The Impact of Migration on Child Labor: Theory and Evidence from Brazil

Garance Genicot*, Anna Maria Mayda◇ and Mariapia Mendola§.

March 2017

Abstract

This paper investigates the impact of internal migration on child labor outcomes in Brazil. We develop a theoretical model and evaluate it on children aged 10 to 14 using two decades of Census data. In our model, migration impacts child labor through changes in the local labor market, which is made up of both adults and children. To shed light on this channel, we complement the individual-level child-labor analysis with an empirical study of the labor-market impact of internal migration within Brazil. We exploit variation in the concentration of both skilled and unskilled immigrants at the municipality level and employ an IV strategy that relies on the historical (1980) distribution of immigrants within the country. Our results show that internal migration of a given skill level has a negative impact on corresponding adults' labor market outcomes. We also find that unskilled (skilled) immigration has a negative (positive) and significant impact on child labor. Finally, unskilled immigration increases children school attendance and decreases their likelihood of being idle.

JEL Classification Numbers: F22, J61, O12
Key Words: Child Labor, Migration

Acknowledgements: We thank participants at the 7th International Conference on Migration and Development in Oxford and seminar participants at Queens College, CUNY in New York, Fundacao Getulio Vargas in Rio de Janeiro and

Universidade de São Paulo for insightful comments. Maggie Liu and Diogo Britto provided excellent research assistance. The usual disclaimer applies.

∗ Georgetown University, NBER and IZA; ⋄ Georgetown University and IZA; § University of Milano Bicocca and IZA. E-mails: garance.genicot@georgetown.edu , amm223@georgetown.edu and mariapia.mendola@unimib.it.

1 Introduction

This paper studies the effect of immigration on child labor in Brazil. Although a large literature has analyzed the impact of immigration on wages and employment of residents, surprisingly little attention has been paid to the effect of immigration on child labor.

This lack of attention is largely due to the fact that most of the literature on the labor-market impact of immigration focuses on developed countries where child labor is virtually non-existent (Borjas 2014, Lewis and Peri 2014 and Blau and Kahn 2012 provide good reviews of this literature). However, the prevalence of child labor is significant in many developing countries, largely due to low income and poor institutions (Basu 1999, Edmonds 2008).

There are reasons to expect that the effect of immigration on child labor is larger than on adult labor. First, the labor response of children may be more elastic (Edmonds and Pavcnik (2005b) show that child labor is greatly influenced by local labor market conditions). Second, immigrants' skill level may be on average much lower than adult natives skill level and, as a result, the two groups of workers may not be close substitutes (see Dustman et al. 2016). On the other hand, children may be closer substitutes of immigrants since they are the least skilled source of labor – a similar point applies to youth employment in advanced economies (see Smith 2012 for the UK). As a result, assessing the effect of migration on child labor is important as it is likely to represent an important dimension through which the economy of migrants' destination adjusts to foreign workers' arrival, especially in middle and low income countries. The existing migration literature has pointed out that, besides changes in wages, the local economy adjusts to inflows of migrants through a number of different channels, ranging from native workers' outflows from the host location (Wagner and Ozden 2016, Borjas 2006, Biavaschi, Facchini, Mayda and Mendola 2016) to changes in production technology due to the arrival of unskilled migrants (Lewis 2011, Dustmann et al. 2005). However, in countries where child labor is prevalent, child labor is likely to be another channel

of adjustment to migration.

Finally, child labor and schooling are generally substitutes and therefore the effect of immigration on children's time allocation is likely to have long-term welfare consequences on the economy.

This paper investigates the causal effect of internal migration within Brazil on child labor. We first present a theoretical model in which both adults and children can contribute to the household income, as is the case in many developing countries, to highlight the different channels through which immigration affects child labor. One key variable that affects the impact of migration on child labor is the skill composition of migrants. Assuming that children are substitutes of unskilled migrants, they compete with them in the labor market. If unskilled wages decrease as a consequence of unskilled migration, then the substitution effect tends to lower children's labor supply, while the income effect works in the opposite direction (Cigno and Rosati 2005, Manacorda and Rosati 2010). At the same time, unskilled migration also increases the return to education which tends to decrease the child labor supply. In contrast, children are not substitutes of skilled migrants. When skilled migration takes place, skilled wages are negatively affected, which decreases the return to education. Hence, schooling should decrease and child labor should increase. Using Brazilian Census data for the years 2000 and 2010, we then relate both local labor market conditions and child labor for children in the age range 10 to 14 to internal migration rates at the municipality level.

Child labor remains significant in Brazil though progress has been made over the past twenty years in the country – particularly through child labor law enforcement, monitoring systems and policy programs – and the share of children involved in any work activities has fallen from 10 percent for 10- to 14-year-olds in 1991 to 7 percent in 2010. Yet, data from the 2000 and 2010 Censuses shows that not all states in Brazil saw a drop in child labor, and some areas have faced rising rates again (e.g. Center-West and North regions).

We focus on *internal* migration for a couple of reasons. First, internal migration

is in general much larger than international migration, especially in middle and low-income countries where child labor is prevalent. There are no good statistics on the magnitude of internal migration, however an approximate estimate for the year 2005 is 760 million people (Bell and Charles-Edwards 2013). In comparison, the estimated number of international migrants worldwide was 230 million people in 2012. In developing countries, the difference in the scale of internal vs. international migration is even larger. For instance, in Brazil, between 2000 and 2010 about 20 percent of the native population moved across different municipalities within the country, while the stock of international migrants as a percentage of the population was only 0.4 in 2010. Second, from a theoretical point of view, one key variable that affects the impact of migration on child labor is the extent of their substitutability, which seems particularly likely in the case of internal migration.

