Trade Shocks and Child Labor: Evidence from Brazil *

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Abstract

This paper examines the medium- and long-term effects of Brazil's tariff reform in the 1990s on schooling and child labor. We exploit differences across industries in the adult and child employment composition in an empirical strategy that allows us to identify distinct effects of local economic shocks on household decisions. Relative to the national trend, we document that regions specialized in adult-specific industries experienced lower growth in schooling and higher increases in child labor, especially in paid works. Regions specialized in child-specific industries observed opposite effects. We provide evidence that these results translated into persistent effects on human capital formation and a structural transformation in employment composition.

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1 Introduction

The analysis of children's time allocation in the context of a household decision problem has received enormous attention from the human capital literature over the past decades.[1] Despite considerable advances, a more proper understanding of the mechanisms linking economic shocks and child labor is still needed. The connection between aggregate income shocks and household decisions is far from simple. In equilibrium, an economic shock (e.g., a decline in the price for a particular commodity produced regionally) causes numerous simultaneous changes in the labor market, thereby triggering different labor supply responses from both adults and children.

Perhaps not surprisingly, the extensive empirical literature on the impact of aggregate income shocks on child labor and educational attainment has obtained mixed results. On the one hand, many studies support a negative relationship between income shocks and child labor. For instance, **?** show that negative agricultural shocks increase the number of hours worked by children and reduce school enrollment in Tanzania. **?** find that higher rice prices due to the end of export quotas in Vietnam are associated with large declines in child labor. **?** examine the impact of tariff reform in rural India in the 1990s and find that schooling increases less in districts more exposed to trade liberalization. Interestingly, they find suggestive evidence that families reduce school enrollment to save schooling costs and that the burden of helping their families cope with poverty falls disproportionately on girls.

On the other hand, several other empirical studies, particularly those focusing on Latin American countries, find a positive relationship between income shocks and child labor. For instance, **?** exploits variations in the value of coffee production at the municipality level to show that periods of economic growth lead to more child labor and less schooling. Similarly, **?** shows that child labor in Brazil also increases in urban areas as local labor market opportunities improve while school attendance decreases. **?** also finds that cohorts in coffee cultivation areas in Colombia who faced higher world coffee prices during childhood completed fewer years of schooling and subsequently have lower adult earnings scores. Focusing on investments in human capital, **?** document that the Indonesian crisis in 1998 was associated with significant reductions in school enrollments.

How can one make sense of this plethora of seemingly contradictory results? In a relevant contribution to the literature, **?** argue that the evidence uncovered by the empirical literature is entirely consistent with theory once one realizes that different types of income shocks bring together different combinations of income and substitution effects.

[1] See **?** for a comprehensive review of the literature.

Following **?**, the authors propose a simple partial equilibrium model that captures essential aspects of the household decision-making problem. They show that positive economic shocks that are mostly related to changes in the households' full income cause an "income effect" and therefore should lead to less child labor and more schooling. Conversely, positive economic shocks that are mostly related to changes in the opportunity cost of children's time cause a "substitution effect" and should lead to more child labor and less schooling. In practice, however, it is difficult to separately identify and distinguish between these two effects since, in general, economic shocks are associated with both of them simultaneously. Thus, a better understanding of the transmission channels through which shocks affect household decisions is needed.

This paper studies the medium- and long-term effects of the adjustment costs of a trade liberalization policy on schooling and work decisions in a general equilibrium framework. Specifically, we examine these issues in the context of Brazil's trade reform in the 1990s. In a move toward openness, the federal government significantly reduced import tariffs on different products between 1990 and 1995, promoting an increase in competition from international markets, especially for the most protected industries. As in **?** and **?**, we exploit cross-section variation in the pre-liberalization industrial composition across Brazilian regions and differences across industries in the magnitude of tariff declines over time to investigate the effects of tariff cuts on child time allocation. By focusing on differences across regions in changes in tariff protection, we thus investigate how schooling and child labor changes differ in regions more specialized in harder-hit industries relative to regions with a relevant fraction of workers employed in industries less affected.

We complement the literature by exploiting differences in the initial patterns of industrial specialization to identify whether shocks to returns to adult and child labor have distinct impacts on household decisions. In particular, children enjoy a comparative advantage in specific industries. Hence, tariff cuts of a given magnitude will affect children and adults differently depending on the initial industry mix of a given region. Following **?**, we extend the traditional shift-share strategy as follows: first, we calculate a child labor intensity index for each tradable industry measured by the ratio of child to adult workers in each region. Next, we construct two disaggregated tariff shock measures, one for adult-specific industries and one for child-specific industries. These measures allow us to exploit distinct effects of tariff cuts on schooling and child labor for different industry compositions.

