisa as consequências das alterações demográficas e do crescimento econômico ocorridos no Brasil durante o início anos 2000 sobre a opção de gastos em educação nos domicílios brasileiros. Os resultados evidenciam que a proporção de estudantes nas escolas privadas eleva-se com o aumento dos rendimentos para os domicílios de baixa renda. Contudo, os gastos dos domicílios por aluno caíram para a maioria dos estratos sociais na educação superior, particularmente entre as famílias mais abastadas. Os domicílios de menores rendimentos, entretanto, mostraram outro comportamento, pois seus gastos por aluno para todos os níveis de ensino cresceram, mantendo todas as demais variáveis estudadas constantes. O resultado indica que a elevação de renda para as famílias mais pobres levou-as a matricular seus filhos em escolas particulares ou mesmo em instituições de ensino mais dispendiosas, talvez mais prestigiosas, considerando que simultaneamente ocorreu a redução do número de pessoas nestes domicílios.

Palavras-chave: Economia da educação; Gastos; Desigualdade; Modelo Tobit; Consumo das famílias

Maria Alice Pestana de Aguiar Remy[1]

Alexandre Gori Maia[2]

[1] Researcher at Instituto de Economia da Universidade Estadual de Campinas – UNICAMP – Rua Pitágoras 353 – Cidade Universitária Zeferino Vaz CEP 13.083-857. E-mail: mariaalice.pestana@gmail.com.
[2] Researcher and Professor at Instituto de Economia da Universidade Estadual de Campinas – UNICAMP. E-mail: gori@unicamp.br

Abstract: *This study analyses the consequences of demographic changes and economic growth during the first decade of the years 2000 in Brazil and how they affected households' education expenditures choices for private schools. Results highlight how the increasing share of students in private schools relates to the rise of income of low-income household strata. These people were excluded of private education access so far. Nonetheless, household expenditures per student fell sharply for most social groups in tertiary education, especially among the most affluent ones due partially to availability of more places in private establishments. On the other hand, household expenditures (primary, secondary and tertiary) per student increased along the period for the lowest income strata, maintaining unchanged all other variables. This result demonstrates that the income increase has led these families to enroll their children either at private schools or even to more expensive, maybe more prestigious, education establishments, considering also household size reduction.*

Keywords: Economics of education; Expenditures; Inequality; Tobit model; Family consumption.

Classificação JEL: D12; D19; J10; I24; I25.

1. Introduction

Despite remarkable improvements in expanding access to schooling over recent decades, the quality of education in Brazil is still a major concern. According to the Program for International Student Assessment (PISA), a worldwide study by the Organization for Economic Co-operation and Development (OECD), Brazilian students are still performing poorly in mathematics, reading and sciences, ranging between the 55th and 59th position among 65 countries in 2014. The failure of primary and secondary public schools in providing adequate supply and education of quality, as well as the shift from a rural to an urban-based society in many developing countries, has stimulated families to invest their own resources in the education of their children, especially through low-price private schools (OECD, 2014).

Recognizing the importance of education, the prior Millennium Development Goals included a target of reaching universal primary schooling by 2015. In fact, jobs increasingly demand at least a modicum of education and economic growth tends to increase the demand for high skill professionals as well as for jobs' creation. Besides economic, demographic dynamics also play a central role determining the investment in education and the ongoing process of demographic transition can also affect and determine new household decisions in education expenditures.

These things simultaneously happened, accompanied by an increase of workers' incomes along the first decade of 2000 in Brazil. Economic and demographic dynamics together played a central role determining the investment in education. In fact, the average number of years of school attendance among young Brazilians has increased sharply, especially in higher education, which tends to be a passport to the middle class (STIGLITZ, 1975, STONE *et al.* 2011). When followed by positive changes in the structure of occupations; economic growth tends to increase the demand for high skill professionals and the marginal returns of education as well (MAIA & SAKAMOTO, 2014).

Goldthorpe (2013), has shown that Education and Destination – ED - association appears to weaken rather than to strengthen along the time, which could be the result of educational qualifications increasingly playing a screening and signaling rather than a certifying role, at least in developed countries, which is not the case. In parallel demographic changes, such as the reduction in the fertility rates and in the number of children per household, phenomenon that have characterized the fast demographic transition in developing countries, has also affected the income available for investment in education of the family pupils.

Literature has rather focused on government spending than on household expenditures. Some observers, considering demographic changes, have pointed out a trade-off between expenditures related to the elderly and those related to the youngster with the ageing of the population. They have projected growth in spending for programs such as Social Security System, medical aid and reduction of education's share of total government outlays during the years 2000. (SHOVEN et al, 1994; GROB & WOLTER, 2005) On the other hand, several studies are available on the determinants of family expenditures in education (TILAK, 2002; CASTRO & VAZ, 2007; CURI & MENEZES, 2010). Other studies have shown also a link between education and demography. Some of them highlighted a strong correlation between (i) education and fertility (BLEDSOE *et al.*, 1999; UNESCO, 2002), (ii) education and child's health (THOMAS *et al.*, 1991; LAM & DURYEA, 1999). However, research on household expenditures on education affected by demographic transition, in Brazil, has not attracted a wide attention of researchers so far.

Brazil provides a rich study to analyze the impacts of income distribution changes and demographic transition on education investments at the same time. Consequently, the diminishing child mortality and high fertility rates, the Brazilian population grew fast

in the 50s and 60s. However, the fertility rate started a sharp drop in the 70s, reducing the number of children per household (CARVALHO *et al.*, 1981, CAMARANO, 2014). The demographic transition in Brazil has already showed consequences over the falling demand for primary education and the increase demand for secondary and tertiary education. At the same time, Brazil witnessed substantial reductions in its high levels of poverty and inequality according to the Brazilian Institute for Applied Economics Research (IPEA, 2007) and to the United Nations (UN,2012) and BARROS *et al.* (2007 and 2010), which have contributed to increase the family income available to invest in education, particularly among the new middle income families.

In such a relevant socioeconomic context, this study analyzes the impact of social, economic and demographic changes on private school enrolments and education expenditures in Brazil. Analyses are based on micro data from the Brazilian Household Budget Survey (POF, *Pesquisa de Orçamentos Familiares*) of 2002-2003 and 2008-2009, conducted by the Brazilian Institute of Geography and Statistics (IBGE, *Instituto Brasileiro de Geografia e Estatística*). Analyses consider the differentials between the type of expenditures according to school level (primary, secondary or tertiary) and type of institution management (public or private). Since the expenditures in education is zero for a nontrivial fraction of the population, a censored regression model is used to identify the net impact of social, economic and demographic changes on education expenditures.