Using individual level data on over 3 million children aged 10 to 14, we relate the individual-level variation in child labor to regional and intertemporal variation in the share of both unskilled and skilled internal immigrants to the child's municipality of residence, while controlling for both children's and parents' characteristics as well as year and municipality fixed effects. Since the main channel through which the effect of migration works in the theoretical model is the labor market, we also estimate a specification at the municipality level where we regress wages and employment rates of the adult population on the share of internal migrants by skill. In the latter specification we exploit the variation across municipalities, years and skills. One immediate concern, though, is that immigrants are not randomly distributed across municipalities but instead tend to cluster in specific locations. Thus, to address endogeneity both in the municipality and individual-level regressions, we implement an instrumental variable strategy. We follow Card (2001) and create a shift-share instrument which uses data on the distribution of immigrants across municipalities, by Brazilian state of origin, in 1980 (for which Census data are available). The instrument is based on evidence that networks are important determinants of migrants' location decisions (Munshi 2003). Our results suggest that this instrument is relevant and the first stage is strong. In addition, during the

1980's, Brazil slowly returned to democracy, after a period of dictatorship. Thus, the political and economic environment of the early 1980's is substantially different from that of the period we analyze, which lends credibility to the exclusion restriction.

At the aggregate level, we find that internal migration of a given skill-level in a given municipality has a negative and significant impact on corresponding wages. At the individual level, we find that child labor is affected by the socio-demographic characteristics of the child and household head, consistent with the existing literature. More importantly, our results show that child labor decreases as internal unskilled migration flows increase. In terms of the theoretical model of child labor, these findings suggest that the substitution-effect channel dominates the income-effect channel. In other words, when unskilled wages go down due to the arrival of unskilled internal migrants, households have less incentives to send children to work since children can earn less, although the household income has most likely decreased (since parents are likely to be unskilled as well). In addition, our results show that the skilled internal migration share has a positive and significant impact on child labor. The interpretation of this result is that, since the skilled internal migration share has a negative and significant impact on the skilled wage, then the return to education decreases, which in turn implies lower school attendance (which we observe in the data) and higher child labor as a consequence of skilled migration. Finally, we find that although the arrival of unskilled internal migrants in a municipality decreases child labor, schooling of children, if anything decreases (for the children who were working just a few hours a week). This is suggestive of some complementarity between child labor and education when education is costly.

The rest of the paper is organized as follows. Section 2 provides an overview of the related literature. Section 3 introduces the theoretical framework which guides the empirical analysis. Section 4 presents the data sources. Section 5 discusses our empirical strategy and presents our estimates. Finally, Section 6 gives our conclusions.

2 Related literature

Our paper is related to three strands of the literature.

First, and most importantly, it represents one of the first systematic analyses of the impact of immigration on child labor outcomes. Thus our paper is related to the large literature on child labor (among others, Basu and Van 1998, Baland and Robinson 2000, Edmonds 2006) and, in particular, on the incidence of this phenomenon in Brazil (see, for example, Manacorda and Rosati 2011, Cardoso and Souza 2004, and Emerson and Souza 2008). According to this literature, determinants of child labor are ultimately related to local labor market conditions, returns to schooling and poverty (Edmonds 2005). At the same time, a growing body of works has been studying the role of globalization and market integration in shaping child time allocation in low-income countries through their impact on the local labor market. Yet, while evidence on the impact of trade liberalization on the employment of child labor in developing countries is relatively abundant (e.g. Cigno et al, 2002; Edmonds and Pavcnik 2005a, 2005b, 2006), there are very few papers in the literature investigating the link between migration and child labor-market outcomes in either origin or destination countries. Among the few exceptions, Dinopoulos and Zhao (2007) use a general equilibrium-model to show that emigration of unskilled (skilled) workers increases (reduces) the incidence of child labor via a labor substitution effect. On the contrary, Epstein and Kahana (2008) consider both the cost of (temporary) migration and the benefit of receiving remittances, and argue that the household income effect would reduce labor supply, increase wages and allow both migrant- and non-migrant-households to take their children out of the labor force. Finally, Mendola and De Paoli (2015) use a cross-country approach to empirically show that international emigration from a large set of developing countries significantly reduces child labor in disadvantaged households at origin through changes in the local labor markets.

Second, our analysis is a contribution to the large body of works which study the labor market effect of migration, though mainly in developed countries. To

understand the wage effect of migration within Brazil, we follow the "spatial correlation" methodology, which exploits variation in the number of migrants across different geographical areas (see Card 1990, Hunt 1992 and Friedberg 2001 among others). Most of the studies in this tradition find only a limited impact of immigration on labor market outcomes (Friedberg and Hunt 1995), with one exception being the recent study by Glitz (2012) – which shows a sizable employment effect of immigration in Germany – and Biavaschi et al. (2016) which estimates a negative and significant impact on natives' labor market opportunities of international migration to South Africa. Biavaschi et al. (2016) is one of the rare papers on the labor-market impact of migration in a developing country (see also Gindling 2009, Wagner and Ozden 2014, Wagner and Del Carpio 2015). We contribute to this literature by showing that, in developing countries, an important dimension of adjustment of the local economy to unskilled immigrant inflows is through child labor.

Finally, since our paper provides evidence on the patterns and impact of internal migration in Brazil, it contributes to the literature on internal migration (see Molloy et al. (2011) and Wozniak (2010) for work on developed countries; and Lucas (1997), Fasani and Farrè (2013) and Beine and Coulombe (2014) for analysis of developing countries.

3 Theoretical framework

This Section reviews the expected impact of unskilled and skilled immigration on labor markets, as well as on child labor.

Labor demand. We start by the labor demand. Following Borjas (1999), we assume that the labor demand function for skill j, where $j = u$ stands for unskilled and $j = s$ stands for skilled, in a given region at time t is given by

$$w_{jt} = X_j L_{jt}^{\eta} \tag{1}$$

where w_{jt} is the wage for skill j, $\eta < 0$ is the factor price elasticity and L_{jt} is the total labor of skill j employed at time t.

Unskilled Labor supply. One contribution of our paper is to recognize that child labor and unskilled migrants complete for similar jobs, and that therefore unskilled migration is likely to impact child labor. The unskilled labor supply is composed of the supply of adult natives N_{ut} and migrants M_{ut}, but also includes the supply of child labor C_t.