Our findings suggest differential effects of trade liberalization on schooling and child labor. We find that children living in regions specialized in adult-specific industries left school to improve family incomes through paid employment, whereas school attendance

increased faster as child-specific industries lost protection. A region with a 10 p.p. change in adult industry tariff shock experienced a 9.9 p.p. increase in schooling between 1991 and 2000, approximately 37 percent below the national average. In the 1991-2010 horizon, schooling increased almost 50 percent below the national trend. The same shock is associated with slower decreases in the fraction of children working without attending school over these periods (4.07 p.p. and 4.89 p.p., respectively). On the other hand, school attendance increased more in regions that experienced higher tariff declines in child-specific industries. A change in child industry shock of 0.3 p.p. would have led to an increase of 1.9 percentage points in the medium run (2000) and 2.78 p.p. in the long run (2010). To put these numbers in perspective, they correspond to around 12 and 14 percent increase above the national trend, respectively. The evidence on work activities mirrors these findings on schooling. Specifically, the share of children who only work was reduced by 0.55 p.p. between 1991 and 2000 and by 0.80 p.p. over 1991-2010. The declines are largest for those children who work and attend school, which represent the most significant share of child workers.

We document that the consequences of trade shocks go beyond the individuals directly affected by them. For instance, we provide evidence on how these costs might be transmitted for future generations by showing the persistent effects of the trade reform on human capital formation. Overall, the results indicate that trade reform had reduced educational attainment in regions specialized in adult-intensive industries. By 2010, high school dropout increased almost 38 percent above the national average with similar deterioration in the average years of schooling. Finally, we present evidence on how these differences in schooling trends translated into subsequent labor market outcomes in adulthood by documenting changes in local employment composition across sectors in harder-hit regions. Formal employment has deteriorated in regions exposed to shocks in adult-specific industries, and labor has reallocated from manufacturing to agriculture and services activities. On the other hand, the exposure to the shock on child industries has led to better employment opportunities in manufacturing industries, increased earnings, and relative increases in formal employment.

This study contributes to the literature by investigating the long-term trends in child labor and schooling. Our empirical analysis combines four waves of the Brazilian Demographic Census from 1980 to 2010, while previous work on Brazil has focused mostly on short-term or cyclical changes in child labor (**???**). Most closely related to our paper is **?** who exploits the 1991 Indian tariff reform to examine the impact of losing tariff protection on children's activities. The authors propose a strategy to identify income and substitution effects by computing disaggregated tariff measures. To do this, they classify crops in the Indian rural areas that are the most and least child labor-intensive using

household survey data. The advantage of our strategy, however, is twofold. First, it does not focus solely on agricultural activities by exploiting shocks in all industries, especially in the manufacturing sector. Second, we directly exploit the geographical distribution of working children across Brazilian regions by using censitary data. The large sample sizes (between 1.9 and 3.4 million children per year) allow us to obtain precise estimates of child employment by industry and region that could not be obtained using typical household surveys.

Another related work is **?**, which documents a faster decrease in child labor in districts that were relatively more exposed to Indonesia's trade liberalization in the 1990s. The authors also provide indirect evidence that this effect was driven by positive income effects for the poor. **?** documents large increases in U.S. high school graduation rates in the labor markets most affected by import competition. Using variation in the timing of export manufacturing plant openings across local regions in Mexico, **?** also studies the impacts of globalization on the labor force and finds higher school dropout rates due to the increased job market opportunities. Finally, this paper also relates to the growing literature on the effects of trade on local labor markets (**???????**).

The remainder of the paper is organized as follows. Section 2 briefly describes the Brazilian trade reform, the child labor in Brazil, and data. Section 4 describes the measures of local trade shocks and the empirical strategy. Section 5 presents our main results on child labor and schooling. Section 6 concludes.

2 Institutional Background

2.1 Brazilian Trade Reform of the 1990s

For more than five decades since the 1930s, Brazil pursued an active state-led industrialization policy based on an import substitution strategy and a complex system of protection against foreign competition. In addition to the high nominal tariffs, a protective structure consisting of non-tariff barriers and special regimes was in place, which included lists of banned products, quantity controls, and government procurement restrictions (**?**). By the mid-1970s, the Brazilian industrialization policy started showing signs of being both financially and fiscally unsustainable and, throughout the 1980s, the country experienced a succession of economic crises and mounting social problems.[2] In this context, the election of Fernando Collor de Mello in 1990 marks a shift towards a more liberal approach to economic policy-making.

