Macro Shocks and Schooling Decisions: The Case of Argentina*

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January 29, 2004

Abstract

This paper asks how households deal with severe, unexpected, nationwide shocks. In particular, I look at whether youths drop out of school in order to work. The data come from the Argentine Permanent Household Surveys for 1996 to 2002, and the shock is the economic crisis, which began at the end of 1998. I find that real household income fell by 50% and that the shock also led to a decline in schooling of 4.2 to 11% for 12 to 17 year olds. This decline in schooling was large enough to largely erase recent gains in schooling attendance in this group. Moreover, the decline in schooling attendance was not evenly distributed across groups. Children with highly educated heads actually increased their probability of attendance by 4.2 to 17.4%, while youths with less educated heads reduced their probability of attendance by 3.1 to 18.4%. Youths from families with less educated heads also increased their probability of being available for work by 4.8 to 20%. These results may exacerbate income inequality in Argentina in the longer-term, if the youths do not return to school.

Key words: macro shocks; schooling decisions; poverty.
JEL classification: I30; I20; I28.

*I would like to thank Sandra Black, Moshe Buchinsky, Alejandra Cox Edwards, Joseph Hotz, Pablo López Murphy, Enrico Moretti, Kenneth Sokoloff, Duncan Thomas, José Wynne, and the RAW Proseminar participants for many useful comments on this paper. I am especially indebted to Janet Currie for her numerous helpful suggestions and her encouragement. The usual caveat applies.

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1 Introduction

Macroeconomic crises are frequent in less developed countries and the way that families react in the face of unanticipated shocks to the economic situation may have dramatic long run consequences for the well being of society. This paper addresses the question of how households deal with unexpected, transitory, and nationwide macroeconomic shocks. In particular, I ask how the schooling decisions of young people are impacted.

The Argentine crisis that began at the end of 1998 constitutes a natural experiment that can be used to study this question empirically. After several years of growth in the 1990s, Argentina faced several huge macroeconomic shocks. I find that these shocks precipitated a decline of almost 50% in real household income over the period 1998-2002. Moreover, this shock was largely unexpected, as discussed further below. Using data from the Permanent Household Surveys from 1996 to 2002, I show that households were able to smooth some of the losses due to reduced earnings of household heads. Some of this smoothing of household incomes was accomplished by youths 12 to 17 who left school to make themselves available for work. This is particularly true among households with less educated heads. These findings suggest that liquidity constraints were an important determinant of schooling attainment, since in the absence of such constraints, one might expect an increase in schooling attendance due to reduced opportunity costs of schooling.

Because youth's schooling and household income are endogenously determined, I instrument household income using the nominal exchange rate between the Brazilian real and the dollar. This instrument is highly correlated with household incomes since the Argentine economy is highly dependent on trade with Brazil. But the real-dollar exchange rate should be exogenous to conditions in Argentina, given that both Brazil and the United States are large countries while Argentina is a small, open economy.

I focus on 12-17 year olds both because recent efforts to increase schooling attendance have been concentrated on this group, and also because teenagers may be in a better position to contribute to household income than younger children. Previous research suggests that youths who drop out are unlikely to return to school, so that these dropouts may have per-

manently lower levels of education as a result of these shocks. And the fact that is primarily children from households with less educated heads who drop out is likely to exacerbate future income inequality. There is continuing discussion in Argentina about implementing a subsidy for low income families who keep their children in school. The results in this paper suggest that the case for such a subsidy may be greater in times of economic crisis.

The rest of the paper is organized as follows. Section 2 presents some background on Argentina and evidence from other countries. Section 3 focuses on data and Section 4 describes the methods. Results are presented in Section 5 and conclusions follow in Section 6.

2 Background

2.1 The Argentine Context

2.1.1 The crisis

For almost a decade, Argentina received huge capital inflows from abroad: investment increased by 35% from 1993 to 1998, GDP grew at a rate of 5% per year, and the country used external savings for a long period. Argentina had a large volume of trade in the region, exported commodities and some industrial goods.

Today, after almost a decade of high economic growth, Argentina is suffering a deep recession; probably, the hardest and longest political, social, and economic crisis in its history. It began at the end of 1998 and it is still not over. The unemployment rate is near 22% according to official statistics, investment has fallen by 60%, and GDP has decreased by 20% since 1998. Capital inflows that were 6% of the GDP in 1997/98 and 3% in 2000 became outflows in 2001. Export prices fell 15% from 1995 to 2001. The depreciation of commercial partners' currencies (Europe, Brazil and Chile) and the impossibility of adjusting the Argentine peso caused Argentina to lose exports.

The exogenous shocks that Argentina faced were of an unusual size. They began with the Asian crisis in 1997 which led to a fall in commodity prices that affected cities with large

primary goods exports. The Russian default of public debt in 1998 led to a rise in the spread for all emerging economies, and impacted areas with high level of external investments.

The Brazilian real devaluation in 1999, and the following variations in the real-per-dollar exchange rate, had a particularly large impact on Argentina because Brazil is a large economy and highly integrated with Argentina. The depreciation of the Brazilian currency over time meant an expansion of the Brazilian tradable sector at the cost of a large reduction of the Argentine tradable sector. Argentina depended strongly on exports to Brazil: more than 30% of Argentine exports went to Brazil. The continuous depreciation of the Brazilian currency, ceteris paribus other factors, implied that Argentina lost enormous trading possibilities.

The devaluation created incredible variation in the magnitude of the real-per-dollar nominal exchange rate. This exchange rate was almost flat during the period 1996-1999 because Brazil had a managed floating regime. It was .975 in January 1996 and 1.205 in December 1998 with a standard deviation of .068. Since the devaluation in January 1999, the Brazilian exchange rate has fluctuated greatly. It increased from 1.914 in February 1999 to 2.48 in May 2002 with a standard deviation of .303, and an increase over the whole period of 155%.[1] Figure 1 compares the evolution of the Brazilian nominal exchange rate over time and changes in average household income in Argentina. The figure shows that the beginning of the decline in household income corresponds to the devaluation in Brazil, and that household incomes continued to fall as the exchange rate depreciated further.

I exploit this dramatic shock as a natural experiment in order to identify the effect of macroeconomic shocks on welfare. In particular, I instrument household income using the nominal exchange rate between the Brazilian real and the dollar. As I show below, this instrument is highly correlated with household incomes since the Argentine economy is highly dependent on trade with Brazil. But the real-dollar exchange rate should be exogenous to conditions in Argentina, given that both Brazil and the United States are large countries

[1] During the period considered in this paper, the Brazilian inflation rate was very low and did not change (it was lower than 9%). Then, the changes in the Brazilian real exchange rate come only through variations in the nominal exchange rate. Because of this, and even considering that the effect is through an aggregate demand channel, I will focus on the nominal rate.

while Argentina is a small, open economy.

Different economic measures suggest that the Brazilian devaluation and the following crisis were widely unexpected. For instance, the spread in interest rates between deposits in pesos and deposits in dollars is driven by expectations about the future. Anticipation of a nationwide crisis would make investors shift resources away from domestic assets towards foreign assets. Therefore, upward variations in the interest rate for domestic assets, such as peso deposits, relative to foreign assets, such as dollar deposits, would be one indicator that a shock was anticipated. However, the Central Bank' s statistics show that neither the spread between interest rates nor the levels changed before July 2001.[2]

Moreover, the Argentine financial system was widely developed and people used the banking system extensively during the nineties. This suggests that almost all medium and large savers had their savings in the domestic banking system. In fact, at least 90% of the savers in the Argentine banking system were surprised by the sudden impossibility of getting their money back out in December 2001. These people recovered only one-third of their money after the Argentina devaluation in January 2002. Hence, it is very difficult to believe that people expected any of the previous shocks.

McKenzie (2003) uses a short panel constructed from the Permanent Household Survey to study the effect of the 2002 devaluation in Argentina (i.e., the last shock in the crisis) on incomes and labor market responses. He finds that the main effect was on real incomes for all sectors of the economy and that total household labor hours per week declined. He also concludes that there is no evidence of changes in household size.