Following Basu and Van 1998, we assume that adults and children labor are substitutes and that a unit of child labor is equivalent to γ units of unskilled labor, where $0 < \gamma < 1$. Hence, the unskilled labor supply in adult equivalent is given is

$$L_{ut} = N_{ut} + M_{ut} + \gamma C_t. \tag{2}$$

Adults receive the wage w_{jt} while children receive $w_{ct} = \gamma w_{jt}$ for their labor. Each native adult has one child. They live for two periods and have a unit of time in each period. To focus on child labor, assume that all adults are supplying their labor inelastically. In the first period, children divide their time between school, rest and labor. In the second period, children, who have now become adults, work and make decisions about their own children. We assume for simplicity that migrants are childless so that any child labor comes from the children of the natives.

Consider a family with an income, excluding children's earnings, of y and let w_c be the going child wage.

Parents decide on the labor supply of their children $\ell \in [0, 1]$ and their schooling $s \in [0, 1]$. The remaining time, denoted by $r = 1 - s - \ell$, is devoted to leisure and rest. When making this decision, parents take into account that the more their child goes to school the more skilled they become. If they have not gone to school, children, once adult, earn the unskilled wage w_u, but if they spend time s in school they will earn

$$w(s) = w_u + p(s)\Delta \quad ; \; \Delta \equiv \overline{w}'_s - w'_u \tag{3}$$

where $p(s) = s^{\alpha}$, $\alpha \in (0,1)$ and $\overline{w}'_s$ is an upper bound on the skilled wage in the next period and w'_u is the unskilled wage in the next period.

The cost of going to school $k(s)$ consists in a fixed cost $\kappa > 0$ and a constant marginal cost k per unit

$$k(s) = \kappa + ks. \tag{4}$$

Parents choose ℓ and s in $[0,1]$ to maximize the following expected utility

$$E_{\Delta} U(y + \ell w_c - k(s), 1 - s - \ell, w(s)) \tag{5}$$

where E_{Δ} represent the expectation over Δ, U is strictly increasing and concave in each term and the marginal utility of each of this term is infinite at 0. Assume also that $U_{12} \geq 0$ and $U_{13} \geq 0$, that is the utility of leisure and consumption are complementary and the utility of one's own consumption and one's child future earnings are complementary.

For any child who works $\ell > 0$, the first order conditions tells us that

$$E_{\Delta} U_1 w_c = E_{\Delta} U_2, \tag{6}$$

while the right hand side dominates for children who do not work.

Given the fixed cost of schooling, children who go to school spends at least a minimum amount of time in school. For interior solutions, we have:

$$E_{\Delta} U_1 k + E_{\Delta} U_2 = E_{\Delta} U_3 \ \alpha s^{-(1-\alpha)} \Delta \quad if \ s > 0. \tag{7}$$

From (6) and (7), we see that for children who both go to school and work

$$E_{\Delta} U_1 (k + w_c) = E_{\Delta} U_3 \ \alpha s^{-(1-\alpha)} \Delta \quad if \ \ \ell, s > 0. \tag{8}$$

An increase in w_u has the following different effects on the supply of child labor:

A substitution effect: $dw_c/dw_u = \gamma > 0$. An increase in the child wage makes labor relatively more attractive and increases the opportunity cost of schooling and leisure.

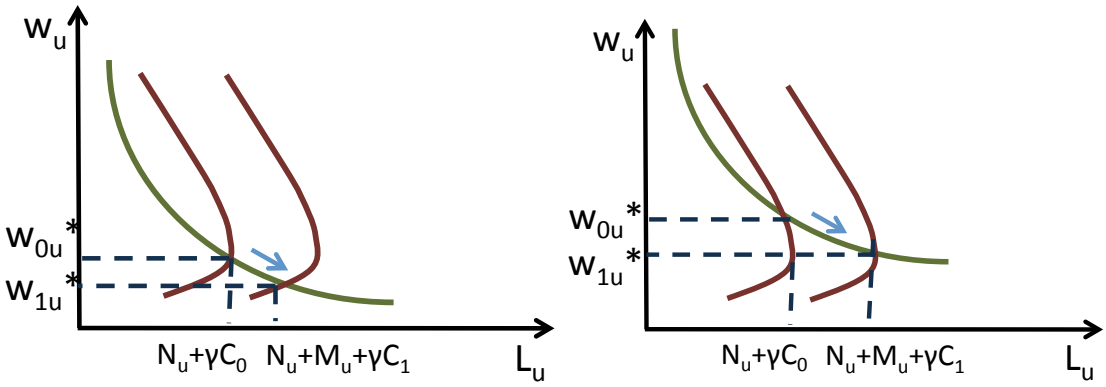
Two income effects: An increase in the child wage increases the value of the endowment in time of children. Nevertheless, $U_{12} \geq 0$ guarantees that this income effect is dominated by the substitution effect above. An increase in the child wage increases child labor.

However, for unskilled parents dy/dw_u is positive so that parental earnings increase. The parental income effects makes schooling and leisure relatively more attractive compared with child labor. In the presence of this income effect, the labor supply can be backward bending over some range of wages.

A return to school effect: $dw'_u/dw_u > 0$ and $d\Delta/dw_u < 0$. An increase in unskilled wage today should imply a higher unskilled wage tomorrow as well, thereby reducing the expected return to school. Unless, there are strong complementarities between child labor and schooling, this effect favors child labor and leisure at the cost of schooling.

Unskilled Wages. Even if the child labor supply is not increasing everywhere, the resulting labor supply in (2) and the labor demand (1) most likely intersect only once. This is illustrated in Figure 1. We see that in this case, an immigrant inflows – that pushes the labor supply by M_u to the right – decreases the equilibrium wage. In panel (a), the relevant part of the labor supply is increasing, so that child labor decreases as a result of the inflow of migrants and this dampens the wage response. In contrast, the labor supply is declining in panel (b) over the relevant range. In this case, child labor increases further amplifying the decrease in wages.

However, as shown by Basu and Van (1998), if the income effect is particularly strong it is theoretically possible to have multiple intersections between the labor supply and labor demand. In this case, there are multiple equilibria and the effect of unskilled migration on unskilled wages is ambiguous as the economy could



(a) Child labor decreases

(b) Child labor increases

Figure 1: The effect of unskilled migration on the unskilled labor market

potentially switch from one equilibrium to the next.