[2]The 1980s are known in Brazilian history as the "lost decade".

In a move towards greater transparency, the Collor administration unexpectedly implemented in 1990 a reform that eliminated all non-tariff barriers, replacing them with higher import tariffs chosen to keep the overall level of protection unchanged.[3] Importantly, from that moment on tariffs started reflecting the actual degree of protection received by each industry, becoming the main instrument of trade policy.[4] Between 1990 and 1995, the trade liberalization process gained momentum, with average nominal tariffs declining from 30.5% to 12.8% and remaining relatively constant thereafter (Figure A1). In Figure 1a we plot the percentage change in tariffs by industry from 1990 to 1995, measured by the variation in ln(1+tariff). Note that there is a substantial degree of heterogeneity in the size of reductions across industries, with tariffs declining by about 30 percentage points in Rubber and Apparel, but only by about 3 percentage points in Petroleum, Gas, and Coal − and in Agriculture tariffs actually increased slightly.

Another important goal of the trade liberalization reform of the early 1990s was to reduce the cross-industry variation in tariffs aiming to minimize economic distortions (**?**). Indeed, consistently with this objective, the dispersion of protection across industries fell substantially between 1990 and 1995, with the standard deviation of tariffs dropping from 14.9 percentage points to 7.4 percentage points. Moreover, crucial to the empirical strategy employed in this study, the most protected industries before the reform experienced the largest cuts (**?**). As shown in Figure 1b there is a strong negative correlation (−0.90) between tariff changes and pre-liberalization tariff levels imposed decades earlier (**?**). This pattern alleviates potential concerns that tariff cuts might have been influenced by industry-specific conditions.

2.2 Child Labor in Brazil

Child labor is still a major problem in Brazil − especially in light of the fact that basic education and human capital have been repeatedly shown to be key determinants of social and inter-generational mobility. As we report in Panel A of Table 1, although the percentage of children who work has been steadily declining since the 1980s, in 2010 approximately 5.5% of the children aged 10 between 14 still worked in either paid or unpaid jobs. This amounts to more than 930,000 children participating in the labor market in a period of their lives which is considered crucial for the development of essential cognitive and social skills. Moreover, conditional on working, in 2010 about 46% of the children were employed in paid jobs, suggesting that a significant fraction of children

[3]This process is known as "tariffication".

[4]For a detailed description of the trade liberalization process in Brazil, see **?**, **?** and **?**.

work in order to supplement their household's income.

In Panel B of Table 1, we show that the proportion of children who work is considerably larger in the poorer and more rural regions of the country, defined respectively as the microregions below the median in terms of average household income and above the median in terms of percentage of rural population. Furthermore, not only is the level of child labor consistently larger in those regions, but also the rate of reduction in child labor has been smaller in those regions during the period of our analysis. Indeed, from 1980 until 2010, the proportion of children who work decreased by about 67% in urban areas, but only by about 48% in rural areas. Also from Panel B of Table 1, it is possible to note that the share of child labor is smallest in the richer states of the South-East, but is otherwise distributed fairly evenly across the other regions of the country. Moreover, focusing on the subsample of children who work, we show that child labor is significantly more prevalent in the agricultural and extractive sectors, as compared to the manufacturing and non-tradable sectors. Specifically, conditional on working, approximately 52% of the children were employed in the agriculture and extractive sectors in 2010, whereas 34% and 7.2% were employed in the non-tradable and manufacturing sectors, respectively.

In Figure A2a we take a closer look at the intensity of child labor by sector by reporting the ratio of child to adult labor in each industry using Census data for 1991, the baseline period for our empirical analysis. The figure reveals the existence of substantial heterogeneity across industries, with the most child-intensive industries belonging to the agricultural sector, as expected. For instance, cotton, tobacco, sugar cane and coffee employ disproportionately more children than other industries. In the manufacturing sector, footwear, non-metallic mineral manufacturing, textiles, wood products, apparel and furniture industries are particularly intensive in child labor. Finally, in Figure A2b we show that there exists a substantial correlation between child labor intensity and labor informality, further reinforcing the idea that children are more likely to work in industries with lower skill requirements.