[2] 30-60 day saving accounts in pesos and in dollars offered an annual interest rate of 8-9 and 5-7 %, respectively, from January 1996 to January 2001. In July 2001, the rates grew 21% and 10% respectively, and during April 2002, they changed to 46% and 5% respectively.

2.1.2 The schooling system

Seven years of primary education have been mandatory in Argentina since 1884. Both primary and secondary schooling have traditionally been public and free.[3] Up to the 1990s, primary schooling involved school attendance for 6 to 12 year olds and secondary schooling was for 13 to 17 year olds. In 1991, the Population Census shows that 96.9% of children in the relevant age range attended primary school, while the attendance rate for secondary school was only 66.8%.[4]

In 1993, a national law increased the period of obligatory schooling to 10 years by including the last year of pre-school (for 5 year olds) and the first two years of high school (for 13-14 year olds). It was hoped that this change would encourage youths to stay longer and also to attend the last three years of high school. In order to implement this change, the government made significant investments to adapt old schools and to also create new ones. The law established that the federal, provincial and municipal governments would guarantee free and public education at all levels: preschool (3-5), primary school (6-12), high school (13-17), undergraduate and graduate. They also have responsibility for quality control and attendance.

Figure 2 summarizes the percentage of people of different ages attending school in May 1996 and May 2002. Unfortunately, we do not have similar data for previous periods but the evidence is clear. Among 6-12 year olds, the percentage in attendance was 99%. For younger and older groups, the rates are much lower. The probability of being out of school rises after age 13.[5] Figure 3 shows that schooling attendance among teenagers increased until 2001,

[3] Official statistics from the Educational Ministry are only available for 1996-2000. They estimate that private schools concentrated 20% of primary school 's students during this period, and 28% of the high school students in 1996 and 27% of them in 2000.

[4] These rates vary across provinces, from 89.4% to 99.3 in primary schooling's rates, and from 49.4 to 87.7% in high school's rates in 1991.

[5] Official Statistics from the National Educational Ministry on grade repetition are only available from 1996-2000. They report the following repetition percentages: 13.7% in 1996 and 10.6% in 2000 for first grade of high school (13 years old); 13.6% in 1996 and 9.1% for second grade of high school (14 years old). Considering the 5-year period of high school, they estimate them as 10% in 1996, and 8.1% (first two years)

but at the end of 2001 and the beginning of 2002, the increasing pattern disappears. The timing suggests that the economic crisis slowed or even interrupted the increasing trend in attendance that Argentina experienced during the nineties.[6]

2.2 Evidence from Other Countries

The literature on the effects of economic crises in developing countries suggests that households take many actions to mitigate the impact of economic shocks, and that it is plausible to think that youths in Argentina may have left school in an effort to smooth family incomes.

Several studies focus on the impact of the Indonesian crisis -a large devaluation in 1998-, using panel data from the Indonesian Family Life Survey. Smith et. al (2000) find reductions in the real hourly earnings of both men and women. Employment remained stable but there was switching between sectors. However, comparing the decline in real household incomes with the decline in individual hourly earnings, they show that households were able to partially smooth the consequences of the crisis.

Frankenberg, Smith and Thomas (2002) investigate these smoothing mechanisms, and find changes in the size and composition of households, as well as changes in labor supply. They find that households became larger and that some consumer members in the family became earners. At the same time, and because the crisis implied a change in relative prices, people cashed in more liquid assets, such as gold, in rural areas.

Thomas et. al (2003) find the Indonesian crisis had an extremely negative effect on school attendance among the poor, especially among young children with older siblings in the same

and 2.3 % (last 3 years) in 2000.

[6] This pattern of high attendance in primary grades, and lower attendance later is typical of Latin American (Filmer and Pritchett, 1998). For instance, in Brazil 92% of the poor complete grade one but only 50% complete grade 5 (data from 1996). Panadeiros, Susmel and Nores (FIEL, 1998) study the educational reform that took place in Chile in the early 1980's. The main goals of the reform were to increase enrollment and lower drop out rates. The results show that even though enrollment rates for basic education were stable over the last 25 years and around 95%, the reform dramatically lowered dropouts, grade repetition and mean time to complete primary school. In 1981, 8.1% of children left school before completing primary school compared to 1.7% in 1995.

household. However, given the high rates of attendance among young children in Argentina, it is unlikely that we would see exactly this effect.

Work in other countries also suggests that education may decline, and child labor may increase when households need to smooth income. For example, Jacoby (1994) uses grade repetition data from Peru to show that if parents have borrowing constraints and child time is valuable in home or in market production, children will withdraw from school to work in order to smooth household consumption. Jacoby and Skoufias (1997) study the response of human capital investments in children to fluctuations in family income using panel data from India. They find that seasonal fluctuations in school attendance constitute a form of self-insurance when households face unexpected income shocks. Beegle, Dehejia and Gatti (2003) use data from a household panel survey in Tanzania and find that crop shocks lead to a significant increase in the level of child labor.

These papers examining the effect of economic crisis on schooling generally have in mind a framework in which households want to invest in their children's education, but face liquidity constraints. When a shock hits, they are forced to trade off the future benefits of educating their children against their current consumption needs. Therefore, children drop out of school in order to contribute to household income and to help to maintain current consumption. In contrast, if markets were complete and households were able to borrow on their child's future human capital, then a fall in wages/opportunity costs might be expected to increase rather than decrease schooling. It is possible that in a middle income country, such as Argentina, large numbers of households will find themselves in this position, so that schooling will decrease among the poor but increase among the rich, thereby increasing future income inequality.

In principal, the decision to drop out of school in a crisis could also reflect high costs of schooling or changes in the return to schooling as well as a desire to work to smooth household incomes. However, in Argentina, schooling is free (as discussed above), and the available evidence suggests that the returns to education typically rise in a crisis, especially among the less educated (Pessino, 1995). For example, she estimates that between 1986-

1989, the rate of return to education among 25 to 54 year old men increased by almost 3 percentage points, from 10 percent to almost 13 percent.[7]

3 Data

The main source of data for this project is the Permanent Household Survey from 1996 to 2002. This is a national socio-economic survey that began in 1972 with a few cities and has been modified and enlarged over time. Today, it covers 29 urban centers, which represent 70% of the national urban population and, 61% of the national population. It is important to note that the rural population in Argentina is less than 10% of the total population. There are two waves per year, in May and October.[8]

This is the only survey that covers almost the entire country over a long period of time. It involves an individual questionnaire focusing on labor issues, income and education; and a family questionnaire about household characteristics. All incomes declared correspond to the previous month, and since the academic year in Argentina runs from March to November, the two waves involve attendance during the third and eight months of the school year, respectively.

The sampling is a two-stage random sample. In a first stage, census areas are chosen with proportional probability according to their size. These primary units are stratified according to the head's education. In a second stage, households are chosen using a systematic sampling method. The survey is designed as a rotating panel. Each household appears in four consecutive waves and after that, it is removed to be replaced with a new household. Therefore, in principle, I could construct a two-year panel. However, attrition is a major problem and I therefore treat the data as repeated cross sections.[9] Moreover, to eliminate

[7] Pessino (1995) uses the Permanent Household Survey for Greater Buenos Aires from 1986-1993 (other cities were not available in early years). She estimates marginal returns to education by level during this period. The rates range from 2-8% for primary school, from 8-18% for high school and from 10-20% for college.

[8] There is a third wave in August only for a few cities.

[9] Each panel would cover a 25% of a wave. When we check these households over time, less than a half of

problems due to repeated individuals, I use only one observation per youth, in each age group. If the household cannot be found, a new one is added according to the corresponding stratum to keep a comparable sample. The survey does not follow the household if it moved but maintains the sample size and strata.

I use all households with children younger than 18 years old during the period May 1996-May 2002. Thus, any households with teenage heads are included in the sample. With two waves over 7 years (except 2002) for 29 cities, I have an average of almost 10,000 households per year and 6,200 12-17 year olds per wave. This sample has only multi-person households.[10] I do not include previous years because several cities were not surveyed and relevant information in covered cities, such as identification of different sources of earnings, was not asked before 1996.