Skilled Labor supply. Children are not substitute for skilled labor. Hence, the supply of skilled labor is only composed of skilled native adults N_{st} and skilled migrants M_{st}:

$$L_{st} = N_{st} + M_{st}. \tag{9}$$

Skilled Wages. The equilibrium skilled wage is therefore such that

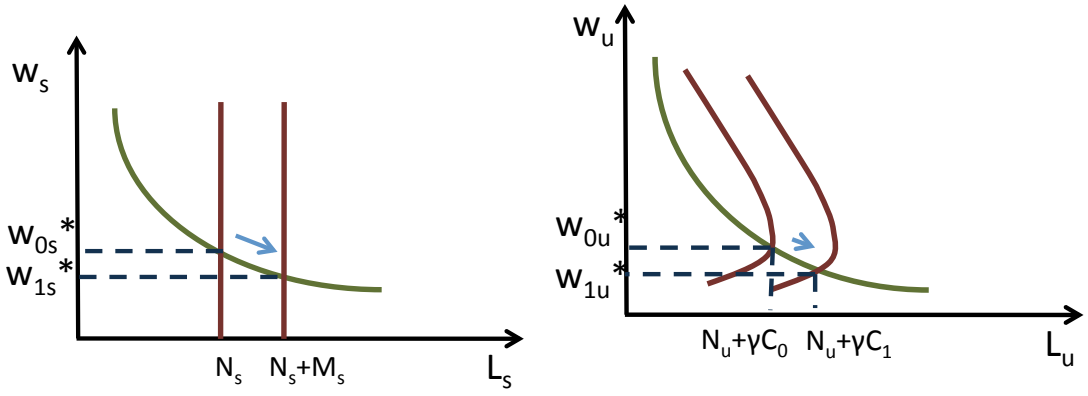
$$log(w_{st}) = log(X_s) + \eta log(N_{st} + M_{st}). \tag{10}$$

It follows that, if at time 0 there was only the native population, but time 1 sees an influx of immigrants (and no outflow of natives) then

$$log(w_{s1}) \approx log(w_{s0}) + \eta m_{s1}; \tag{11}$$

where m_{s1} is the share of migrants in the skilled population.

As illustrated in Figure 2 panel (a), more skilled immigration lowers the skilled wage.



(a) On the skilled market

(b) On child labor

Figure 2: The effect of skilled migration

Skilled Immigration on Child Labor. Finally notice that skilled immigration can affect child labor decision. We just saw that skilled immigration lowers the skilled wage. This reduces the return to schooling Δ and therefore reduces children education. Unless there are particularly strong complementarities between child labor and schooling or multiple equilibria, we expect child labor to increase and the unskilled wage to decrease. This is illustrated in Figure 2 panel (b).

4 Data

For our analysis we use data from two Censuses carried out in 2000 and 2010, by the Instituto Brasileiro de Geografia e Estatistica[1], which are publicly available online.[2] This dataset is a representative sample of more than 20 million people

[1]For our IV estimation, we also use data from the 1980 Census.

[2]See http://www.fflch.usp.br/centrodametropole. We do not employ Census data for the 1991 in our analysis because between the latter year and the 2000, about 1000 new municipalities were created in Brazil out of those already existing. Thus, since our definition of internal migration is based on people mobility across municipalities– as discussed in details in the main text below – the increase in the number of municipalities gives rise to an artificial increase in the migration

each year and comprises more than 3 million children between 10 and 14 years of age in 2000 and 2010.[3]

A wealth of information is collected in the Census data sets, including labor market outcomes and important individual-level characteristics. First, we know whether an individual was born in the municipality of current residence and whether (and when) she moved within the country. Following the literature on internal migration, we define as immigrants those individuals who moved between the two Censuses either across Brazilian states or across different municipalities within the same state of residence.[4]

We are looking at the working age (i.e. 16-55) population of a particular skill group i in municipality j at time t. Our main measure of immigration, denoted p_{ijt}, is the share of recently-arrived adults within that population. Let M_{ijt} be the number of internal migrants in skill group i in municipality j at time t and N_{ijt} represents the corresponding number of residents (non-migrants). Our measure of immigration is then $p_{ijt} = M_{ijt}/(M_{ijt} + N_{ijt})$. The level of skill, which we construct using information on the respondent's education, can only take on two values, skilled and unskilled. Specifically, an unskilled resident or migrant is defined as having up to primary school completed, while a skilled resident or migrant is defined as having completed at least some secondary schooling.[5] To sum up, our

rate which can bias our analysis.

[3]The IBGE sampling methodology is such that the 2000 data consists in a 10 % sample of the population within municipalities with an estimated population greater than 15,000 inhabitants and a 20% sample within the remaining municipalities. The 2010 sample consists of a 5% sample of the population in municipalities with estimated populations greater than 500,000; a 10 % sample in municipalities with estimated populations between 20,000 and 500,000; a 20% sample in municipalities with estimated populations between 8,000 and 20,000; a 33% sample in municipalities with estimated populations between 2,500 and 8,000; and a 50% in the remaining municipalities.

[4]We exclude from the analysis those born outside of Brazil, since international migrants represent a very small fraction of the population.

[5]Until 2006, the Brazilian education system used to have one year of literacy before 4–years of primary schooling. As of 2006, primary schooling encompassed the one year literacy by becoming a 5-year system. Yet, to construct a measure which is comparable across years, we define unskilled individuals as having up to primary education in all of our sample years.

focus is on internal, recent, migration of adults, who can be either skilled (more than primary education) or unskilled (up to primary education).

As for measures of labor market outcomes, we use information on each individual's wage, employment status and working hours. The hourly wage is defined as monthly earnings from the individual's occupations divided by hours of work. To construct the average employment rate and wage of each municipality in a given year, we restrict the sample to the resident (i.e. non-migrant) adult (i.e. age 16-55) labor force of that municipality and year.[6]

With respect to the dependent variable, we construct various measures of child labor-market outcomes, as the latter are highly heterogeneous and there is no measurement standard in the definition of child labor (Edmonds, 2005). First, we create a dummy variable which indicates whether a child works or not. This dummy equals 1 when the child works at least one hour per week and 0 otherwise. We also construct a more restrictive dummy variable equal to 1 when the child works at least twenty hours per week and 0 otherwise. Next, we use a continuous variable measuring the child's hours of work per week. Besides work, children can also go to school or remain idle. Thus, we further analyze the impact of migration on "school attendance" and being "idle." Leaving aside idle children, we decompose the child-labor and school attendance outcomes into three mutually exclusive categories/dependent variables, namely "child labor only" (i.e. at least one hour of work per week and no school attendance), "both work and school" and "school attendance only" (i.e. no labor).