3 Data

3.1 Schooling and Child Labor Data

Our main source of data on schooling and child labor comes from the Brazilian Demographic Censuses for the years of 1980, 1991, 2000 and 2010. These datasets contain detailed information about the labor market participation, school attendance and various socioeconomic characteristics of children, and have the key advantage of being representative at fine geographic levels. Specifically, our analysis exploits information on whether

children attend school, work or remain idle (i.e. neither work nor attend school). Moreover, for the subsample of employed children, we also observe whether the work is paid or unpaid. Importantly, the dataset contains information about the sector of activity in which the child is employed, as given by the 5-digit CNAE Domiciliar classification.[5]

Our analysis focuses on children aged between 10 and 14 years old, given that information on schooling and labor market participation is not collected for children below 10, and also considering that the Brazilian legislation allows work as "apprentice" for children above 14. Moreover, following the literature on local labor markets, our analysis is carried out at the microregion level − a level of aggregation defined by the Brazilian Institute of Geography and Statistics (IBGE) which comprises neighboring municipalities sharing similar geographic and productive characteristics. Similarly to **?** and **?**, our final sample consists of 411 microregions whose boundaries remained constant between 1980 and 2010 based on the definition of "minimally comparable areas" provided by **?**.[6]

Our analysis focuses on changes in child labor, schooling and other educational and labor market outcomes between 1991−2000 ("medium-run") and 1991−2010 ("long-run"). Furthermore, we use information from the 1980 Census to account for pre-existing trends possibly related to future trade shocks and rely on census data to construct demographic control variables at the microregion level for the baseline year of 1991. Finally, we exploit annual information available from Brazil's School Censuses for the period between 1995 and 2022 in order to assess the effects of the trade liberalization schock on the dynamics of school enrollment.

3.2 Local Exposure to Trade Liberalization

Following the empirical literature on the regional effects of foreign competition, we construct a measure of local exposure to trade liberalization by exploiting two main sources of variation in a shift-share design. Specifically, we take advantage of the cross-industry variation in protection arising from distinct changes in nominal tariffs between 1990 and 1995, combined with cross-regional variation in the industry mix within the country. Intuitively, while tariff cuts were the same across all regions for a given industry, different localities were more or less exposed to the reform depending on their pre-reform

[5]The CNAE Domiciliar provides a classification of economic activities and is used in demographic census and other household surveys in Brazil.

[6]As in the related literature, we do not consider the microregion containing the Free Trade Area of Manaus, since it was not impacted by the trade liberalization reforms of the 1990s. Moreover, we also drop the archipelago of Fernando de Noronha for which no information is available before the 1991 census.

sectoral specialization.

In particular, we follow **?** and **?**, who propose a measure of regional tariff change based on the average tariff reduction across industries weighted by the participation of each industry in the local labor market. Formally, the level of exposure of microregion m to the trade liberalization reform is given by:

$$\Delta Tariff_m = -\sum_{j \in S} \omega_{mj} \times \Delta log(1 + \tau_j), \tag{1}$$

where τ_j is the nominal tariff on industry j, $\Delta log(1 + \tau_j)$ is the long difference of tariff rates in industry j between 1990 and 1995, and S is the set of all tradable industries.[7] Tariff changes are calculated based on data provided by **?** on industry-specific tariff rates from 1987 to 1998.[8] The term ω_{mj} captures the relative importance of industry j in microregion m's employment and is given by:

$$\omega_{mj} = \frac{\lambda_{mj}/\varphi_j}{\sum_{j' \in S} \lambda_{mj'}/\varphi_{j'}} \tag{2}$$

where $\lambda_{mj} = L_{mj}/L_m$ is the share of microregion m's workers employed in industry j measured at the baseline year of 1991, and φ_j equals one minus the wage bill share of industry j calculated based on information from the Brazilian national accounts. In order to facilitate the interpretation of the results, we multiply the tariff exposure measure by minus one, so that microregions facing greater tariff cuts have larger positive values for $\Delta Tariff_m$.

While the $\Delta Tariff_m$ index captures the overall exposure to the trade liberalization reform experienced by each microregion, it does not distinguish between tariff reductions that affected adult and child workers differently. In order to capture this specific dimension of the variation in tariffs, we decompose the standard measure of regional trade exposure by exploiting the fact that distinct industries and microregions differ in terms of the proportion of adult and child labor which they employ. Specifically, for each industry j and microregion m we calculate the share of child labor at the baseline year of 1991, $Ch_{mj} = L^{Ch}_{mj}/L_{mj}$, and then split the aggregate microregion level tariff exposure into two

[7] Following **?**, we exclude the non-tradable sector from the analysis. Interestingly, **?** shows that because the non-tradable price moves together with the price of a locally produced tradable good, the magnitude of the local tariff shock depends exclusively on the local tradable sector.