Tables 1 and 2 summarize some sample statistics. Table 1 shows the means (Panel A) and percentage changes (Panel B) in total, head and other members' real incomes, at the household level, over time. All measures are monthly incomes. I characterize the households according to the characteristics of heads, such as education, in an effort to track similar groups over time. Therefore, each column corresponds to households whose heads have the same level of education. I define the head as the person who is declared in the survey to be the head of the household.

The impact of the crisis on real earnings is immediately evident. Panel A of Table 1 shows that real incomes, on average, increased from 1996-1998 (i.e., the period before the crisis). After 1998, households with less educated heads (i.e., less than high school) began to face a

the original 25% is present. The crisis does not seem to increase the attrition relative to previous waves. I also tried to use short panels as Mckenzie (2003) does but the attrition is worse for the target group that I consider.

[10] One-person households were not excluded, the original sample did not present 12-17 aged people living alone. The sample of households with teenagers that I use includes 3.15% of households with 2 people, 11.5% with 3 people, 24% with 4 people, almost 25% with 5 people, 15.4% with 6 people and 20% with more than 6 individuals. At the same time, 90% of 12-17 aged youths live with at least one of the parents and almost 24% of the young people live in extended families. Less than 1% of the children declared that they were the head of the household.

fall in total real earnings while the incomes of household heads decline in all groups.[11] The Argentine devaluation at the end of the period also led to a dramatic fall in real resources.

Looking at the percentage variation in incomes from 1996 to 1998 in Panel B of Table 1, the data suggest that head labor incomes increased during this period for all heads while all incomes coming from the head increased for all heads but heads with high school education. Other member incomes rose -relative to heads- more before the crisis. If I compare the changes in total income of heads and of other household members from 1996 to 2001, head incomes fell dramatically. However, the percentages indicate that other members either suffered smaller losses than heads or increased their earnings in two out of the three categories of households.

For instance, households characterized by a head with intermediate education (i.e., high school), suffered a 17.71% loss in head income, compared to a 12.98% loss in other member incomes. Moreover, in the case of households with highly educated heads (i.e., more than high school), head incomes fell while other member's incomes rose (a decline of 12.60% versus an increase of 10.46%). This phenomenon suggests that households were acting to smooth income. When the head suffers a large fall in real income, other household members begin contributing to the budget. These changes in household income may also reflect changes in living arrangements. For example, household income could rise not only because existing members work more, but because new members join the household, although McKenzie found little evidence that this was the case.[12]

Table 2 describes three relevant rates for 12-17 year olds during the period, by age intervals and sex.[13] The rates are labor force participation, school attendance and the percentage of youths who are neither studying nor working. These young people should be

[11] The standard deviation of labor incomes, even it is not presented in the paper, is larger than the corresponding to total incomes. For both of them, it increases over time but not significantly.

[12] It is interesting to note that families were able to smooth income through some of the earlier macroeconomic shocks. However, the last shock in 2002 was so large that little smoothing was apparently possible.

[13] I distinguish between May and October because there can be seasonal differences in economic activity and school enrollment. For instance, May corresponds to the beginning of the academic year and October to the last part of it.

attending the last years of primary school or high school but could also be earners during a crisis. The data suggest that changes in youth behaviors begin to be observed some time after the crisis began, as the economic downturn deepened.

Panel A of Table 2 concerns changes in labor force participation by age. Up to 2000, participation was decreasing for all groups, but after that year this trend begins to reverse.

Panel B of the same table highlights school attendance rates. Attendance is increasing before 2001 and then begins to stabilize or decrease for all age groups in 2001. For instance, the rate of attendance increased around 2-2.7%, 16-17% and 17% for 12-13, 14-15, 16-17 year old groups, respectively, from 1996 to 2001. Then, from May 2001-May 2002, the attendance rate fell for 12-13 aged females, 14-17 aged males, and 16-17 aged females.

There are differences between males and females, not only in levels but also in changes. Female rates are always higher and some continue increasing slowly during the crisis while for the same age group, male youths present decreasing ratios. For instance, from May 2001-May 2002, attendance increased 1.34% in the case of 14-15 aged girls and decreased .46% in the case of 14-15 aged boys.[14] It is possible that young men have more labor market possibilities than young women.

Finally, Panel C of Table 2 summarizes the percentage of youths who declared that they are neither working nor studying. It is clear that the percentages of youths "doing nothing" decreased for all groups before 2001. For example, this percentage fell 47% for 16-17 year old males and 47.8 % for 16-17 females over the entire period. But at the same time, the data suggest that the rates increase for some groups at the end of the period as schooling attendance decreases, indicating that these groups may be available for work.

In summary, the data analysis suggests that the crisis caused a large decline in real income for all households and that it could have had an adverse effect on schooling attendance.

[14] Unfortunately, the Permanent Household Surveys do not contain information about the grade that the young is attending or attended before quitting school. The only piece that we may know is if the person who left school finished it or not. In other words, it can be the case that a person dropped out school just after finishing primary school or without getting the degree. This last case is worsening over time for primary and high school by more than 30%.

4 Methods

The first step in my analysis is to show that household incomes in Argentina were strongly affected by the Brazilian real-dollar exchange rate. I then examine the effect of household income on schooling attainment. OLS models are likely to be biased by unobserved factors that are correlated both with higher earnings and higher educational attainments. Hence, I instrument household income using the Brazilian exchange rate in order to identify the causal effect of income on schooling attendance, and to quantify the effect of the shock to income on schooling attendance in Argentina. The identifying assumption in these instrumental variables models is that the Brazilian nominal exchange rate impacted the real incomes of households but did not have any direct effect on schooling decisions other than through its effects on household income.

All of these models are estimated separately for males and females, for different age groups and, for more and less educated heads. I distinguish three age groups: 12-13, 14-15, and 16-17 year olds because it may be the case that the effect differs over different grades. The first two age intervals involve mandatory grades, and the last one covers optional grades. Also, differences between boys and girls in the same age range are possible given the different labor market and home production opportunities available to them.

The first stage regression models for the effect of the Brazilian exchange rate on household incomes, at household level, have the form:

$$\begin{aligned} y_{hcwy} &= \alpha_0 year + \delta_0 wave + \gamma_0 city + \rho_0 BrazNER_{wy} \\ &\quad + \beta_0 x_{hcwy} + \varepsilon_{hcwy} \end{aligned} \tag{1}$$

where y_{hcwy} is the measure of real income for household h, expressed in logarithms, during wave w in year y and city c. Year is a vector of year dummies from 1996-2002, wave is a dummy variable equal 1 if the observation corresponds to the second wave of the year, and city is a vector of city dummies; $BrazNER_{wy}$ is the Brazilian real-dollar nominal exchange rate lagged one month given that the effect cannot be instantaneous, and x_{hcwy} are different exogenous or predetermined variables involving household characteristics. In this regression

the main coefficient of interest is that on the Brazilian exxhange rate. Other variables are included in order to control for other important determinants of outcomes, which could be correlated with the variables of primary interest. For instance, I control for the head's education and age, as well as for the size and composition of the household.

I present models using several different measures of income in an effort to detect the presence or absence of income declines and smoothing behaviors. It is possible that new household earners could compensate for the initial fall in real earnings in such a way that I would not see any fall in the total income of families. I examine the real income of heads, of all members of the household, and of 12-17 year old youths as the dependent variables. Moreover, I estimate models for all sources of income and for only labor income. I expect to see the largest impacts of the crisis on head's labor income if smoothing behaviors are taking place.

The models of school attainment model has the following form:

$$\begin{aligned} y_{icwy} &= \alpha_1 year + \delta_1 wave + \gamma_1 city + \\ &\quad \rho_1 \log(HH\_inc)_{icwy} + \beta_1 x_{icwy} + \mu_{icwy} \end{aligned} \tag{2}$$

where the unit of observation unit is now an individual young person and y_{icwy} is equal to 1 if individual i during wave w in year y and city c attends school and 0 otherwise. $\log(HH\_inc)_{icwy}$ is the logarithm of total real income of the household (net of youth's income), and x_{icwy} are different individual characteristics that may affect the dependent variable, including education, age and gender of the head of the household; and size and composition of the household. Year is a vector of year dummies from 1996-2002, wave is a dummy variable equal 1 if the observation corresponds to the second wave of the year, and city is a vector of city dummies.