Table 1 presents summary statistics of the main variables that we use in the empirical analysis. Panel A reports the incidence of child labor (according to the definition of the extensive and intensive margins described above) among resident (i.e. non-migrant) children of 10-14 years of age in Brazil. The share of resident

[6]Brazilians can work up to 65 for men and 60 for women. However, to retire on full pay most workers need only contribute for 15 years, so that most Brazilians retire startlingly early (at 54 on average for a man in the private sector, and just 52 for a woman). This is the reason we keep individuals aged 16 to 55 in our working age population).

children involved work activities for more than 20 hours per week slightly decreased from 5.4 percent to 4 percent between 2000 and 2010, while school attendance increased from 94 to 97 percent in the same years. Average hours of work span from 29 per week in 2000 to 21 in 2010. Among children who work, the majority also to school.

Panel B reports average immigration rates by skill. Over the period, there is a stock of long-term migrants within Brazil which account for about 43 percent of the native population, while around 20 percent of the native population migrated internally between the two Census years. Moreover, the share of skilled migrants (over the skill-specific total working-age population) is higher than the unskilled one, even though the former slightly decreases over the period while the latter remains stable. Yet, in the empirical analysis we fully exploit the large size of the two Census samples and the spatial dimension of internal migration by taking advantage of the heterogeneity in the distribution of domestic migrant and non-migrant workers across localities.

5 Empirical analysis

We are interested in assessing the impact of internal migration on child labor in Brazil. To do so, we first investigate the wage effect of internal migration in the adult labor market at the level of municipality. Next, we focus on children and estimate individual-level regressions of children outcomes as a function of internal migration shares.

Table 1: Summary Statistics

	2000	2010	Total
Child-level characteristics			
Male	0.51	0.51	0.51
Age	12.0	12.0	12.0
Child work (1+h/week)	0.069	0.068	0.068
Child work (20+h/week)	0.054	0.039	0.047
Hours/week	29.4	21.7	25.9
School attendance	0.945	0.965	0.954
Only school	0.887	0.903	0.894
Only work	0.010	0.006	0.008
School and work	0.058	0.061	0.059
Idle	0.043	0.027	0.036
Municipality-level characteristics			
Migration share	0.433	0.426	0.430
Migration share unskilled	0.458	0.447	0.453
Migration share skilled	0.416	0.412	0.414
Recent Migration share	0.209	0.200	0.204
Recent Migration share unskilled	0.200	0.195	0.197
Recent Migration share skilled	0.223	0.205	0.214

5.1 The labor market effect at municipality level

To study the labor market effect of internal migration within Brazil, we exploit the variation across about 4000 municipalities[7] in the distribution of internal migrant workers – of different skill levels – over time. Hence, we restrict the analysis to the working age population and estimate the following specification:

[7]In 2010, there are 5,565 municipalities in Brazil, about 1500 of which were created between 1980 and 2010. Since we use the distribution in 1980 of immigrants within the country as an instrumental variable for predicting actual immigration shares, we restrict the whole analysis to Brazilian municipalities that are stable between 1980 and 2010 (N=3931).

$$L_{ijt} = \beta_p p_{ijt} + \beta_x X_{ijt} + \gamma_{ij} + \delta_{it} + \eta_{jt} + \varepsilon_{ijt} \tag{12}$$

where the dependent variable L_{ijt} is a labor market outcome for resident workers in skill group i (2 skill groups: skilled and unskilled), municipality j (3931 municipalities), and Census year t (2 years); p_{ijt} is the main variable of interest. Controls include skill-municipality specific fixed effects γ_{ij}, skill-year fixed effect fixed effects and municipality-year fixed effects δ_{it}. These fixed effects control for differences in labor market outcomes across skill groups, local labor markets and over time. Throughout, standard errors are clustered at the skill-municipality level. Note that the labor market outcomes (L_{ijt}) we analyze are the (log of) hourly wage and the employment rate.

An immediate concern is that the fixed effects estimates may suffer from endogeneity bias due, in particular, to reverse causality. Indeed, it is widely recognized that immigrants are not distributed randomly but instead tend to cluster in specific (e.g. economically stronger) locations. At the same time, it is well known that immigrants tend to settle in geographic areas where earlier migrants from the same origin have established themselves (Bartel 1989; Munshi 2003). Thus, we follow Card (2001) and implement an instrumental variable strategy based on the idea of migrant networks. Assume that the total number of internal migrants from a given origin Brazilian state is independent from the labor–demand conditions prevailing in any particular municipality of the country. Then, we can decompose the actual inflow of internal migrants from a given source state to a municipality into an exogenous supply component – based on the total number of internal migrants from the given source state and the share of internal migrants from that state who went to that municipality at an earlier period of time (in our case 1980) – and a residual component – that reflects short term fluctuations from the long term patterns. Card's shift-share instrument is based on the idea that the exogenous supply component represents the supply shifter that can be used as an instrumental variable.

More precisely, let $\widetilde{M}_{iot}$ be the number of immigrants of skill i from source state o at time t,[8] and λ_{oj} be the share of immigrants from source state o who were observed living in municipality j at an earlier period of time. Our shift–share instrument is then

$$SS_{ijt} = \sum_{o} \widetilde{M}_{iot}\lambda_{oj}, \tag{13}$$

where to address the possible concern that the total number of migrants from a given state may be correlated with local conditions at the skill/municipality ij level, we omit the contribution of skill/municipality ij to $\widetilde{M}_{iot}$ (Cortes and Pan, 2013) To construct λ_{oj} we use information from the 1980 Census. This is so as during the 1980's Brazil slowly returned to democracy, after a period of dictatorship. Thus, the political and economic environment of the early 1980's is substantially different from that of the period we analyze, which lends credibility to the exclusion restriction.