The study contributes to the growing literature on the rise of investments in private education, in developing countries. This is also the first applied study to analyze the contribution of socioeconomic and demographic factors on educational expenditures in Brazil, especially in a temporal context characterized by important socioeconomic and demographic changes. Results emphasize how the falling enrolment of students in primary and secondary grades, which is a main result of demographic changes, and the higher enrolment in private schools, resulting from socioeconomic changes, have modified the patterns of inequality in education expenditures among socioeconomic groups in Brazil.

2. The determinants of investments in private education in Brazil

Up to the 1950s, Brazilian public schools[3] were able to provide successful education while it was restricted to the country's wealthiest citizens. At the same time, these families could traditionally use private schools mainly denominational as alternative to the public system at primary and secondary levels. These schools (most of them Catholic) had the same type or even higher quality than the public institutions many times. (PILETTI, 1994)

There are several arguments for the decline of public basic (primary and secondary) education system in Brazil. The main one holds that it started declining when it began operating (around 1955) to attend as many students as possible since there was an undersupply of public school spaces for the entire population in school age (PILETTI, 1994; SAMPAIO, 2009; KERSTENETZKY, 2012). The aim was to achieve universal basic education being able to reach the poorest families' children. But the Nation needs resulted in a trade-off between quantity (of students) and quality (of education). The deterioration in the quality of public free education has been blamed on overcrowding in government primary and secondary schools.

There is evidence in the literature that when public education system presents a poor performance with unqualified teachers, low salaries and high dropout rates parents tend to pay for private education. Psacharopoulos *et al.* (1997) highlighted that the willingness to enroll their children in high quality schools would affect the search for private schools. His research on Bolivia, one of the poorest countries in South America, demonstrated the proliferation of low-cost cost private institutions.

[3] Free of charge.

The families who could afford and had their children in public institutions chose to change and enroll them in private ones from the 60s on. Many others had to remain in the failing public system and Basic school is not even universal nowadays in Brazil. In many cases, the private primary system is the normal educational venue for the wealthy and the public system the normal one for everyone else. This lowers the school's impact on social cohesion and tends to exacerbate problems of social stratification (HEYNEMAN & STERN, 2014).

Recent studies have also highlighted the significant rise of low-cost private schools in the developing world (PHILLIPSON, 2008; DIXON, 2012; HEYNEMAN & STERN, 2014). While some are ran by charities and churches, or rely on state subsidies, the larger share is small low-cost schools run by entrepreneurs in poor areas. According to data provided by the World Bank, private schools enroll a much bigger share of primary-school pupils in poor countries than in rich ones.[4]

Parents decide to send their children to private school for a variety of reasons (HALL & NATTINGER, 2012). Some families, for example, might choose private schools for religious purposes, while others might choose in order to select different peers for their children. Nonetheless, the quality of education is decidedly an important reason, since educational achievements in private schools tend to be higher than in public schools (ALDERMAN *et al.*, 2001).

Brazil largely reproduces the recent trend of the expansion of private schools in developing countries. For example, the share of pupils enrolled in private primary schools raised from 12.7% in 2010 to 15.0% in 2013 according to National Institute of Educational Studies and Research (INEP, 2014). The rising demand for private schools in this country would firstly mean the failure of the state supplying the demand but also in providing good education quality. Second, it would also represent higher investment in education, as a result of positive socioeconomic changes witnessed in this country in the last decade (MAIA & SAKAMOTO, 2015).

Few studies have analyzed the determinants of household investments in education in Brazil. For example, Castro & Vaz (2007) highlighted how higher levels of income are related to higher share of education expenditures. Curi & Menezes (2010) pointed out how education expenditures are related to household characteristics, such as the mother schooling (since they lean to enroll their children in private schools). Santana & Menezes (2009) emphasized racial inequalities in the investments in education. Remy (2014) showed how the shares of education expenditures within income groups are linked to the dynamics of their *per capita* income, reproducing the same patterns of income inequality in educational expenditures.

A peculiar characteristic of the educational system nowadays in Brazil is that it is notably regressive. The richest families usually enroll their pupils in private schools, which mean higher expenditures in primary and secondary education. Nonetheless, these richer and better-educated students are those who usually obtain a place at a free of charge public university, which mean lower expenditures in higher education. Hence, no expenses in tertiary level may be the result of a previous optimal choice when the household decision was towards of quality schools, mainly private during primary and secondary education. Meanwhile, students from poorer households who reach university either enter in less prestigious courses of public institutions or enter in private institutions where they have to pay for and the courses are mainly of less quality (SCHWARTZMAN, 2003). Waltenberg and Vandenberghe (2007) in an empirical work found out that to promote equal-opportunity policy across students of different socio-economic background using per-pupil spending, as an instrument it would be required to multiple by 6.8 the level of spending on the lowest achieving pupil. However, the Education National Plan (Law #10.172/2001) with the "education for everybody" approach

in federal higher education established an expansion of the student population (30%) in ten years. The first expansion occurred from 2003 to 2007 and the main purpose then was to interiorize higher education campuses creating new Universities across the country. The second phase happened between 2007 and 2011 during the implementation of REUNI, a program of restructuring and expansion of Federal Universities. The number of higher education students enrolled increased 112% from 2003 to 2011, which means that the provision had grown considerably with the offer of more 122 thousand vacancies (Census/INEP). It is also important to point out two similar programs: FIES and PROUNI. FIES was created to finance higher education in private universities to students who could not get into a public institution and could not pay either. The coverage grew little by little since its creation in 1999 reaching almost 99 thousand contracts in 2010 according to Development in Education National Fund (FNDE).

In primary and secondary education (together) there was a reduction (5%) in enrollments (Census/Inep) but the reduction occurred due to the demographic profile of the population. Yet so far, private education has shown expansion.

Comparing private and public quality of basic education and according to Ministry of Education and Culture (MEC, 2014) the institutions' rating resultant of the 2011 National High School Examination (ENEM[5]), only seven out of 50 schools better classified in the country were public; the other 43 belonged to private sector. This provides a clear sign to the families who intend to guarantee better education for their children that they should enroll them in these institutions in order to provide appropriate academic formation so they can obtain a place at a free public university. Most public tertiary education institutions are known for their degree of excellence. As an evident consequence, households with better income send their children to paid private institutions until high school assuring academic excellence.