In this regression the main coefficient of interest is that on household incomes. As before, other variables are included in order to control for other important determinants of outcomes, which might be correlated with the variables of primary interest. I argue that the main effect of the shock is through real household income. However, it could also affect the size and composition of the household, so I control for this possibility. I include year and wave

dummies in order to control for overall trends and systematic differences between May and October, respectively, in the dependent variables; and city fixed effects are included in order to control for persistent differences between regions.

We could check if the macro shock affected size and composition of the household by estimating the model without including these variables. Similar estimates for the variable of interest would indicate that the shock did not impact size and composition largely.

Finally, I analyze reduced forms of the schooling equations at the individual level to check that the IV estimates are consistent with the reduced forms. I also study reduced form models of the willingness to work among 12-17 year olds.

These regression models have the form:

$$\begin{aligned} y_{icwy} &= \alpha_2 year + \delta_2 wave + \gamma_2 city + \\ &\quad \rho_2 BrazNER_{wy} + \beta_2 x_{icwy} + \mu_{icwy} \end{aligned} \tag{3}$$

where the unit of observation unit is an individual young person and y_{icwy} is the outcome of interest for individual i during wave w in year y and city c. I focus on two different dependent variables: an attendance variable equal to 1 if the person attends school and 0 otherwise, and an availability to work variable which takes the value of 1 if the youth works or is willing to work and 0 otherwise.

Based on the previous literature, I expect changes in schooling attendance and labor market participation of household members if young people left school either to work or to help with household production.

Finally, the regression models are estimated allowing different effects for youths in families with heads with less than high school and in families whose heads have high school or more, in an effort to test for the presence of liquidity constraints. I expect that households with more educated heads will be less affected by the crisis in terms of income declines and will have less problems borrowing (or more savings) than families with less educated heads.

These models are similar to (1), (2) and (3) except that in the first case I include the variable $BraNER_{\_cwy} * less\_educ\_head$, where $less\_educ\_head$ is a dummy variable that takes

the value 1 if the head has less than high school and 0 otherwise. In the last two cases, I estimate the models using the two subsamples separately.

5 Results

5.1 The Effect of the Crisis on Household Incomes

The first row of Table 3 shows estimates corresponding to equation (1). As dependent variables, I use household, head and youth incomes and distinguish between total income and labor income. All of these income variables are expressed in logarithms.[15] These first stage equations can be used to address two questions. First, by comparing the impact on different types of income, I can attempt to identify whether smoothing behaviors were important. If households were smoothing income, then this makes it more plausible that they might be smoothing income by increasing the labor force participation of youths. Second, these equations can help to establish whether the Brazilian real-dollar exchange rate is likely to be a useful instrumental variable.

The estimates in Table 3 suggest that the crisis resulted in a huge fall in incomes for households with young children. In the case of heads, labor earnings suffered a larger decline than total income suggesting that non-labor income could have increased. Comparing head and youth incomes, the results indicate the presence of some smoothing by other members of the household. But, even with efforts to maintain income levels, the crisis led to a dramatic fall in household incomes. I estimate that changes in the Brazilian exchange rate led to a 50% fall in household incomes between 1998 and 2002.

The control variables are generally statistically significant. In particular, the level of education of the head has a positive effect on personal and household real income. Households with male heads and prime age heads also have higher incomes.

[15] Less than 4% in the sample declares partial incomes, huge amounts or incompatible situations. In the case of people who declare zero income (less than 10%), we transformed zeros into 1 in order to include them in the sample.

The bottom panel of Table 3 shows the results of a model similar to equation (1) except that it includes the interaction of a dummy variable for heads with low levels of education and the Brazilian exchange rate. The results suggest that all households were affected by the shock, and the point estimates suggest that the Brazilian exchange rate had a stronger effect on households with less educated heads. The crisis reduced household real incomes by 52% in households with less educated heads, compared to 42% in the case of households with more educated heads, although the interaction term is not statistically significant. Almost all of the decline in real incomes is accounted for by a fall in labor incomes for both kinds of households.

All the results indicate that the crisis caused a dramatic decline in household real income. Even in the presence of smoothing behaviors undertaken by members of the household, the shock was large enough to impact family resources. Moreover, the results suggest that the instrumental variable I am using is highly correlated with the endogenous household income variable. Although all types of households suffered large income losses, it may still be the case that households with less educated heads were more likely to call on youths to drop out of school and work than other households. This possibility is investigated in the next section.

5.2 OLS and IV estimates

Table 4 presents OLS estimates corresponding to equation (2). Each column corresponds to a particular age interval and sex. The coefficient of interest indicates the marginal effect of household real income, measured in logarithm units, on the probability of attending school. OLS estimates of the effect of real household income on the schooling decision suggest that an increase of 1% in real income increases the probability of schooling attendance by 0.7% for 12-13 year old girls, around 2% for 14-15 year old boys, 1.3% for 14-15 year old girls and almost 4% for 16-17 year old boys. The differences between the sexes in each age group are not significant. Table 5 presents the instrumental variable estimates of the models of schooling attendance. In all the cases, OLS estimates are smaller and more precise than IV

estimates. Table 5 suggests that household income plays an important role with respect to schooling decisions, but the effects are different across age and gender groups.[16] In particular, 14-17 year old boys and 14-15 year old girls are more likely to leave school when there is a decline in household real incomes.

The crisis led to declines of 10 and 7 percentage points in these two groups, respectively.

Among females, only 14-15 aged girls face a higher probability (7.6%) of leaving school when household income falls. As discussed above, it may be the case that in a context of a crisis the labor market possibilities open to young men are better than those available to young women.

In terms of age groups, 14-15 year olds were most affected, although these were the group targeted by the educational reforms. It is possible that the effects are weaker for the 16-17 year olds because they are closer to getting their degree than younger youths. Children younger than 14 may have fewer opportunities to contribute to household income, and are still enrolled in primary school.

Table 5 also presents the R squared and t-statistics from the first stage regressions.

These results are not exactly the same as in the first stage regressions at household level. The main reason of the difference is that sample sizes are very different. While the sample includes almost 59,000 households when I estimate the effect of the shock on household income at household level, each sample involves around 13,000 youths when I estimate the first stage at individual level.

These test statistics confirm that the Brazilian nominal exchange rate is highly correlated with incomes and therefore, satisfies one of the conditions for being a good instrument for household income. Except among 12 to 13 year old males, the impact of the macroeconomic shock on real incomes is large and statistically significant.

The estimated coefficients on the included control variables are not presented in the tables. But they suggest that characteristics of the head such as education and age, and household structure are also important to the schooling decision. The presence of other

[16] The control variables are only presented in table 3 but all the regressions include the same controls.

members of the household other than parents and siblings has a negative effect on youth's schooling, which suggests that these other people are neither contributing to household income nor taking care of other members. At the same time, the presence of other children increases the probability of quitting school for 16_17 year old boys.

These models assume that the size and age composition of the household are predetermined variables in models of schooling decisions. However, since household structure could be endogenous, I have also estimated all of the models eliminating these controls. The point estimates were almost exactly the same although they were estimated less precisely.

Table 6 presents the IV estimates separately for youths in households with heads with different schooling levels. When the sample is stratified, the first stage is not always significant, and hence the second stage IV estimates sometimes have large standard errors. In Table 6, I have included the IV estimates for the cases in which the first stage was significant. The qualitative pattern is as expected -there are larger effects for youths in households with less educated heads. For instance, it is interesting to study the case of 14-15 aged girls. In both households with more educated and less educated heads, these girls suffered a large fall in household real income. However, only in households with less educated heads did this have any effect on schooling.

The results are in line with the literature reviewed above. The Argentine crisis led to a dramatic drop in schooling attendance among children 12-17 years old. The size of the effect varies significantly across groups. In particular, children with less educated heads faced the most severe consequences.

Finally, I estimate regression (3) to capture the reduced form effect of the shock on schooling and on the "availability to work" decisions of 12-17 year olds. Table 7 shows reduced forms models for both decisions. Each column corresponds to a particular age interval and sex. The first line of estimates shows the marginal effect of the Brazilian nominal exchange rate on the probability of schooling attendance. The second line summarizes the marginal effect of the same shock on the probability of being available to work.