The results of the analysis of the labor-market impact of internal migration are reported in Table 2. We find that, both in the OLS and IV specifications, internal migration of a given skill-level has a negative impact on corresponding labor market outcomes. In our preferred IV specifications, a 10 percent increase in the share of migrants in a given skill-municipality labor market cell decreases the resident adult workers' corresponding wages by 8 percent and employment rate by 5.7 percent.

Overall, the strong and negative impact of internal migration on residents' wages may in turn affect child labor-market outcomes, as we investigate in what follows.

[8]This is the product of number of immigrants from source state o at time t and the fraction of internal migrants that in year t belong to skill group i.

Table 2: Labor market effect of internal migration on adult residents.

	Log-wage	Employment rate
	(1)	(2)
OLS results		
Immigration share	-0.297**	-0.119***
	(0.14)	(0.03)
R-squared	1.00	0.99
N	15724	15724
Fixed effects	Y	Y
IV results		
Immigration share	-0.814**	-0.575***
	(0.36)	(0.08)
R-squared	1.00	0.99
N	15724	15724
Fixed effects	Y	Y
First-stage results	Immigration share	
IV	0.324***	
	(0.04)	
F-stat	65.97	
	0.00	
Fixed effects	Y	

Notes: Number of skill-municipality cells is 7,862. The estimation sample includes the adult working age (16-55) population. Immigration share is measured over total population (residents and migrants). The skill level is measured on the basis of two categories, i.e. those with less and more than primary education completed. Fixed effects (FE) include skill-municipality, skill-year and municipality-year fixed effects. Robust standard errors clustered at skill-municipality level in parentheses under the coefficients. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

5.2 Child labor estimates at the individual level

In order to empirically assess the impact of internal migration on child labor outcomes, we use data on more than three million Brazilian children aged 10 to 14

and estimate the following child-level regression:

$$CO_{ijt} = \beta_p p_{jt} + \beta_x X_{ijt} + r_j + q_t + \varepsilon_{ijt} \tag{14}$$

where CO_{ijt} is the outcome variable for child i in municipality j and Census year t and p_{jt} is the main variable of interest, i.e. the immigration share in municipality j and year t. Controls include a vector of municipality and year fixed effects. X_{ijt} is a vector of individual-level control variables, which include: the child's age, gender, racial background, location in an urban area, household size, whether the head in the child's household is a male and, finally, the household head's educational attainment.

The child outcomes that we analyze include child labor (based on either one hour of work per week or 20 hours per week), school attendance, hours of work, child labor only, school attendance only, both work and school and, finally, idle. OLS results are reported in Table 5.2 while our preferred IV findings are in Table 5.2.

Table 3: The labor market effect of internal migration on children: OLS results at the child level

	Child Labor (1+h/week)	Child Labor (20+h/week)	Hours of work	School Attendance	School only	Work only	School & Work	Idle
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Unskilled immigration share	-0.018	-0.083***	11.572***	0.188***	0.161***	-0.045***	0.027	-0.143***
	(0.02)	(0.02)	(3.48)	(0.02)	(0.03)	(0.01)	(0.02)	(0.02)
Skilled immigration share	0.050*	0.075***	-4.128	-0.128***	-0.143***	0.035***	0.015	0.093***
	(0.03)	(0.02)	(3.53)	(0.02)	(0.03)	(0.01)	(0.02)	(0.02)
Age	0.020***	0.016***	1.678***	-0.011***	-0.027***	0.003***	0.016***	0.008***
	(0.00)	(0.00)	(0.03)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Male	0.030***	0.024***	0.870***	-0.006***	-0.030***	0.005***	0.025***	0.001**
	(0.00)	(0.00)	(0.10)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Urban residence	-0.075***	-0.051***	1.846***	0.024***	0.089***	-0.009***	-0.066***	-0.014***
	(0.00)	(0.00)	(0.14)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Family size	0.003***	0.003***	0.380***	-0.004***	-0.006***	0.000***	0.002***	0.003***
	(0.00)	(0.00)	(0.02)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Male hh head	-0.001***	-0.002***	-1.011***	0.010***	0.010***	-0.001***	0.000	-0.008***
	(0.00)	(0.00)	(0.10)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Hh head years of schooling	-0.001***	-0.001***	-0.343***	0.003***	0.004***	-0.000***	-0.001***	-0.002***
	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
N (millions)	3.39	3.39	0.23	3.39	3.39	3.39	3.39	3.39
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Year and Mun FE	Y	Y	Y	Y	Y	Y	Y	Y

Notes: N=3,146,808 (number of municipalities 3938). The estimation sample includes resident children of age 10-14. Unskilled (skilled) immigration share is measured over the total unskilled (skilled) total population. Child labor is defined on the basis of hours of work per week. Individual controls include those reported in the table and individual race categories. Robust standard errors clustered at municipality-level in parentheses under the coefficients. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: The labor market effect of internal migration on children: IV results at the child level

	Child Labor (1+h/week)	Child Labor (20+h/week)	Hours of work	School Attendance	School only	Work only	School & Work	Idle
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Unskilled immigration share	-0.160**	-0.283***	19.768	0.691***	0.684***	-0.167***	0.007	-0.524***
	(0.07)	(0.06)	(13.56)	(0.08)	(0.08)	(0.02)	(0.06)	(0.06)
Skilled immigration share	0.241**	0.316***	-5.544	-0.769***	-0.803***	0.207***	0.034	0.563***
	(0.11)	(0.11)	(13.62)	(0.12)	(0.15)	(0.05)	(0.09)	(0.08)
Age	0.020***	0.016***	1.677***	-0.011***	-0.027***	0.003***	0.016***	0.008***
	(0.00)	(0.00)	(0.03)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Male	0.030***	0.024***	0.871***	-0.006***	-0.030***	0.005***	0.025***	0.001**
	(0.00)	(0.00)	(0.10)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Urban residence	-0.075***	-0.051***	1.845***	0.023***	0.089***	-0.009***	-0.066***	-0.014***
	(0.00)	(0.00)	(0.14)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Family size	0.003***	0.003***	0.381***	-0.004***	-0.006***	0.000***	0.002***	0.003***
	(0.00)	(0.00)	(0.02)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Male hh head	-0.001***	-0.002***	-1.011***	0.010***	0.010***	-0.001***	0.000	-0.008***
	(0.00)	(0.00)	(0.10)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Hh head years of schooling	-0.001***	-0.001***	-0.342***	0.003***	0.004***	-0.000***	-0.001***	-0.002***
	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
N (millions)	3.39	3.39	0.23	3.39	3.39	3.39	3.39	3.39
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Year and Mun FE	Y	Y	Y	Y	Y	Y	Y	Y