3. Data and Methodology

Analyses are based on data from the POF 2002-2003 and 2008-2009 accomplished by IBGE. In this survey, respondents report what they have purchased and how much they have spent in the acquisition of products and services during a period. Besides expenditures' information, the survey also collects some demographic and social characteristics. The main purpose is to capture the pattern of expenditure during a period that lasts twelve months in which it is possible to verify changes on family budget across a 12-month period.

POF is representative of the entire Brazilian territory. For example, in 2008-2009 the survey represented a population of 55,970 thousand households and 190,159 thousand individuals. Only households with students were considered in this analysis. Over fifty percent of the households with students have reported no expenditures in education, which can be explained by no charge in public schools and a wide governmental program that provides free books and school articles. This fact can introduce a selection bias in the estimation procedures if it is not controlled for, since the outcome (expenditures in education) is strongly determined for the choice between public and private education. All monetary values were converted to Brazilian reais of January 1st, 2009 using the National Consumer Price Index (INPC), as proposed by PINTO (2000) and normally used (Diniz et al. 2007; Silveira, 2008; Hoffmann, 2010) with Consumer Expenditure Survey. The index used to expense in education was 1.499554, and for other values the index was 1.391437)

The variable of central interest is the logarithm of the household education expenses *per* student (*Y*). Six types of household education expenditures are considered in this variable: 1) primary and secondary education[6]; 2) tertiary education; 3) books; 4) school

[5] It is an examination created by MEC in 1998. By that time the purpose was to evaluate the education quality before university in the country. The students are not required to take the exam but the grade they have is used for entrance in public universities. The evaluation has 180 multiple choice questions about Science, Mathematics and Portuguese as well as a student composition. The exam began to have foreign language questions (English or Spanish) from 2010 on. Nowadays ENEM has a certification role.

[6] Primary education does not include children in kindergarten in the survey.

articles; 5) other courses and 6) other type of expenditure related to education. One unit was added to education expenses in order to allow the application of the logarithm transformation. The same procedure was applied to other continuous variable that was transformed to logarithm (income, for example).

Censored regression model

Suppose initially the following relation for *Y*:

$$Y_i = x_i\beta + e_i \tag{1}$$

Where x_i is the vector of covariates for the *i*-th household and *e* is the random error. The dependent variable is the household edction expenditure (logarith) per student.

Since the education expenditures are zero for a nontrivial fraction of the population, this relation can be better estimated by a censored regression model, or Tobit model. Tobit model uses all of the information available in the sample, including the censored values, and provides consistent estimates of the parameters (LONG, 1997). The relation established by the Tobit model can be expressed by:

$$Y_i^* = x_i\beta + e_i^* \tag{2}$$

Where Y_i^*, represents a latent variable not-directly observed, since, even having students, some families do not spend anything in education and the value can't be observed. Therefore, the Y_i^* observed is:

$$Y_i = Y_i^* \text{ to } Y_i^* > 0 \tag{3}$$

$$Y_i = 0 \text{ to } Y_i^* \leq 0 \tag{4}$$

The restriction imposed to the observed data would make the Ordinary Least Square (OLS) estimation biased for the equation (1). The alternative option is to use the Tobit model, which treats differently distinct possibilities estimating censored values differently from the others, using Maximum likelihood method (WOOLDRIDGE, 2006). Tobit model has already been used before in studies of education expenditures (for example, TANSEL & BIRCAN, 2006).

We must also emphasize that the Tobit model used in our analyses may also be subject to limitations. One potentially important limitation of the Tobit model is that the expected value conditional on *Y>0* is closely related to the probability that *Y>0* (WOOLDRIDGE, 2006). The effect of X_j on *P(Y>0|x)* will be directly proportional to the effect on *E(Y|Y>0,x)=β_j*. In our case, this means, for example, that if the richest families are more likely to have some expenses with education, then expenses with education will also increase if income increases (conditional on having some expense). Since most of our control variables are mainly related to different levels of socioeconomic deprivation, we expect that this assumption will largely hold. Alternatively, one could also rely on two-part models, which have the property that *P(Y>0|x)* and *E(Y|Y>0,x)* depend on different parameters (DUAN *et al.* 1983); or Heckit models, which would assume that the positive expenses with education (*Y>0*) configure a nonrandom sample selection of the whole population, meaning that we do not observe *Y* because of the outcome of another variable *x* (HECKMAN, 1979). In this latter case, we would need to define instrumental variables for the probability of positive expenses *P(Y>0|x)*, which would impose additional challenges in our study.

Several variables can determinate Y, those related to the household and to the household reference[7] person characteristics. They may indicate quite different education expenses. Demographic characteristics are of main importance. Age for example can be a proxy for professional experience which is probably associated to the household income *stratum* and therefore to potential higher education expenses. Other sociodemographic variables such as gender, race/color and years of schooling are important as well. They are:

Household information

- Six binary variables to represent seven categories of family income strata, which were defined based on segmentation (2008-2009) accomplished by IBGE, ranging from *A* category (the highest household income) and *G* (the lowest). IBGE calculates Brazilian household income according to monthly Minimum Wage (MW). The categories are: "A" higher than 18.1 MW, "B" to 18,1 MW, "C" to 10.8 MW, "D" to 7.2 MW, "E" 4.3 MW, "F" to 2.2 MW and "G" up to 1.4 MW (used as a reference of analysis). We kept the same 2008-2009 income division in 2002-2003 applying INPC. The main advantage of using family income strata instead of family income is that this classification allows us to control for non-linear relations between income and expenses with education;

- One variable representing total number of students in the family, which is expected to directly affect the household expenses in education;

- Six binary variables to inform the student type of enrolment in one of the following education categories: *Primary private; Secondary private; Tertiary private; Primary public, Secondary public; Tertiary public;*

- Six binary variables to represent seven household composition categories, which are related to particular expenditures patterns. *Single; Married with no child; Nuclear with one child (reference); Nuclear with two children or more; Single parent with one child; Single parent with two children or more; Extended families;*

- Five binary variables to represent six regions in order to consider regional heterogeneities: *North; Northeast (reference); Southeast without São Paulo state; São Paulo state; South and Midwest.* São Paulo state was taken out of Southeast region and represented a special region due to its demographic and economic expression[8];

- Three binary variables to represent four categories of areas (within the regions): *Capital; Metropolitan; Other cities; Rural* (reference).