[8] We apply the same methodology employed by **?** to aggregate information at the *Nível 50* industry classification level into a system compatible with the sector coding available in the Brazilian census data, resulting in 20 tradable sectors.

additive components:[9]

$$\Delta Tariff_m^{Child} = -\sum_{j \in S} Ch_{mj} \times \omega_{mj} \times \Delta log(1+\tau_j) \tag{3}$$

and

$$\Delta Tariff_m^{Adult} = -\sum_{j \in S} (1 - Ch_{mj}) \times \omega_{mj} \times \Delta log(1+\tau_j) \tag{4}$$

Figure 2 presents the spatial distribution of the adult and child-specific tariff exposures across Brazilian microregions, with darker areas representing the regions more exposed to tariff cuts. Note that there is substantial spacial variation in both measures, even within the same state. Importantly, Figure A3 shows that while the relationship between the overall index and the adult-specific measure is almost perfect ($\rho = 0.99$) − which is to expect since adults form the vast majority of the labor force − the correlation between the overall index and the child-specific measure is substantially smaller ($\rho = 0.60$).[10] Our analysis exploits precisely this variation in adult and child-specific tariff exposures within states as a source of identification.

3.3 Summary Statistics

To summarize, our dataset consists of information at the microregion level on changes in schooling and child labor over the periods 1991-2000 and 1991-2010, as well as local measures of tariff exposure calculated based on tariff changes between 1990 and 1995. Table 2 provides summary statistics for the main variables used in our analysis. Panel A reports descriptive statistics for our measures of local exposure to trade liberalization. Note that, as expected, given the larger participation of adults in the workforce, the average adult-specific tariff shock is significantly larger than the average child-specific shock. Importantly, there is a considerable degree of variation in both indexes. For the reference, the difference between microregions in the 90th and 10th percentile of the distribution of both the overall and adult-specific measures is around 0.106 log points (or 10.6 percentage points (pp)), while the same difference for the child-specific measure is 0.003 log points (or 0.3 pp).

Next, in Panel B we report descriptive statistics for changes in schooling and child labor between 1991 and 2000 ("medium run"). Observe that during this period there was a substantial increase in the percentage of children who attend school only (15.7 pp) accompanied by a decrease in the fraction of children who remain idle (13.3 pp) and a

[9] **?** use a similar strategy to decompose labor demand shocks into gender-specific components.

[10] The correlation between adult and child-specific measures is around 0.58.

more modest reduction in the percentage of children who work (3.4 pp). The same pattern is observed in Panel C where we report summary statistics for the same variables for the period between 1991 and 2010 ("long run"). Note that over this period the percentage of children who attend school only increased even further by 19.6 pp, accompanied by a reduction in the faction of children who are idle (15.6 pp) and work (4 pp).

Finally, in Panel D we report descriptive statistics for selected socio-economic characteristics of Brazilian microregions at the baseline year of 1991, showing that they were on average small, poor and underdeveloped. Specifically, the mean poverty rate, defined as the fraction of the population living with less than 1/2 minimum wage per month, was 71.9 pp − driven to a great extent by extremely poor microregions in the northeast. Moreover, the average share of urban population was 61.2 pp and the mean illiteracy rate was 30.3 pp.

4 Empirical Strategy

Our main empirical analysis is composed of four parts, which we discuss below, focusing on the effects of the trade liberalization reform on (i) child labor and schooling, (ii) school enrollment, (iii) human capital accumulation and (iv) structural transformation.

Child Labor and Schooling. We begin our analysis by examining the impact of the overall exposure to trade liberalization on child labor and schooling by estimating the following regression:

$$\Delta y_m^{\tau-1991} = \beta \Delta Tariff_m + \theta \Delta y_m^{1991-1980} + W_m \gamma + \delta_s + \epsilon_m \tag{5}$$

where $\Delta y_m^{\tau-1991}$ represents the first-difference of variable $y_{m,t}$ between $\tau \in \{2000, 2010\}$ and the baseline year of 1991 for microregion m, i.e. $\Delta y_m^{\tau-1991} \equiv y_{m,\tau} - y_{m,1991}$. We estimate the above equation separately for the short and long differences, i.e. $\tau = 2000$ and 2010 respectively, in order to investigate the medium and long-run effects of tariff reductions. The main outcome variables of our analysis are the shares of children who attend "school only", "work" and neither work nor study ("idle"). Moreover, we also examine the impact of trade liberalization on the share of children employed in paid jobs. Our parameter of interest here is β, which captures the effect of the overall tariff shock on children's activities.