Notes: N=3,146,808 (number of municipalities 3,938). The estimation sample includes resident children of age 10-14. Unskilled (skilled) immigration share is measured over the total unskilled (skilled) total population. Child labor is defined on the basis of hours of work per week. Individual controls include those reported in the table and individual race categories. Robust standard errors clustered at municipality-level in parentheses under the coefficients. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Results show that child labor is affected by the socio-demographic characteristics of the child and household head, consistent with the existing literature. In particular, older, male, black children are more likely to work (results on ethnic groups available on demand). Moreover, those living in urban areas, in smaller families with an educated household head are less likely to be employed. More importantly, our results show that child labor decreases as internal unskilled migration flows increase. Ceteris paribus, a 10 percent increase in low-skilled immigration share generates 1.6 percentage points decrease in the probability that children work in any activity and a 2.8 percentage points reduction of child employment of more than 20 hours per week. In terms of the theoretical model of child labor, these findings suggest that the substitution-effect channel dominates the income-effect channel. In other words, when unskilled wages decrease due to the arrival of unskilled internal migrants, households have less incentives to send children to work since children can earn less, although parental earnings have most likely decreased (since parents are likely to be unskilled as well). In addition, our results show that the skilled internal migration share has a positive and significant impact on child labor. A 10 percent increase in the share of skilled migrants in a municipality leads to a 2.4 percentage points increase in the children's likelihood to work (the probability to work more than 20 hours increases by 3.1 percentage points). This result is consistent with the fact that, since the skilled internal migration share has a negative and significant impact on the skilled wage, then the return to education decreases, which in turn implies higher child labor and lower school attendance. In fact, we next estimate the consequences of both skilled and unskilled immigration on child schooling (column 4). Consistently, we find that higher unskilled (skilled) immigration share has a positive (negative) and significant impact on child school attendance.

Table 5: IV EFFECTS OF INTERNAL MIGRATION ON CHILDREN BY SKILL OF THE HOUSEHOLD HEAD

	Child Labor (1+h/week)	Child Labor (20+h/week)	Hours of work	School Attendance	School only	Work only	School & Work	Idle
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PANEL A: Low-skilled Household Head								
Unskilled immigration share	-0.110	-0.292***	9.313	0.836***	0.739***	-0.207***	0.097	-0.629***
	(0.10)	(0.09)	(18.19)	(0.11)	(0.11)	(0.04)	(0.08)	(0.08)
Skilled immigration share	0.234	0.339**	1.860	-0.917***	-0.898***	0.253***	-0.019	0.664***
	(0.17)	(0.16)	(16.55)	(0.17)	(0.21)	(0.08)	(0.12)	(0.11)
N (millions)	2.08	2.08	0.18	2.08	2.08	2.08	2.08	2.08
PANEL B: High-skilled Household Head								
Unskilled immigration share	-0.024	-0.045	36.905	0.184***	0.174***	-0.033***	0.009	-0.150***
	(0.05)	(0.03)	(25.93)	(0.03)	(0.06)	(0.01)	(0.04)	(0.03)
Skilled immigration share	0.083	0.098**	12.077	-0.180***	-0.219***	0.043***	0.039	0.137***
	(0.06)	(0.04)	(29.39)	(0.03)	(0.07)	(0.01)	(0.05)	(0.03)
N (thousands)	639	639	18	639,145	639	639	639	639
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Year and Mun FE	Y	Y	Y	Y	Y	Y	Y	Y

Notes: The estimation samples include resident children of low-skilled (less than primary educated) household head (Panel A) and high-skilled household head (Panel B). Unskilled (skilled) immigration share is measured over the total unskilled (skilled) total population. Child labor is defined on the basis of hours of work per week. Individual controls include those reported in the previous table. Robust standard errors clustered at municipality-level in parentheses under the coefficients. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Moreover, by focusing on the last four columns where we report results on mutually exclusive dependent variables, we find evidence that the reduction of child labor due to unskilled immigration is coming significantly from a drop in the fraction of children who only work, while there is a significant increase in kids who only go to school. The latter is also due to a reduction in idle children. The opposite is true with respect to skilled migration upon which children quit school to work only and (mostly) to be idle.

Finally, Table 5.2 splits the sample according to the education of the head of the household. Would the skill specific parental income effect discussed in Section 3 dominate, we would expect a reversal in the sign of the effect of skilled and unskilled immigration shares in Panel B. Instead the results look very similar though much smaller in magnitude. This suggest that the substitution and return to school effects dominates though these effects are weaker for households with an educated head as they are likely to be richer.

6 Conclusions

In this paper we have analyzed the impact of internal migration within Brazil on child outcomes. The main channel through which the effect of migration works, in the theoretical model, is the labor market. Thus we complement the individual-level analysis of child outcomes with the empirical investigation of the labor-market effect of internal migration.

Bibliography

Bartel, A. P. (1989). *Where do the new U.S. immigrants live?* Journal of Labor Economics 7, 371-391.

Basu K. (1999). *Child Labor: Cause, Consequence and Cure, with Remarks on International Labor Standards.* Journal of Economic Literature 37.

Basu K., Van P. (1998). *The Economics of Child Labor.* American Economic Review, 88(3), 412-27.

Baland J.-M. and J.A. Robinson (2000). *Is Child Labor Inefficient?* Journal of Political Economy, University of Chicago Press, 108(4), 663-679.

Beine M. and S. Coulombe (2014). *Immigration and Internal Mobility in Canada.* CESifo Working Paper Series 4823, CESifo Group Munich.