Personal information

- One binary variable to represent two categories of gender: *Male* (reference); *Female*;

- One binary variable to represent two categories of color or race: *White or Asian; Others* (reference). To simplify discussion further, we assume two racial groups and each of these two groups represents approximately half of the valid observations, so we chose the category that made interpretation of results easier;

- Five binary variables to represent six age groups: *Up to 19* (reference); *20 to 29; 30 to 39; 40 to 49; 50 to 59; 60 or more;*

- Three binary variables to represent four categories of education: *Up to four*

years (reference); *5 to 8 years; 9 to 11 years; 12 years or more.*

The estimation and the variance analysis use DTOBIT2 routine of the STATA software. We provide two estimates: (i) how the regressors affect the propensity to spend with education, or how they change the decision to spend (β, or effect on the latent variable); (ii) Effect over the unconditional *Y (E(Y/x))*, which considers the expected value of Y for householsd with both positive and null expenditures in education.

4. Results

4.1 The dynamics of education expenditures in private and public schools

Education expenditures are very sensitive to the population age structure, the family cycle as well as to the share of enrolment in public or private schools. First, in just 5 years, the fast Brazilian demographic transition (sharp reduction of fertility rates in previous decades) has impacted remarkably in the share of students enrolled in each level of education (Figure 1). The share of students enrolled in primary education reduced 5 p.p. between 2003 and 2009 (from 67.9% to 62.9%). In turn, the share of students enrolled in tertiary education raised 5 p. p. in the same period (from 9% to 14.2%). The share of students in the secondary education is practically the same (23%). Primary education is designed to provide basic understanding in writing, mathematics and the entry age is 6 years old. Students are typically expected to have completed primary schooling before entrance in Secondary education with generally 15 or 16 years old (EM,2014).

Concerning the type of management, the share of students enrolled in private schools (primary, secondary and tertiary) increased by 3 p.p. in 5 years, from 23.9% in 2003 to 26.5% in 2009. This increase is mainly due to higher share of students enrolled in private universities (from 6.5% in 2003 to 10.6% in 2009). In fact, the enrolment in superior institution is the only one, which has increased in a whole. The number of students have more than doubled both in public and private institutions of superior education, although in public institutions the share has raised in slower pace (just 1 p.p.) than in private ones (4 p.p.).

The enrolment in secondary education increased in public institutions, but reduced in private ones. In addition, the enrolment in primary education reduced in both public as in private schools, although in faster pace in public ones which reveals the age structure change of the Brazilian population.

As expected, the share of students in private schools is remarkably larger in the top strata (Figure 2). Differences are larger for enrolments in primary and secondary schools, due to the Brazilian educational system regressive structure. Richer students, better educated in private primary and secondary schools, are more likely to be approved in public and free universities even though their share in private tertiary institutions is still expressive (29.4% in 2009).

The rising participation of private school in Brazil is mainly a middle-income class' phenomenon when we considered the three levels of education (primary, secondary and tertiary). The share of students enrolled in private institutions rose 2 p.p. for middle *stratum* (classes C, D and E), and less than 1 p.p. for the top and bottom strata (A and B; F and G).

Figure 1. Percentage of enrolment in private and public schools for each level of education, Brazil, 2003 and 2009.
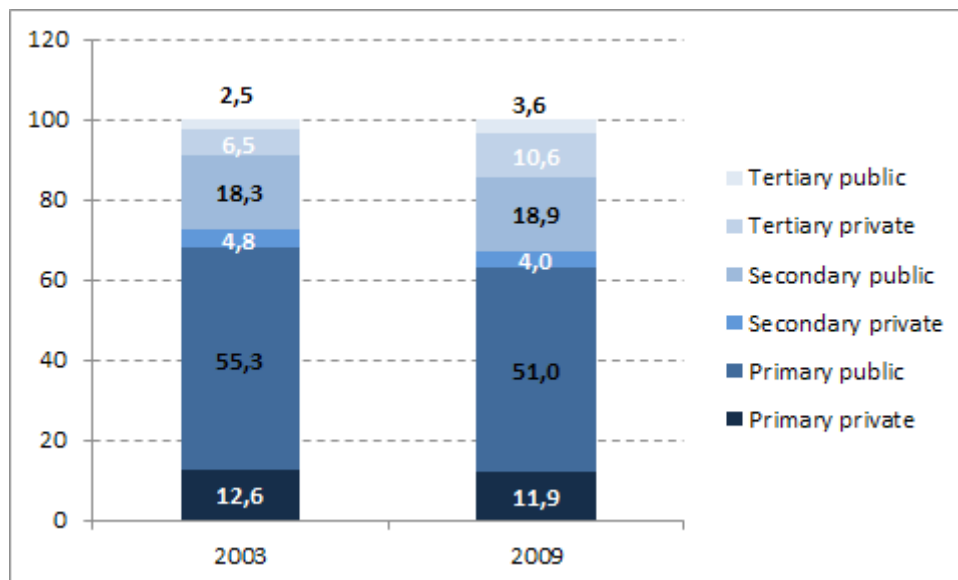
Source: Based on microdata of POF, IBGE

Figure 2. Percentage of enrolment in private and public schools for each level of education, according to *per* capita *stratum*, Brazil, 2003 and 2009.
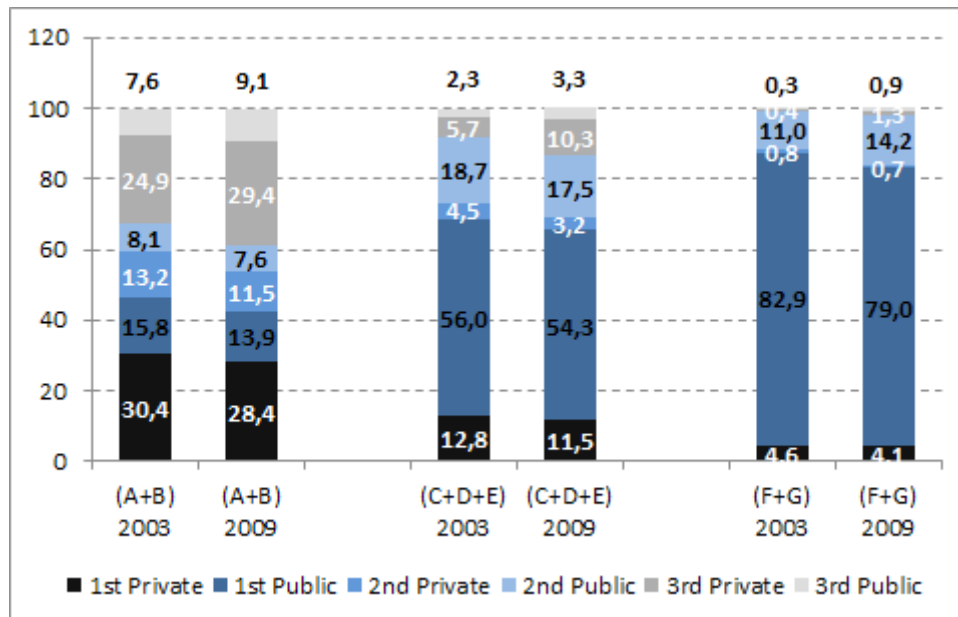
Source: Based on microdata of POF, IBGE