In the case of schooling attendance, the shock impacted the educational decisions of 14-15

year old youths and of 16-17 year old youths. The coefficients indicate a decline of almost 11% in the probability of attending school among 14-15 year old males, and declines of almost 8% for 14-15 females, 7% for 16-17 males, and almost 4.2% for 16-17 females during the crisis. But the differences between the male and female estimates in each age group are not significant at 5% level. As I discussed briefly above, the attendance rate increased 2-2.6% for 12-13 year olds, 11-13% for 14-15 year olds and 12-14% for 16-17 year olds during the middle nineties.[17] Hence, this crisis led to a significant reversal of earlier gains.

The reduced form for working decisions suggests that the crisis increased the availability for work of young people. In particular, I find that it increased the probability by 1.6-3.8% for the first group, 12% for 14-15 males, 8.2% for 14-15 females, and almost 7% for 16-17 males. The different effects between male and female are not statistically significant. The results suggest once again that 14-15 year old youths were the most impacted by the crisis.

These findings are consistent with the previous estimates. For instance, taking into account the reduced form and IV coefficients corresponding to 14-15 males, I calculate that the change in the exchange rate from 1998-2002 led to a 25% fall in household incomes, and that this negative change increased the probability of dropping out of school by 10.8%, which is fully consistent with the direct effect of the devaluation on schooling decisions.

My results indicate that 14-15 year old youths and 16-17 year old males left school and tried to get a job to contribute to the household budget. Moreover, it is likely that these decisions reflect liquidity constraints given the large declines in family incomes. At the same time, the situation appears to be different for 16-17 girls. This group has a lower probability of attendance, but they are not more willing to work. It is possible that there are fewer market opportunities for girls than for boys and/or that girls are more useful at home, taking care of other members and/or engaged in household production. Also, comparing the results for girls of different ages, it is possible that older girls are more productive in the home than younger ones. These findings are generally consistent with the IV estimates.

[17] The percentages correspond to the cumulative growth of attendance rate during the years before the crisis.

Finally, the youngest group, particularly the boys, only show a higher availability for work. It seems to be the case that households do not sacrifice the attendance of sons and daughters with 6-7 years of schooling, but that the children are still trying to contribute to family resources. The point estimates suggest that 12-13 year old boys face more obstacles to employment than 14-17 year old boys.

In an effort to confirm that the only effect of the macro shock on education comes through changes in household resources, I estimate reduced forms for schooling attendance and availability to work in two separate subsamples: youths with less educated heads (i.e., less than high school), and youths with more educated heads (i.e., high school or more). The argument is that families with less educated heads face are less likely to have access to credit or to have previous savings.

The results are shown in Table 8. They suggest that the crisis affected 12-17 year old youths belonging to disadvantaged families more severely. While almost all youths from households with less educated heads saw large declines in the probability of schooling attendance, boys and girls with highly educated heads increased attendance. The probability of schooling attendance declined by 3.1-18.4% among youths in households with less educated heads (depending on age and sex), and increased by 4.2-17.4% in the households with more educated heads. The gender differences within each age range are only significant (at the 5% level) for the 14-15 year old group with less educated heads.

It is also interesting to highlight the differences in the effect of the shock on availability to work by head education. In the case of 14-15 boys, boys with less educated heads increased their probability of being available to work by almost 20%, while boys with more educated heads decreased their probability of being available to work by 7.7%. In the case of availability to work, gender differences are significant at 10% level in the case of 14-17 year old people with less educated heads and, at 1% in the case of 14-15 with more educated heads.

5.3 Some Extensions

The results discussed above were robust to several changes in specification. All of the regressions were estimated using the real Brazilian real-dollar exchange rate (i.e. not nominal) with very similar results. One reason that this choice does not matter is that the inflation rate was low during this period. I also estimated the regression models using the contemporaneous, rather than the lagged Brazilian nominal exchange rate, without changing the results.

I also estimated all the regression models excluding observations from 2002 because of fears that the Argentine devaluation might have had some impact on the real-dollar exchange rate. The results were robust to this change.

In the first stage regressions estimated at the individual-level, I observed some differences in the effect of the crisis on the household incomes of boys and girls. In particular, the difference in the impact of the crisis was statistically significant for the 14-15 year olds. This difference suggests that there are some unobserved and uncontrolled differences between households with 14-15 year old boys and those with 14-15 year old girls. I found that if I estimated the model using all households with two parents, all households with identical family compositions (by age and gender by age), or all non-extended families, the crisis had a large impact on all households with 14-15 year olds. The coefficient of interest varied from .24 to .50.

I have also estimated the models excluding the controls for household size and composition and the results were very similar. Finally, I estimated reduced forms for the probability of working. The results were consistent with those corresponding to availability to work.

6 Conclusions

During the 1990s, Argentina increased mandatory schooling levels from 7 to 10 years. Prior to the economic crisis that began in 1998, large gains were made in the fraction of youths attending school. The census data indicates that schooling attendance has been growing since 1991. Moreover, between 1996 and 1998, schooling attendance was increasing, on

average, at 1% per year among 12-13 year olds and 4% per year among 14-17 year olds. The raw data suggests that the crisis was responsible for a leveling off of these trends.

Instrumental variables estimates suggest that the crisis had a causal impact on schooling attainment. In particular, the probability of attending school fell by between 4.2 and 11% for some groups. The groups that suffered the largest declines were 14-15 year old males (11%), 14-15 year old females (7.6%) and 16-17 males (6.8%). These percentages mean that approximately 110,000 14-15 year old youths and 32,000 16-17 year old males left school in Argentina as a consequence of the economic crisis.

The consequences of the crisis were even more severe for youths in households with less educated heads. In this group, the decline in the probability of schooling attendance ranged from 3.1% to almost 18.4%. For instance, the probability of schooling attendance decreased by 8.2% for 14-15 year old girls, 18.4% for 14-15 year old boys, and 15.7% for 16-17 year old girls.

These findings are important because dropping out of school at a young age may entail long run adverse consequences not only to individuals and families but also to society, particularly if the educational system is unable to capture these individuals again. Moreover, this development could worsen income inequality since it is the youths from the poorest families who are most affected.

Unfortunately, I cannot yet be sure about the long-term consequences for these dropouts. This paper examines the short run effect of the crisis and it is at least theoretically possible that the youths could return to school in future. However, the literature suggests that this is most unlikely, particularly if the crisis is lengthy and the youths stop attending for several years. Prior studies of Argentina show that a very low percentage of people who leave high school ever return to finish (Llach, 1999).

In any case, because macroeconomic shocks are very frequent in developing countries, policy makers and international agencies should take into account the potentially permanent effects of these shocks when they consider policies designed to mitigate their effects. In particular, the policy of paying a subsidy to low income families who keep children in school has

been discussed several times in Argentina (Llach (1999), Guadagni et. al (2002)). Moreover, the government implemented a subsidy to poor families with unemployed heads in August 2002. However, this subsidy has not been linked to youths schooling attendance.

Recent estimates of the effects of an English program that pays subsidies directly to full-time student youths from poor families suggest that the approach is promising (Ashworth, 2002). The English government gives around 30 pounds a week to poor full-time students aged 16-18 who stay in school. This fully allowance is payable if total parental taxable income does not exceed 13,000 pounds per year. For those with parental income between 13,000 and 20,000 pounds per year, the amount is progressively tapered to a minimum of 5 pound per week. During the first two years of the program, participation increased by 6 percent points among eligible young people.

In Argentina, a subsidy of 150 dollars per year paid directly to youths would lead to a 10% increase in the family's income during the academic year. At the mean income of a person without high school education (1,600 dollars per year), an average rate of return to a year of school of 13% (Pessino, 1995) and a discount rate of 10 percent (generally used in a World Bank or IMF), the present value of the private return to an additional year of education is 190 dollars. Following the English case, this kind of subsidy could be assigned to youths whose family income is lower than certain level.

While this "back of the envelope" calculation is crude, it suggests that there may be considerable leverage to mitigate the effects of economic crisis on educational attainment in a cost-effective way.