Crucial to our identification strategy is a proper account of potential trends in the outcome variables that could be possibly correlated with regional exposure to trade liberalization. To do so, our basic specification includes state fixed effects δ_s to control for distinct state-specific trends, as well as a vector of microregion-specific characteristics W_m

measured at the baseline year. In particular, using information from the 1991 Census, we include log of population, share of the population aged between 10 and 14, share of urban population, poverty rate, illiteracy rate, and income inequality (Gini index). Note that by including these variables in the regressions we account for potentially different trends across microregions that are allowed to vary according to their initial demographic and socio-economic characteristics. Moreover, we also include the lag of the dependent variable, $\Delta y_m^{1991-1980} \equiv y_{m,1991} - y_{m,1980}$, in order to control for preexisting trends. All regressions are weighted by population size in 1991 and standard errors are clustered at the mesoregion level to allow for spatial correlation across neighboring microregions.[11]

Next, we examine the separate effects of adult and child-specific tariff reductions by estimating the following regression:

$$\Delta y_m^{\tau-1991} = \beta^{Adult}\Delta Tariff_m^{Adult} + \beta^{Child}\Delta Tariff_m^{Child} + \theta\Delta y_m^{1991-1980} + W_m\gamma + \delta_s + \epsilon_m, \tag{6}$$

where similarly as before we control for state fixed effects, the lag of the dependent variable and a number of microregion-specific characteristics measured at the baseline year. All regressions are weighted by population size in 1991 and standard errors are clustered at the mesoregion level. Our parameters of interest in this case are β^{Adult} and β^{Child}, which capture the effects of adult and child-specific tariff shocks. As discussed before, we expect the estimates associated with these two parameters to have opposite signs. In particular, adult-specific tariff shocks are expected to lead children to move out of school and into the labor market due to its negative impact on household income, while child-specific tariff shocks are expected lead children to move in the opposite direction by reducing the opportunity cost of schooling.

We perform a number of robustness checks where we control for longer pre-trends, higher-order polynomials in income per capita, and a detailed set of characteristics of local labor markets, exposure to social programs such as the *Bolsa Familia*, educational infrastructure, government spending and other regional shocks that may also have affected Brazilian microregions during the period of our analysis. Furthermore, we perform several heterogeneous effects analyses where we split the sample according household income, level of education of the household head, race and gender in order to investigate whether the estimated effects are larger for the group of more disadvantaged children.

[11] A mesoregion is a geographic unit defined by the IBGE consisting of neighboring microregions with similar socio-economic characteristics. Our sample contains 91 mesoregions.

School Enrollment and Age-Grade Distortion. Next, we exploit information from the Brazilian School Census to examine in more detail the dynamic effects of adult and child-specific tariff reductions on school enrollment and age-grade distortion rates. Data from the School Census has the advantage of being reported directly by schools on an annual basis and of being available for a longer period, between and 1995 and 2022. Our analysis focuses first on the share of children aged between 10 and 14 enrolled in school using as baseline the year of 1995 − the year of the first School Census.[12] Specifically, we estimate a linear regression similar to that specified in equation (6) separately for each year $\tau \in \{1996, ..., 2022\}$ controlling for state fixed effects and microregion-specific characteristics. Moreover, while in this case we are unable to directly control for the lag of the dependent variable due to the inexistence of information on school enrollment prior to 1995, we proxy it by including the difference in the share of children who attend school (part or full-time) between 1980 and 1991 using data from the Demographic Census.

Furthermore, to check whether the children who may be coming to school as a result of the shocks are actually being able to progress through the educational system − or conversely whether the children who may be dropping out of school are exactly those who would not have been able to progress anyway − we complement our analysis by examining the effects of tariff reductions on age-grade distortion rates, defined as the share of children aged between 10 and 14 who are enrolled in a school grade two or more years below that which would be expected based on their current age. We then estimate a regression for each year $\tau \in \{1996, ..., 2022\}$ using the same specification described above for school enrollment. Finally, as an alternative measure, we also examine the effect of trade shocks on grade retention rates in elementary school, defined as the share of children who are re-enrolling in the same grade.[13]

[12] While information on enrollment is obtained directly from the School Census, data on the population size of children aged between 10 and 14 is available only for the census years of 1991, 2000 and 2010. Following a standard approach in the literature, we project the population of children of this age group in non-census years using a linear interpolation method. We also note that information on school enrollment per age group is not reported in the School Census of 1997. Thus for this particular year we also employ a simple interpolation procedure to project the enrollment of children aged between 10 and 14 for each microregion. As we shall discuss below, none of our findings depend on the results obtained specifically for 1997.