The joint effect of changes in the aging structure, lower participation of children in primary school, and the increasing participation of students enrolled in private universities would have contributed to raise the household expenditures in education. Economic theory supports that increased demand would cause schools to act like businesses and raise tuition levels to maximize income profits. Nevertheless, on the contrary to the expected, the average expenditures *per* student dropped sharply in the

period, in both private and public schools (Table 1). The most surprising change occurred in the tertiary education, where the expenditures *per* student reduced by 35.8% in public and 43.4% in private institutions. In other words, families are investing less in education, no matter the increasing participation of students in universities, where the expenditures *per* student is relatively higher. The expansion of provision (112 thousand vacancies in seven years) and federal finding programs for students in private universities had crucial role for the decline of households' expenditures in tertiary private institutions since inflation's rate was considered.

Table 1. Average expenditures *per* household and *per* student (in R$ of January 2009) according to level of education and private or public school, Brazil, 2003 and 2009

Type	Household			*Per* Student		
	2003	2009	(%)Δ	2003	2009	(%)Δ
Primary private	326. 4	265.3	(18.7)	248.8	215.5	(13.4)
Primary public	35.4	29.5	(16.7)	19.3	17.3	(10.4)
Secondary private	472.1	404.9	(14.2)	413.2	371.2	(10.2)
Secondary public	62.3	49.4	(20.7)	55.0	42.5	(22.7)
Tertiary private	645.9	365.3	(43.4)	541.3	314.3	(41.9)
Tertiary public	296.9	190.7	(35.8)	254.5	168.6	(33.8)

Source: Based on microdata of POF, IBGE

Education expenditures reduced also for most of household's economic strata, especially for the middle and top strata (Table 2). These groups are expending less in all levels of education, mainly in tertiary education. Instead, the poorest are expending more in primary and secondary education, both in private and public institutions. Carvalho et al (2015) indicated that a reallocation of opportunities from nonvulnerable to vulnerable groups had taken place in Brazil, and that access to higher education had also risen slightly from 2003 to 2013. The authors found out that there was an increase in the supply of higher but only 12% of Brazilian youths in the expected age were attending higher education.

4.2 Education expenditures according to sociodemographic characteristics

Although the share of students in private institutions increased (by 2.3 p.p.) between 2003 and 2009, the average expenditure *per* student has fallen slightly for the country as a whole: from (R$ 75 *per* student) 2003 to (R$ 65) 2009 (Table 3). These small but divergent trends hide important changes in the structure of the expenditures among social groups in Brazil.

For example, the education expenditures are substantially higher among top and middle-income groups. The average expenditures *per* student of top income households were between 30 and 60 times higher than that of the bottom *stratum* in 2009. A remarkable change in the shares of household according income strata was the sharp reduction of the two bottom segments together (from 47% in 2003 to 39% in 2009) and the consecutive increase participation of the middle strata (C, D and E, which increased from 45% to 52%). In fact, there is also evidence that middle strata households were more likely to change their children from public to private institutions especially in primary and secondary levels.

But although the share of middle income strata students increased in the period, their families turned to spend less in education. For example, the share of students in private

institutions in group C increased by 4 p.p. (from 45% in 2003 to 49% in 2009), but the average expenditures reduced from R$ 157 to R$ 139 *per* student (11.4%). Reductions were even wider among the lower-middle class: 14% in class D.

Table 2. Average expenditures *per* household and *per* student (in R$ of January 2009) according to *per* capita *stratum*, level of education, private or public school, Brazil, 2003 and 2009

Strata	Level of Education	Household			Student		
		2003	2009	(%) Δ	2003	2009	(%) Δ
A + B	Primary private	859.6	635.9	(26.0)	628.7	476.5	(24.2)
	Primary public	301.2	188.8	(37.3)	201.3	138.1	(31.4)
	Secondary private	917.3	768.7	(16.2)	784.1	684.2	(12.7)
	Secondary public	295.8	268.5	(9.2)	246.4	230.1	(6.6)
	Tertiary private	946.2	616.7	(34.8)	738.3	487.2	(34.0)
	Tertiary public	582.1	399.4	(31.4)	490.9	354.8	(27.7)
C + D + E	Primary private	208.9	169.6	(18.8)	159.4	140.4	(11.9)
	Primary public	51.2	39.2	(23.4)	30.2	24.6	(18.5)
	Secondary private	308.7	227.5	(26.3)	271.7	210.4	(22.6)
	Secondary public	78.7	53.7	(31.8)	63.9	45.8	(28.3)
	Tertiary private	467.5	269.6	(42.3)	409.1	240.3	(41.3)
	Tertiary public	163.1	117.9	(27.7)	140.3	102.8	(26.7)
F + G	Primary private	38.5	58.8	52.7	30.7	50.8	65.5
	Primary public	10.7	10.5	(1.9)	5.5	5.8	5.5
	Secondary private	79.2	73.6	(7.1)	72.2	71.9	(0.4)
	Secondary public	16.2	14.7	(9.3)	13.4	12.8	(4.5)
	Tertiary private	191.9	133.1	(30.6)	186.5	123.8	(33.6)
	Tertiary public	48.1	29.0	(39.7)	43.5	27.2	(37.5)

Source: Based on microdata of POF, IBGE

Per capita expenditures in education are also sensitive to the number of students in the household. For example, the average expenditure for households with just one student was almost four times higher than that of households with four or more members in 2009 (R$ 78 and R$ 20, respectively). Moreover, it is worth to highlight that the number of households with only one student increased in the period (43.8% in 2003 to 49.2% in 2009), although their expenditures decreased by 36%.