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Table 1: Real incomes: mean and variation over time, by head education

Household level

	All sources of real income			***Labor real income***		
Head education:	***less HS***	***HS***	***more HS***	***less HS***	***HS***	***more HS***
Panel A: Means						
Total income						
1996	715.61	1295.30	2064.31	633.03	1080.54	1915.26
1997	771.06	1200.47	1985.55	687.11	1094.75	1824.98
1998	796.77	1262.66	2184.32	717.97	1150.06	2030.33
1999	714.06	1264.31	2261.65	636.52	1150.97	2077.45
2000	676.64	1269.53	1958.37	600.50	1152.80	1773.50
2001	606.81	1083.48	1916.14	537.41	974.36	1694.91
2002	396.86	723.15	1353.42	339.15	599.54	1214.96
Head income						
1996	453.08	923.14	1578.63	394.58	755.33	1480.41
1997	481.45	858.55	1541.32	422.73	787.34	1430.83
1998	501.04	875.62	1654.60	442.12	801.55	1548.62
1999	440.55	801.98	1653.63	387.98	730.23	1532.41
2000	437.02	897.34	1479.83	384.96	815.88	1340.52
2001	388.39	759.62	1379.65	338.47	679.02	1250.08
2002	263.91	511.01	1026.57	224.14	414.98	921.42
Other members income						
1996	262.53	372.15	485.67	238.45	325.21	434.84
1997	289.61	341.91	444.23	264.37	307.40	394.15
1998	295.73	387.04	529.73	275.85	348.51	481.71
1999	273.50	462.33	608.01	248.54	420.74	545.04
2000	239.61	372.18	478.54	215.54	336.92	432.98
2001	218.42	323.86	536.49	198.94	295.34	444.83
2002	132.95	212.14	326.85	115.02	184.56	293.54
Panel B: % Variations						
Total income						
1996/1998	11.34	-2.52	5.81	13.42	6.43	6.01
1996/2001	-15.20	-16.35	-7.18	-15.11	-9.83	-11.50
1996/2002	-44.54	-44.17	-34.44	-46.42	-44.52	-36.56
Head income						
1996/1998	10.58	-5.15	4.81	12.05	6.12	4.61
1996/2001	-14.28	-17.71	-12.60	-14.22	-10.10	-15.56
1996/2002	-41.75	-44.64	-34.97	-43.20	-45.06	-37.76
Other members income						
1996/1998	12.65	4.00	9.07	15.69	7.17	10.78
1996/2001	-16.80	-12.98	10.46	-16.57	-9.18	2.30
1996/2002	-49.36	-43.00	-32.70	-51.76	-43.25	-32.50

Panel A: Each cell represents a real income mean at HH level for a particular year. It is calculated from the combination of three dimensions: 1) Sources of income: all sources or only labor income; 2) Education of the head of HH: less than HS, HS, or more than HS and; 3) Income from all members, from the head and, from other members different than the head. The table involves all HH in the sample. Panel B: Each cell represents the percentage variation of income means described in Panel A, per corresponding periods.

Table 2: Labor Force Participation, Schooling Attendance and "doing nothing" among 12_17 year olds

	12_13		14_15		16_17	
	male	female	male	female	male	female
Panel A: Labor force participation						
May						
1996	5.1	4.11	21.93	18.93	39.68	35.22
1997	3.38	1.66	16.79	12.13	39.93	26.77
1998	2.78	2.67	14.48	8.27	30.2	25.35
1999	2.24	2.47	10.91	9.82	30.08	24.44
2000	2.73	1.08	7.27	4.87	27.42	20.86
2001	2.72	1.66	6.29	5.4	20.62	17.44
2002	2.38	1.48	6.7	4.14	20.27	17.46
October						
1996	3.02	3.34	20.24	15.46	42.43	36.14
1997	2.8	2.16	15.64	13.31	33.63	34.3
1998	2.91	1.36	12.31	14.16	34.42	22.67
1999	2.98	1.44	9.73	6.18	32.58	24.8
2000	1.83	0.71	7.41	6.31	24.69	22.61
2001	3.63	1.8	8.66	7.55	23.1	16.85
Panel B: Schooling Attendance						
May						
1996	95.56	96.11	80.94	81.9	65.88	67.49
1997	97.17	98.48	85.88	88.68	68.11	76.79
1998	97.69	98.58	89.87	93.06	74.32	77
1999	98.78	97.82	91.64	91.83	76.37	78.12
2000	97.59	99.22	94.03	95.67	79.77	82.96
2001	97.49	98.72	95.16	94.87	83.96	85.77
2002	98.02	98.65	94.72	96.14	83.7	84.12
October						
1996	97.36	96.74	82.05	85.39	64.19	68.11
1997	98.38	97.84	87.03	87.49	71.22	69.51
1998	98.22	98.85	89.16	88.17	70.61	82.37
1999	97.89	98.72	91.85	95.02	75.73	78.11
2000	98.61	99.53	95.55	94.87	79.74	80.94
2001	98.35	98.73	92.38	93.22	82.47	85.17
Panel C: Neither working nor studying						
May						
1996	3.87	3.44	13.93	15.7	20.04	25.8
1997	2.02	1.51	9.76	9.75	14.84	19.35
1998	1.52	1.36	6.01	6.2	14.44	18.41
1999	1.17	2.06	6.41	6.99	11.54	16.34
2000	2.27	0.78	4.28	3.74	12.41	13.15
2001	1.98	1.15	2.03	3.64	9.34	11.57
2002	1.7	0.86	4.1	3.36	10.53	13.48
October						
1996	2.35	3.22	11.61	13.46	21.76	27.05
1997	1.3	2.15	9.66	9.94	19.46	23.04
1998	1.6	1.03	5.35	10.34	14.92	14.17
1999	1.76	1.27	4.95	4.1	13.05	15.88
2000	1.39	0.34	3.09	4.54	11.89	14.58
2001	1.4	1.14	4.57	6.37	12.06	11.51

Table 3: Reduced forms - Labor and total real income of different members.
Household level