[13] Our measure of grade retention is limited by the fact that the School Census reports only information on the number of children who repeated a grade in the previous year $(t-1)$ and enrolled again in the current year (t), i.e. children who repeated and continued in school, thus underestimating the actual extent of the grade retention problem. However, considering that this limitation applies to all microregions, we believe that this measure still provides useful information to assess the effect of tariff shocks on children's educational performance.

Human Capital Accumulation. Next, we turn to the investigation of how local exposure to trade liberalization affected human capital accumulation in the long-run. Since we expect the effects in this case to be concentrated on specific age groups, our analysis focuses on an alternative specification conducted at the 'year-of-birth cohort'-'microregion' level, using the shares of individuals who completed elementary school, completed high school and have some college education as measures for the stock of human capital. In line with the literature on early childhood environment (**???**), we expect the cohorts of individuals who were very young during the early 1990s to have been more impacted by the trade reform. Specifically, using on data from the 2010 Census we estimate the following regression:

$$y_{cm} = \sum_{\substack{j=1958 \\ j\neq 1973}}^{1992} \beta_j^{Adult}(\mathbb{1}\{c=j\} \times \Delta Tariff_m^{Adult}) + \sum_{\substack{j=1958 \\ j\neq 1973}}^{1992} \beta_j^{Child}(\mathbb{1}\{c=j\} \times \Delta Tariff_m^{Child}) + \sum_{\substack{j=1958 \\ j\neq 1973}}^{1992} \gamma_c(\mathbb{1}\{c=j\} \times W_m) + \lambda_m + \mu_c + \delta_{cs} + \epsilon_{cm}, \tag{7}$$

where y_{cm} is a measure of the human capital of cohort c in microregion m. The specification controls for microregion fixed effects λ_m, cohort fixed effect μ_c, cohort-state fixed effects δ_{cs} and the interaction between cohort fixed effects and the same microregion-specific characteristics W_m considered in previous models, measured at the baseline year of 1991. As before, all regressions are weighted by population size in 1991 and standard errors are clustered at the mesoregion level.

Our analysis focuses on cohorts born in the period 1958-1992 − whose members were between 18 and 52 years old in 2010 − considering as the omitted category the cohort born in 1973 − whose members were exactly 18 years old in 1991. Our parameters of interest are β_c^{Adult} and β_c^{Child}, which capture the effect of adult and tariff-specific tariff reductions on cohort c. Note that, since individuals born in 1973 and before were not exposed to the trade liberalization shock during the most important part of the human capital accumulation period of their lives, we expect the estimates associated with β_c^{Adult} and β_c^{Child} to be statistically insignificant for $c \leq 1973$. Conversely, since the cohorts born after 1973 were progressively more exposed to the shocks, we expect the coefficient estimates to become significant at some point after 1973.

Structural Transformation. Finally, we study how the exposure to trade liberalization affected the structure of local economies, focusing in particular on its medium and long-run effects on the differences in the logarithm of average individual earnings, share of informal employment (i.e. fraction of private sector workers who do not have a formal

contract), share of non-employment (including both unemployed individuals and those out of the labor force), and share of the workforce in agriculture/mining, manufacturing and services. A number of previous studies have already examined the overall effect of Brazil's trade liberalization reform on some of these outcomes (**???**), so that our focus here on disentangling the effects of adult and child-specific tariff reductions in order to check whether the results are consistent with our general findings. As before, our analysis is based on estimating a linear regression model similar to that specified in equation (6) controlling for state fixed effects, lag of the dependent variable and microregion-specific characteristics. As a robustness check, we also implement **?**'s two-step approach, where we net out social and demographic characteristics of the local workforce before running our main regression. All regressions are weighted by population size in 1991 and standard errors are clustered at the mesoregion level.