Changes in the composition of the family size are also of great importance to determine education expenditures. Categories such as "Single" and "Married with no child", which tend to invest more in education, raised their share among the family types (15.4% to 16.3% and 12.8% to 16.3%, respectively). Actually, they were the only two type of household arrangement which also increased their *per* capita education expenditures (R$ 115 to R$ 146 and R$ 112 to R$ 148, respectively) between 2003 and 2009.

Table 3. Education expenditures according to household's characteristics, Brazil 2003 and 2009

Variable	2003			2009		
	Mean expenditure *per* student	Household	Student in private school	Mean expenditure *per* student	Household	Student in private school
		(%)	(%)			(%)
Income *Strata*						
A	484	3.4	75.1	398	3.8	74.5
B	333	4.8	64.8	255	5.2	66.0
C	157	6.5	45.2	139	7.2	48.5
D	86	12.7	29.1	74	15.4	31.7
E	31	25.9	14.8	28	29.4	15.3
F	13	16.7	7.9	13	17.4	8.2
G	6	29.9	4.7	6	21.6	4.4
Size						
1 student	123	43.8	25.3	78	49.2	28.3
2 students	89	32.1	22.3	65	30.8	25.0
3 students	61	14.9	17.4	41	13.2	17.7
4 students or +	26	9.2	9.4	20	6.8	9.7
Arrangement Type						
Single	115	15.4	25.8	146	16.3	32.9
Married no child	112	12.8	22.0	148	16.3	28.6
Nuclear	80	43.3	20.2	63	42.8	22.0
Single parent	67	19.9	18.8	49	16.8	19.1
Extended	56	8.6	15.3	40	7.7	19.3
Region						
North	23	6.6	10.8	28	6.8	13.5
Northeast	31	25.3	15.9	33	26.1	18.7
Southeast without S Paulo	100	22.2	25.9	80	21.5	26.2
São Paulo state	142	22.6	22.5	108	22.5	24.5
South	82	15.8	20.6	68	15.4	22.7
Midwest	74	7.4	17.7	58	7.6	23.4
Area						
Capital	86	5.8	28.1	78	7.0	33.3
Metropolitan	128	30.3	30.3	98	29.7	29.9
Other	63	48.6	17.3	57	47.7	21.1
Rural	12	15.3	3.6	14	15.6	4.5
Brazil	75	100	19.4	65	100	21.7

Source: Based on microdata of POF, IBGE

Table 4. Education expenditures according to household head's characteristics, Brazil 2003 and 2009

Variable	2003			2009		
	Mean Household Expenditure	Household (%)	Student in private school (%)	Mean Household Expenditure	Household (%)	Student in private school (%)
Gender						
Male	121	75.7	19.3	106	70.4	22.0
Female	114	24.3	19.8	85	29.6	20.9
Race/Color						
White	177	49.9	27.6	149	46.4	30.3
Black	61	8.3	11.4	58	9.0	14.3
Yellow	530	0.5	41.1	179	0.5	38.9
Brown	56	41.0	12.3	57	43.6	15.2
Indian	44	0.3	9.2	34	0.5	9.7
Age						
Até 19	89	0.4	14.4	136	0.4	19.6
20 30	60	11.5	19.6	59	11.5	20.2
30 40	101	30.4	18.2	80	27.8	17.6
40 50	151	29.6	20.2	118	30.1	23.1
50 60	160	15.9	21.3	134	17.7	26.4
60 or over	92	12.1	18.2	91	12.4	23.1
Years of school						
Up to 4	31	46.5	7.0	31	36.7	7.3
5 to 8	56	24.5	13.5	49	23.8	12.8
9 to 11	159	18.9	34.0	104	25.3	30.2
12 or over	611	10.0	69.8	357	14.3	64.9
Brazil	119	100	19.4	100	100	21.7

Source: Based on microdata of POF, IBGE

Households from the poorest regions, such as North and Northeast, spend substantially less in education than households from richest regions, São Paulo state, Southeast (without São Paulo), South and Midwest. However, average expenditures just grew in the poorest regions, North (21%) and Northeast (6.5%). They reduced in the other more developed places . The residence in capitals or metropolitan areas also has an important impact on the education expenditures. For example, in comparison with rural areas, the average *per* capita education expenditure was 7 times more in metropolitan areas in 2009. Social characteristics, such as gender, race, age and education of the household head, also influence education expenditures (Table 4). A curious result is that families headed by females expend less in education than those headed by men both in 2003 and 2009.

Differences between race and color are remarkable. For example, families headed by Asian Brazilians (yellow) spent 20% more than families headed by whites (R$ 179 to R$ 149

per student in 2009) and three times more than families headed by black Brazilians. Therefore, inequality reduced from 2003 to 2009, among a vulnerable racial group (browns) because *per* capita education expenditures grew and reduced among the less vulnerable (white and yellow).

Education expenditures are strictly related to family life cycle. Households headed by 40 to 60 years old people tend to spend more in education. Probably because these families have, children enrolled at a secondary or tertiary school, which means higher average expenditures. When household head is 60 years old or older, his/her children are not probably in school age any more, which could explain their lower average education expenditures. Moreover, the share of families headed by people under 50 years of age fell substantially (from 72% 2003 to 70% in 2009), in opposition to the rise of households headed by people over 50, which is a result of the fast Brazilian population ageing.

The level of education of the household head plays also a major role on the investment in education of his/her pupils. Households headed by people with secondary degree or more spend twelve times more in education than families headed by people with no more than 4 years of education (R$31 to R$ 357 *per* student in 2009, respectively). The gap reduced significantly in the period, since households headed by people with no more than four years of education were the only type which did not decline expenditures *per* student. Nonetheless, the share of these households also reduced remarkably in the period (from 46.5% to 36.7%), which would have contributed even more to decrease overall inequality in the education expenditures among households.

4.3 Determinants of household education expenditures

Although previous analysis identified important patterns of association between investments in education (expenditures and enrolment in private schools) and social, economic and demographic characteristics, these results do not represent causal relationships. For example, even though households headed by Asian Brazilians (yellow) tend to spend higher sums in education (or to enroll their pupils in private schools), we could not point out precisely whether the reason is due to their higher income *per* capita or because these families take education as a major value. Moreover, previous results also do not identify whether the reduction in the differences of households' education expenditures were related to changes in the composition of the households, or due to lower investments within the same social group.