log of:	household real income	household real labor inc.	head's income	head's labor income	youths real income	youths real labor inc.
Without differential shock effects						
Brazil non. exch. rate	**-0.383**	**-0.398**	**-0.578**	**-0.732**	**-0.148**	**-0.111**
	(0.079)**	(0.104)**	(0.103)**	(0.151)**	(0.039)**	(0.015)**
1 if there is spouse	0.097	0.154	-0.195	0.280	-0.102	-0.061
	(0.057)***	(0.041)**	(0.086)*	(0.075)**	-0.069	-0.055
1 if other members	-0.030	-0.187	-0.265	-0.338	0.132	0.057
	-0.048	(0.038)**	(0.057)**	(0.063)**	(0.038)**	(0.029)*
# of members less 3 yrs	-0.131	-0.077	-0.140	-0.100	0.072	0.067
	(0.025)**	(0.035)*	(0.030)**	(0.039)**	(0.030)*	(0.019)**
# 3_5	-0.088	-0.105	-0.022	-0.011	0.051	0.031
	(0.019)**	(0.035)**	-0.032	-0.048	(0.021)*	(0.015)*
# 6_12	-0.062	-0.070	-0.070	-0.076	0.055	0.169
	(0.009)**	(0.011)**	(0.013)**	(0.013)**	(0.014)**	(0.0111)**
# 13_14	-0.047	-0.040	-0.075	-0.046	0.084	0.476
	(0.023)*	-0.025	(0.031)*	-0.033	(0.016)**	(0.011)**
# 15_17	0.033	0.057	-0.025	0.000	0.439	0.784
	(0.011)**	(0.026)*	-0.020	-0.028	(0.036)**	(0.031)**
# 18_22	0.182	0.262	-0.039	-0.038	0.005	0.003
	(0.015)**	(0.023)**	(0.015)**	(0.022)***	-0.016	-0.010
# 23_29	0.371	0.604	-0.042	0.002	-0.068	-0.047
	(0.016)**	(0.024)**	(0.020)*	-0.029	(0.025)**	(0.018)**
# 30_44	0.458	0.923	-0.007	-0.027	-0.200	-0.122
	(0.022)**	(0.032)**	-0.036	-0.041	(0.027)**	(0.021)**
# 45_54	0.394	0.772	-0.098	-0.220	-0.176	-0.091
	(0.024)**	(0.033)**	(0.049)*	(0.049)**	(0.029)**	(0.020)**
# 55_64	0.271	0.364	-0.209	-0.289	-0.023	-0.027
	(0.040)**	(0.073)**	(0.100)*	(0.127)*	-0.063	-0.046
# 65 & older	0.241	-0.054	-0.005	-0.012	-0.073	-0.033
	(0.052)**	-0.055	-0.079	-0.061	-0.059	-0.039
1 if head is male	0.149	0.521	0.930	1.497	-0.086	-0.001
	(0.051)**	(0.041)**	(0.063)**	(0.052)**	(0.051)***	-0.045
1 if head is 31_54 yrs old	0.273	0.173	0.702	0.894	-0.542	-0.295
	(0.079)**	-0.104	(0.086)**	(0.126)**	(0.088)**	(0.080)**
1 if head is 55_64 yrs old	0.181	-0.035	0.361	-0.144	-0.697	-0.379
	(0.075)*	-0.123	(0.158)*	-0.167	(0.126)**	(0.102)**
1 if head is 65 or older	0.284	-0.535	0.445	-2.728	-0.679	-0.420
	(0.134)*	(0.141)**	(0.165)**	(0.145)**	(0.114)**	(0.101)**
1 if head has HS	0.506	0.488	0.651	0.593	-0.144	-0.124
	(0.029)**	(0.025)**	(0.037)**	(0.039)**	(0.020)**	(0.019)**
1 If head has more than HS	1.031	0.996	1.230	1.242	-0.116	-0.154
	(0.032)**	(0.044)**	(0.031)**	(0.047)**	(0.031)**	(0.018)**
R^2	0.21	0.23	0.14	0.28	0.08	0.22
With differential shock effects						
Brazil non. exch. rate	**-0.334**	**-0.339**	**-0.57**	**-0.7929**	**-0.0911**	**-0.0381**
	(0.101)**	(0.134)*	(0.136)**	(0.187)**	(0.048)	(0.025)
BraNER* 1 if head has less than HS	**-0.073**	**-0.087**	**-0.014**	**0.086**	**-0.083**	**-0.107**
	(0.052)	(0.066)	(0.063)	(0.069)	(0.033)*	(0.021)**
R^2	0.2	0.23	0.13	0.27	0.08	0.22
Obs.	58975	58975	58975	58975	58975	58975

Robust standard errors in parentheses. *** significant at 10%, * significant at 5% and, **significant at 1%. The regressions in the bottom panel panel also include city, year, wave dummies; and the controllers on head characteristics, size and composition of the HH. Dependent variable: log of different real incomes.

Table 4: Schooling attendance - OLS Estimates

Individual level

1 if youth attends school	12_13		14_15		16_17	
	male	female	male	female	male	female
log (HH income net of youth income)	**0.007** (0.005)	**0.007** (0.002)**	**0.019** (0.005)**	**0.013** (0.004)**	**0.039** (0.006)**	**0.006** (0.004)
R^2	0.04	0.04	0.12	0.13	0.18	0.23
Observations	13537	13089	13475	12986	13471	13500

Robust standard errors in parentheses. *** significant at 10%, * significant at 5% and, **significant at 1%. The regressions include city, year, wave dummies; and the controllers on head characteristics, size and composition of the HH. Dependent variable: 1 if the young person attends school, 0 if not. The main coefficient is the estimate of the probability of attendance on log(HH real income).

Table 5: Schooling attendance - IV Estimates

Individual level, Second Stage

1 if youth attends school	12_13		14_15		16_17	
	male	female	male	female	male	female
log (HH real income)	**-0.038** (0.085)	**0.011** (0.015)	**0.433** (0.207)*	**0.095** (0.044)*	**0.088** (0.018)**	**0.150** (0.135)
$R^{2\ \text{First Stage}}$	0.19	0.21	0.23	0.21	0.23	0.25
Instrument t-stat.$^{\text{First Stage}}$	1.44	3.50	2.09	4.88	6.86	2.28
Obs.	13537	13089	13475	12986	13471	13500

Robust standard errors in parentheses. *** significant at 10%, * significant at 5% and, **significant at 1%. The regressions include city, year, wave dummies; and the controllers on head characteristics, size and composition of the HH. Dependent variable: 1 if the young person attends school, 0 if not. The main coefficient is the IV estimate of the probability of attendance on log(HH real income). Instr.t-stat.$^{\text{First Stage}}$ is the t-stat. of the reduced form estimate of log(HH real income) on the Braz. nom. exch. rate.

Table 6: Schooling attendance by head education- IV Estimates

Individual level, Second Stage

1 if youth attends school	12_13		14_15		16_17	
	male	female	male	female	male	female
less educated parents						
log (HH real income)	-	**0.053** (0.012)**	-	**0.091** (0.054)***	**0.240** (0.045)**	-
$R^{2\ \text{First Stage}}$	0.11	0.15	0.16	0.15	0.17	0.2
Instrument t-stat.$^{\text{First Stage}}$	1.53	2.28	0.76	3.52	2.56	1.22
Obs.	9485	9111	9529	9286	9716	9638
More educated parents						
log (HH real income)	-	-	-	**0.036** (0.035)	**-0.112** (0.028)**	-
$R^{2\ \text{First Stage}}$	0.18	0.18	0.21	0.17	0.2	0.24
Instrument t-stat.$^{\text{First Stage}}$	0.95	0.82	1.33	1.86	3.32	0.21
Obs.	4052	3978	3946	3700	3755	3862

Robust standard errors in parentheses. *** significant at 10%, * significant at 5% and, **significant at 1%. The regressions include city, year, wave dummies; and the controllers on head characteristics, size and composition of the HH. Dependent variable: 1 if the young person attends school, 0 if not. The main coefficient is the IV estimate of the probability of attendance on log(HH real income). Instr.t-stat.$^{\text{First Stage}}$ is the t-stat. of the reduced form estimate of log(HH real income) on the Braz. nom. exch. rate. Top Panel includes all youths with heads with less than HS; and Bottom Panel includes all youths with heads with HS or more education.

Table 7: Reduced forms - Schooling attendance and availability to work
Individual level

Dependent variable	12_13		14_15		16_17	
	male	female	male	female	male	female
Youth attending school						
Brazil non. exch. rate	**0.006**	**-0.004**	**-0.085**	**-0.060**	**-0.053**	**-0.033**
	(0.012)	(0.005)	(0.005)**	(0.029)*	(0.014)**	(0.020)***
R^2	0.03	0.03	0.12	0.13	0.17	0.23
Youth available to work						
Brazil non. exch. rate	**0.030**	**0.013**	**0.093**	**0.064**	**0.053**	**-0.018**
	(0.012)*	(0.004)**	(0.007)**	(0.034)***	(0.031)***	(0.016)
R^2	0.04	0.03	0.12	0.13	0.17	0.22
Obs.	13537	13089	13475	12986	13471	13500