Bell M. and E. Charles-Edwards (2013). *Cross-National Comparisons of Internal Migration: An Update of Global Patterns and Trends* United Nations Department of Economic and Social Affairs, Population Division, Technical Paper No. 2013/1.

Biavaschi C., G. Facchini, A.M. Mayda and M. Mendola (2016).*South-South migration and the labor market: Evidence from South Africa*, working paper.

Blau F.D. and Kahn L.M. (2012). *Immigration and the Distribution of Incomes.* NBER Working Paper No. 18515.

Borjas G.J. (1999). *The economic analysis of immigration*, Handbook of Labor Economics, edition 1, vol. 3, chapter 28, 1697-1760.

Borjas G.J. (2003). *The Labor Demand Curve is Downward Sloping: Reexamining the Impact of Immigration on the Labor Market.* The Quarterly Journal of Economics 118 (4), 1335-1374.

Borjas, G. J. (2006). *Native international migration and the labor market impact of immigration.* Journal of Human Resources 41, 221-258.

Borjas, G. J. (2014). *Immigration Economics.* Harvard University Press.

Card, D. (1990). *The impact of the Mariel boatlift on the Miami labor market.* Industrial and Labor Relations Review 43, 245-257.

Card D. (2001). *Immigrant Inflows, Native Outflows, and the Local Labor Mar-*

ket Impacts of Higher Immigration. Journal of Labor Economics, University of Chicago Press, vol. 19(1), 22-64.

Cardoso E. and A. Souza (2004). *The Impact of Cash Transfers on Child Labor and School Attendance in Brazil.* Vanderbilt University Department of Economics Working Papers 0407.

Cigno A., F.C. Rosati , Guarcello (2002). *Does globalization increase child labor?*, World Development 30, 1579-1589.

Cigno A., F.C. Rosati (2005). *The Economics of Child Labor*, Oxford University Press

De Paoli A. and M. Mendola (2015). *International Labor Mobility and Child Work in Developing Countries.* The World Economy, forthcoming.

Dinopoulos E., Zhao L. (2007). *Child Labor and Globalization.* Journal of Labor Economics, 25(3), 553-580.

Dustmann C., U Schönberg and J. Stuhler (2016). *The Impact of Immigration: Why Do Studies Reach Such Different Results?,* Journal of Economic Perspectives, American Economic Association, vol. 30(4), 31-56.

Dustmann C., T. Hatton and I. Preston (2005). *The Labour Market Effects of Immigration*, The Economic Journal 115, 297?299

Edmonds E. (2005). *Does Child Labor Decline with Improving Economic Status?* Journal of Human Resources 40(1).

Edmonds E. (2006). *Child labor and schooling responses to anticipated income in South Africa.* Journal of Development Economics 81(2), 386-414.

Edmonds E. (2008). *Child Labor.* Handbook of Development Economics, Elsevier.

Edmonds E. and N. Pavcnik (2006). *International trade and child labor: cross-country evidence.* Journal of International Economics, 68 (1), 115-140.

Edmonds E and N. Pavcnik (2005a). *The Effect of Trade Liberalization on Child Labor.* Journal of International Economics 65(2), 401-419.

Edmonds E. and N. Pavcnik (2005b). *Child Labor in the Global Economy.* Journal of Economic Perspectives, 18(1), 199-220.

Emerson P. and A. Portela Souza (2011). *Is Child Labor Harmful? The Impact of*

Working Earlier in Life on Adult Earnings. Economic Development and Cultural Change, University of Chicago Press, vol. 59(2), 345 - 385.

Epstein G. and N. Kahana (2008). *Child Labor and Temporary Emigration.* Economics Letters, 99(3), 545- 548.

Fasani, L. and F. Farrè (2013). *Media exposure and internal migration – Evidence from Indonesia.* Journal of Development Economics 102(C), 48-61.

Friedberg, R. (2001). *The impact of mass migration on the Israeli labor market.* Quarterly Journal of Economics 114, 1373-1408.

Friedberg, R. and J. Hunt (1995). *The impact of immigrants on host country wages, employment and growth.* Journal of Economic Perspectives 9, 23-44.

Gindling, T. (2009). South-South migration: The impact of Nicaraguan immigrants on earnings, inequality and poverty in costa rica. World Development 37, 116-126

Glitz, A. (2012). *The labor market impact of immigration: A quasi-experiment exploiting immigrant location rules in Germany.* Journal of Labor Economics 30, 175-213.

Hunt, J. (1992). *The impact of the 1962 repatriates from Algeria on the French labor market.* Industrial and Labor Relations Review 45, 556-572.

Lewis, E. (2011). *Immigration, Skill Mix, and Capital Skill Complementarity.* The Quarterly Journal of Economics, Oxford University Press 126(2), 1029-1069.

Lewis, E. and Peri G. (2015). *Immigration and the Economy of Cities and Regions.* Handbook of Regional and Urban Economics, Elsevier.

Lucas, Robert E B, (1987). *Emigration to South African's Mines.* American Economic Review, American Economic Association 77(3), 313-30.

Manacorda, M. and Rosati, F. (2010). *Local labor Demand and Child Labor.* Research in Labor Economics, 31.

Molloy, R., C. Smith and A. Wozniak (2011). *Internal Migration in the United States.* Journal of Economic Perspectives, American Economic Association 25(3), 173-96.

Munshi, K. (2003). *Networks in the Modern Economy: Mexican Migrants in the U. S. Labor Market.* The Quarterly Journal of Economics (2003) 118 (2).

Ozden C. and M. Wagner (2014). *Immigrant versus Natives? Displacement and Job Creation.* World Bank Policy Research Working Paper WPS6900.

Smith, C. (2012). *The Impact of Low-Skilled Immigration on the Youth Labor Market.* Journal of Labor Economics, 30(1), 55-89.

Wagner M. and X. Del Carpio (2015). *The Impact of Syrian Refugees on the Turkish Labor Market.* World Bank Policy Research Working Paper WPS7402.

World Bank (2011). *Migration and Remittances Factbook.*

Wozniak, A. (2010). *Are college graduates more responsive to distant labor market opportunities?* Journal of Human Resources 45, 944-970.