In order to accomplish these aims we fitted two multiple regression models for censored data (Tobit model, equation 3): one for the 2003 and other for the 2009. We also computed the differences between the estimates to analyze the dynamics of the marginal effects. The Tobit model is indicated due to the considerable number of households with children enrolled in schools that present null education expenditures: 8,948 out of 33,130 observations in 2003, and 9,422 out of 32,442 observations in 2009. Both adjustments were significant at 0.01% (likelihood ratio) with *Pseudo R^2* equivalent to 13% for the first period (2003) and 9% to the second (2009). The majority of estimates were significant at 10% (Table 6). Estimates for the Tobit model allow two types of analysis: i) impacts on the latent variable (β) and (ii) impacts on the unconditional expectancy of the household education expenditures (*[E/x]*).

As would be expected (Castro & Vaz, 2007), income *stratum* has a significant net impact on education expenditures, this means, even after we control other factors. For example, the average log education expenditure per student in stratum *A* was twice (β=2.439) than that of stratum *G* (reference in 2009, holding constant other variables. This means that the average expenditure in stratum *A* was 10 tenfold than that of stratum *G* ($e^{2.439}$-1=10.462). It is also worth to highlight that there was no notable evolution between the marginal effects of per capita strata on education expenditures between

2003 and 2009, this means, there was little or no changes in the net diferences between theses social groups.

As families make transition to smaller sizes, they consequently have fewer students than before and, as a result, they increase their expenses in education *per* member. This is particularly evident as an additional student meant a mean reduction of 12.3% ($e^{-0.131}-1=-0.123$) in education in 2009, holding all other valuables constant. Nevertheless, differences shrank between 2003 and 2009, which could mean that the number of students in the family became of less importance in the determination of education expenditures.

Families with students enrolled in tertiary private institutions have the highest mean expenses, after other factor are held constant. It is important to highlight that private establishment's supply are around 70% in tertiary education, much more than in basic education. At second place, there are the households with students enrolled in primary and, at third place, in secondary private schools. Results for public education also highlight that the expenses increase positively with the education level, which means that expenses are higher for families with students in tertiary education (public) as well.

There were also meaningful variations in the expenditures among the three levels of education along the time. When controlled by family factors, households' expenditures raised up relatively for those with students enrolled in private primary and secondary institutions. On the other hand, expenses fell down more remarkably for families with students in private tertiary education, which is surprising since there was a growing demand along the period.

Other social factors are important to determine the expenses as well. For example, small nuclear family arrangements, with just one child, tend to spend significantly more than those with two children (or more) do. The results obtained here reveal that although there were not substantial expenditures differences among regions, there are significant and strong differences among families living in urban areas (capitals, metropolitan and other smaller cities) and rural ones. Gender and race were not of major importance when controlled by other factors. Household reference person's age (30 to 49 years old) and university schooling indicate sharp increases in spending for education.

Finally, expenditures differences have reduced along the time, concerning the majority of socioeconomic issues. According to our results, the reduction of education expenditure inequality was greater among regions, residence areas, reference person's age and schooling.

5. Final remarks

In a country characterized by low levels of socioeconomic development and high levels of inequality, the investments in education may be the key determinant to promote intergenerational mobility. Especially because the Brazilian public institutions are failing to promote public qualified education at primary and secondary levels. In parallel, labor market is demanding at least secondary level of education, as a result of technological changes that increasingly need abilities related to problem solving, judgment, and creativity (AUTOR, 2003).

The augment in the share of students in private schools observed in Brazil in the 2000s was mainly related to the dynamics in private universities. In fact, as a result of the fast demographic transition, the share of students in basic levels of education (primary and secondary) reduced, in opposition to a growing share of students in the tertiary education. Nevertheless, in opposition to income dynamics, which grew substantially in the period, household education expenditures fell sharply for all levels of education,

especially in the tertiary education.

Table 5. Estimates of the Tobit model for the effects on the latent variable and on the unconditional marginal effects (Part I), Brazil, 2003 and 2009

Description	2003				2009				2009-2003			
	β^{03}	E(Y)	t	p	β^{09}	E(Y)	t	p	β^{09}-β^{03}	E(Y)	t	p
Income household *stratum*												
G	reference				reference				reference			
F	0,386	0,029	13,12		0,415	0,295	11,76		0,029	0,266	0,63	+
E	0,757	0,028	26,55		0,745	0,529	22,34		-0,012	0,501	-0,26	+
D	1,344	0,038	35,26		1,294	0,919	30,33		-0,05	0,881	-0,88	+
C	1,729	0,051	34,05		1,737	1,233	31,17		0,008	1,182	0,1	+
B	2,012	0,06	33,49		2,143	1,521	32,56		0,131	1,461	1,47	+
A	2,441	0,068	35,76		2,439	1,731	30,51		-0,002	1,663	-0,02	+
Students												
Number *per* household	-0,193	0,01			-0,131	-0,093	-9,73		0,062	-0,103	3,67	
Type of enrolment												
Primary (private)	0,928	0,036	26,09		1,116	0,792	26,63		0,188	0,756	3,42	
Secondary (private)	0,878	0,045	19,32		0,958	0,68	16,64		0,08	0,635	1,1	+
Tertiary (private)	1,537	0,048	32,34		1,241	0,881	29,03		-0.296	-0.241	-4.63	
Primary (public)	-0,416	0,034			-0,394	-0,28			0,022	-0,314	0,42	+
Secondary (public)	-0,004	0,028	-0,14		-0,116	-0,082	-3,64		-0,112	-0,11	-2,69	
Tertiary (public)	0,143	0,054	2,64		-0,072	-0,051	-1,28		-0,215	-0,105	-2,75	
Family arrangement												
Single	-0,507	0,055	-9,18		-0,111	-0,078	-1,28		0,396	-0,133	3,85	
Married w/o children	-0,605	0,056			-0,235	-0,167	-4,06		0.370	0.275	4.60	
Nuclear 2 children or +	-0,007	0,032	-0,23		0,025	0,018	0,74		0.032	-0.014	0.69	+
Single parent 1 child	-0,156	0,047	-3,31		-0,021	-0,015	-0,39		0,135	-0,062	1,89	
Single prt 2 children or +	-0,122	0,041	-2,97		0,032	0,023	0,62		0,154	-0,018	2,34	
Extended	-0,057	0,041	-1,38		-0,124	-0,089	-2,79		-0,067	-0,13	-1,11	+
Nuclear 1 child	reference				reference				Reference			
Region												
North	0,022	0,03	0,75		0,001	0,001	0,01		-0,021	-0,029	-0,21	+
Southeast w/o S. Paulo state	0,308	0,033	9,45		0,028	0,021	0,84		-0,28	-0,012	-6	
São Paulo state	0,152	0,055	2,75		0,074	0,053	1,43		-0,078	-0,002	-1,03	+
South	0,102	0,035	2,93		0,031	0,021	0,74		-0,071	-0,014	-1,31	+
Middle west	0,17	0,03	5,64		-0,217	-0,155	-5,94		-0,387	-0,185	-8,17	
Northeast	reference				reference				reference			
Area												
Capital	0,115	0,035	3,3		0,034	0,025	0,85		-0,081	-0,01	-1,53	+
Metropolitan	0,344	0,038	9,03		0,135	0,096	3,22		-0,209	0,058	-3,68	
Others	0,159	0,027	5,93		0,151	0,107	4,98		-0,008	0,08	-0,21	+
Rural	reference				reference				reference			

Source: Own estimates based on microdata of POF2003 and 2009, IBGE.