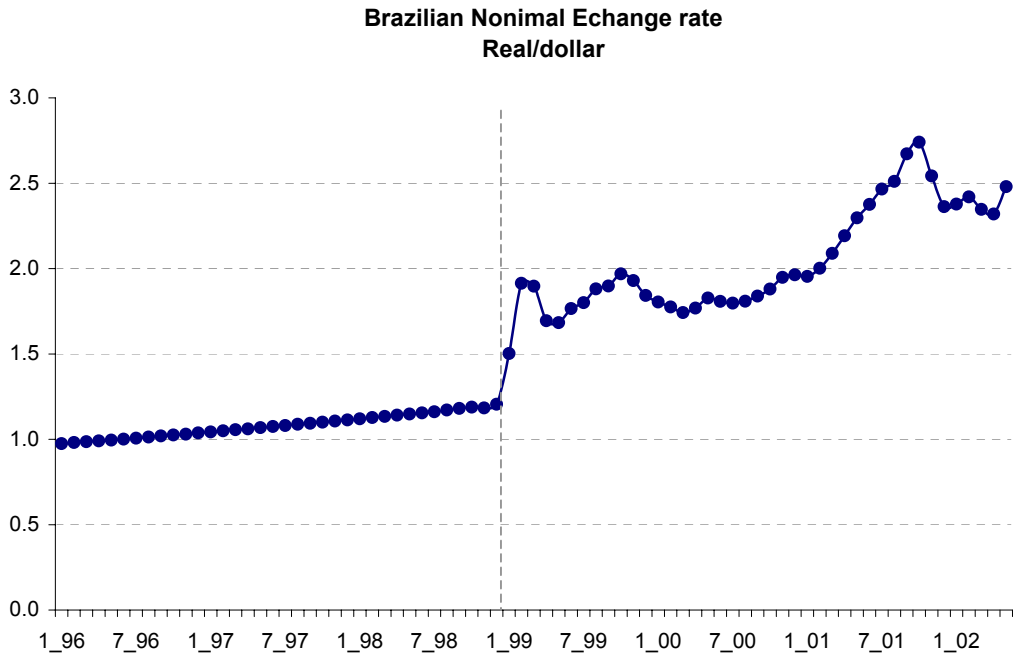
Robust standard errors in parentheses. *** significant at 10%, * significant at 5% and, **significant at 1%. The regressions include city, year, wave dummies; and the controllers on head characteristics, size and composition of the HH. Top Panel: Dependent var.: if if the young person attends school, 0 if not. Bottom Panel: Dependent var.: 1 if the young person is available to work, 0 if not. Logit estimates are significant and with the expected sign.

Table 8: Reduced forms - Schooling attendance and availability to work, by head education
Individual level

Dependent variable	12_13		14_15		16_17	
	male	female	male	female	male	female
Youth attending school						
less educated heads						
Brazil non. exch. rate	**-0.002**	**-0.024**	**-0.144**	**-0.064**	**-0.122**	**-0.121**
	(0.019)	(0.004)**	(0.008)**	(0.037)***	(0.019)**	(0.016)**
R^2	0.03	0.04	0.1	0.13	0.13	0.21
Obs.	9485	9111	9529	9286	9716	9638
more educated heads						
Brazil non. exch. rate	**0.041**	**0.033**	**0.060**	**-0.019**	**0.109**	**0.136**
	(0.011)**	(0.013)**	(0.010)**	(0.021)	(0.020)**	(0.039)**
R^2	0.06	0.03	0.05	0.09	0.09	0.15
Obs.	4052	3978	3946	3700	3755	3862
Youth available to work						
less educated heads						
Brazil non. exch. rate	**0.052**	**0.038**	**0.155**	**0.071**	**0.110**	**0.051**
	(0.018)**	(0.006)**	(0.012)**	(0.045)	(0.022)**	(0.010)**
R^2	0.04	0.04	0.1	0.13	0.13	0.19
Obs.	9485	9111	9529	9286	9716	9638
more educated heads						
Brazil non. exch. rate	**-0.036**	**-0.032**	**-0.060**	**0.019**	**-0.057**	**-0.139**
	(0.010)**	(0.012)**	(0.012)**	(0.021)	(0.076)	(0.040)**
R^2	0.05	0.03	0.06	0.09	0.1	0.15
Obs.	4052	3978	3946	3700	3755	3862

Robust standard errors in parentheses. *** significant at 10%, * significant at 5% and, **significant at 1%. The regressions include city, year, wave dummies; and the controllers on head characteristics, size and composition of the HH. Top Panel: Dependent var.: if if the young person attends school, 0 if not. Bottom Panel: Dependent var.: 1 if the young person is available to work, 0 if not. Logit estimates are significant and with the expected sign.

Figure 1: Evolution of the Brazilian Nominal Exchange rate over time and changes in average Household income



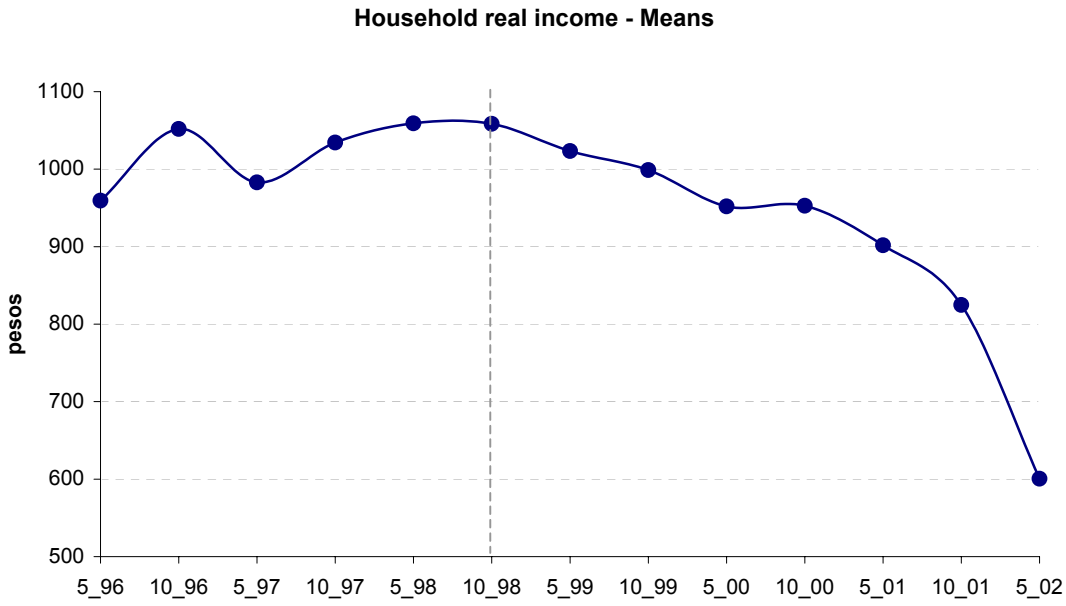


Figure 2: Schooling Attendance rate, by age

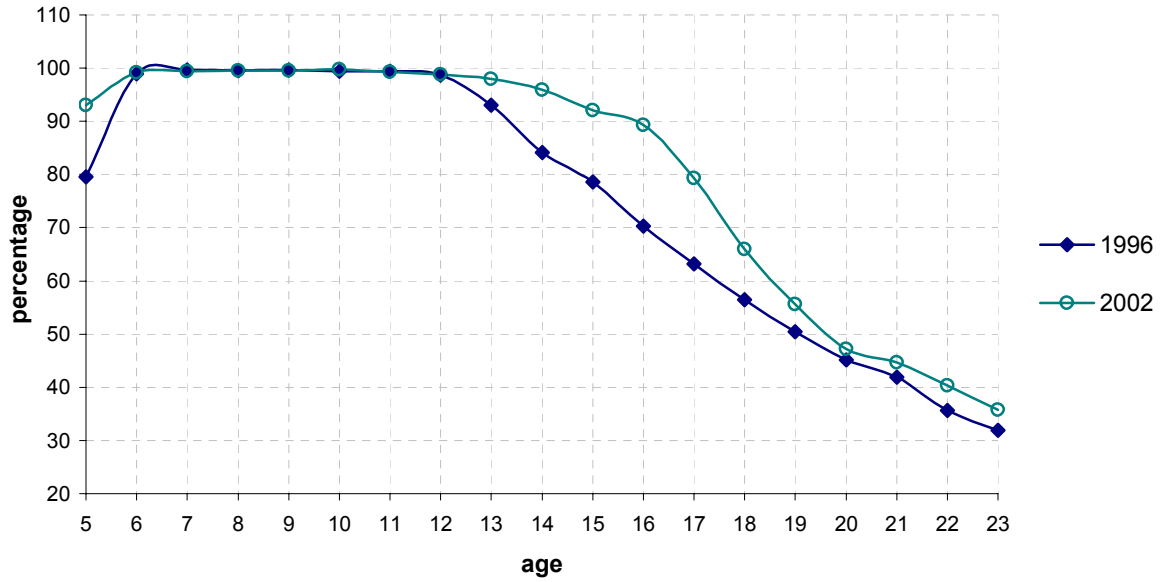


Figure 3: Schooling attendance rate, over time