+ Not significant at 10%.

Table 5. Estimates of the Tobit model for the effects on the latent variable and on the unconditional marginal effects (Part II), Brazil, 2003 and 2009 (cont.)

Description	2003				2009				2009-2003			
	β^{03}	E(Y)	t	p	β^{09}	E(Y)	t	p	β^{09}-β^{03}	E(Y)	t	p
Gender												
Female	0,004	0,03	0,14		-0,014	-0,01	-0,42		-0,018	-0,04	-0,41	+
Male	reference				reference				reference			
Race/color												
White or Asian	-0,106	0,155	-0,68		0,198	0,14	1,19		0,304	-0,015	1,33	+
Others	reference				reference				reference			
Age group												
Up to 19	reference				reference				reference			
20 to29	-0,48	0,139	-3,46		0,021	0,015	0,13		0,501	-0,124	2,35	
30 to 39	-0,248	0,138	-1,79		0,188	0,134	1,17		0,436	-0,004	2,05	
40 to 49	-0,223	0,139	-1,61		0,246	0,174	1,53		0,469	0,035	2,21	
50 to 59	-0,291	0,14	-2,09		0,081	0,057	0,51		0,372	-0,083	1,76	
60 or over	-0,387	0,027	-2,77		-0,032	-0,023	-0,21		0,355	-0,05	1,72	
Years of school												
Up to 4	reference				reference				reference			
5 to 8	0,171	0,027	6,33		0,097	0,069	3,13		-0,074	0,042	-1,8	
9 to 11	0,416	0,031	13,26		0,202	0,143	5,94		-0,214	0,112	-4,62	
12 or over	0,672	0,048	13,88		0,407	0,289	8,51		-0,265	0,241	-3,89	

Source: Own estimates based on microdata of POF2003 and 2009, IBGE.

+ Not significant at 10%.

Socioeconomic variables play an important role determining the share of students in private schools and in the investments in education also. In the prosperous economic context of the 2000s, many Brazilian families ascended to middle income strata. These families are more likely to enroll their pupils in private schools and to invest more in education. However, the share of middle and top income strata students increased in the period, their families turned to spend less in education. Exogenous factors, such as institutional policies oriented to education may partly help to explain this dynamics such as public subsidies and programs granted by government to tertiary private institutions. These institutions, interested in the subsidies turned to supply an increasing number of vacancies in an unfavorable competition for public funds, which explains the lowering family expenditures. Both, supply and demand for vacancies in private institutions expanded but the supply rose faster.

Brazil has risen up social spending significantly in education, which can partly explain the reduction of household expenses along the period. For example, the ProUni program is a federal program that finances scholarship to students who can't pay a private university. The percent of GDP expenditures in education have increased from 4.6 percent in 2003 to 6.1 percent in 2011 (WEISBROT *et al.*, 2014). This includes spending not just by the central government, but by state governments, public enterprises and development banks. However, public investments in education are still very low in comparison to other countries to justify a reduction in the household education expenditures. According to OECD (2014), annual expenditure *per* student from primary to tertiary education (including R&D activities) was just 3,066 US$ PPP in Brazil, three times less than what is registered for developed nations.

Demographic dynamics is also a core element to explain investments in education. For example, family size reduced sharply in the period, and this is an important factor to increase education expenditures *per* student. The dynamics of these changes among social groups is also relevant to understand the process that generates inequality in the long run, since children of top income strata (smaller household size) tend to be even better prepared than children from poorer families (larger household size). Since the differences between the family sizes reduced significantly in the period, it may generate a positive impact to reduce inequality in the long term.

The family life cycle has also important impacts on education. The share of households headed by up to 40 years old adults, whose families have a larger share of children enrolled in primary and secondary levels, reduced in the period. On the other hand, the percentage of families headed by people with 50 years old or more, which have a greater share of students in the tertiary education, increased sharply. These changes had important effects on the household budget, contributing to increase the share of expenditures in tertiary education.

This article seeks to show household education expenditures in education in Brazil, during the first 2000 decade, pointing out low cost private schools as probable family choice and federal funding to students in private tertiary institutions as well. The empirical part applied socioeconomic and demographic factors to explain such type of household investments. Results emphasize how the falling enrolment of students in primary and secondary grades, which is a main result of demographic changes, and the higher enrolment in private schools, resulting from socioeconomic changes, have modified the patterns of inequality in education expenditures among socioeconomic groups in Brazil in such a period characterized by both socioeconomic and demographic changes.

Some limitations of this study must be also highlighted. POF neither provides information about the institutions quality nor about the discrepancy age/grade of the student. We suppose that families enrolling their students in private institutions (primary or secondary) or those expending more in education are providing better education for their children. Although this is not necessarily true for the tertiary education, the rising demand for primary and secondary private schools in groups of middle income might clearly be a sign of a search for quality. In turn, the reduction in the average expenditures *per* student may be a signal of changes in the quality and provision of public education, as well as the probable emergence of low-cost private schools in Brazil once inflation was not able to explain it. Future directions for research should include further discuss on this issue and it should examine the relation between low-cost institutions provision of vacancies and quality of teaching and learning in these organizations.

One empirical limitation is that our models consider that the both the decision to invest in education, $P(y>0)$, and the expected expenditure with education, $E(y|y>0)$, are affected in the same direction by the explanatory variables. Alternative strategies, considering independent parameters in each equation, would be considered in further studies. Finally, our estimates consider only the impacts on the average expenditure with education, although the impacts may differ along the distribution of values. For example, income may play a more important role boosting the expenditures with education among those families that prize more education, this means, those families that expend more with education. A more comprehensive analysis of the relationship between expenditures with education and the explanatory variables would be given using quantile regression (KOENKER, 2005).

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