5 Main Results

5.1 Child Labor and Schooling

Baseline Estimates. We begin our discussion by reporting in Table 3 the effect of local exposure to trade liberalization on child labor and schooling between 1991 and 2000 (columns 1, 3, 5 and 7) and 1991 and 2010 (columns 2, 4, 6 and 8). In Panel A, we report coefficient estimates for equation (5) focusing on the impact of overall tariff reductions on children's activities. Our results show that local tariff reductions lead to smaller increases in the share of children who "study only" over the medium and long-run relatively to the national average (columns 1 and 2), accompanied by larger relative increases in the share of children who "work" (columns 2 and 4) − with no significant effects on the share of children who remain "idle" (columns 5 and 6). Our results also suggest that the larger relative increases in child labor in regions more heavily exposed to the overall tariff reduction shock is mostly driven by larger increases in the share of children who have a paid employment (columns 7 and 8).

Interestingly, we find that the estimated effects are persistent and always larger in the long-run. Specifically, our point estimates imply that reducing the overall local tariff exposure by 0.109 log points − which approximately corresponds to moving a microregion from the 10th to the 90th percentile of the distribution of overall tariff reductions − leads to a relative decrease in the share of children who "study only" of about 1.3 percentage points (pp) (0.132×0.109) in the medium-run and 4.8 pp (0.442×0.109) in the long-run, accompanied by a relative increase in the share of children who "work" of about 2.8 pp (0.258×0.109) and 6.0 pp (0.551×0.109), respectively. To put these figures in

perspective, note that the fraction of children who "study only" in Brazil increased 19.9 pp between 1991 and 2010 (see Table 2, panel B), so that a microregion exposed to an overall tariff reduction of 0.109 log points is estimated to have experienced an increase in this share about 24.1% (4.8/19.9) below the national average.

Next, we disentangle the effects of adult and child-specific tariff reductions on children's activities by estimating equation (6) for both the medium and long-run. As expected, the results reported in Panel B of Table 3 show that the estimates associated with adult-specific tariff reductions are very similar to those obtained for the overall measure − with the same sign but consistently larger in magnitude. Conversely, the estimates associated with child-specific tariff reductions have always the opposite sign, consistently with the substitution effect mechanism. In particular, we find that local exposure to child-specific tariff reduction leads to larger relative increases in the share of children who "study only" over the medium and long-run (columns 1 and 2), accompanied by smaller increases in the percentage of children who "work" (columns 3 and 4) and have a paid employment (columns 7 and 8) − with no significant effect on the share of children who remain "idle" (columns 5 and 6).

As before, we also find that the estimated effects of both adult and child-specific tariff shocks are persistent and always larger in the long-run. Specifically, focusing on child-specific tariff reductions, our point estimates imply that a decrease in tariff exposure of 0.003 log points − which approximately corresponds to moving a microregion from the 10th to the 90th percentile of the distribution of child-specific tariff reductions − leads to a relative increase in the share of children who "study only" of about 2.2 pp (7.456×0.003) in the medium-run and 3.3 pp (11.058×0.003) in the long-run, accompanied by a relative decrease in child labor of about 2.0 pp (6.676×0.003) and 2.6 pp (8.822×0.003), respectively.[14] Observe that a microregion exposed to a local child-specific tariff reduction of 0.003 log points is estimated to have experienced an increase in the share of children who "study only" about 16.5% (3.3/19.6) larger than the national average between 1991 and 2010.[15]

Interestingly, while child-specific tariff reductions are much smaller in magnitude than adult-specific tariff reductions, our results shows that the effect of both shocks are sub-

[14]For the case of adult-specific tariff reductions, a decrease in exposure of 0.103 log points − which approximately corresponds to moving a microregion from the 10th to the 90th percentile of the distribution of adult-specific tariff reductions − leads to a relative increase in the share of children who "study only" of about 2.7 pp in the medium-run and 6.6 pp in the long-run, accompanied by a relative decrease in child labor of about 3.7 pp and 7.1 pp, respectively.

[15]Similarly, a microregion exposed to a local adult-specific tariff reduction of 0.103 log points is estimated to have experienced an increase in the share of children who "study only" about 33.1% (6.6/19.6) smaller than the national average.

stantial and economically significant. Moreover, consistently with the theoretical mechanisms of income and substitution effects, we find that the impact of both shocks go in opposite directions, with microregions more exposed to adult-specific tariff reductions experiencing slower declines in child labor (particularly in paid employment) and microregions more exposed to child-specific tariff reductions experiencing faster increases in the share of children who attend "school only".

Robustness Checks. In order to check the robustness of our main findings, we estimate a number of alternative versions of the model specified in equation (6) controlling for various additional socio-economic variables that could potentially be correlated with both adult and child-specific tariff reductions. Tables 4 and 5 report the results of these robustness checks focusing on the two main outcome variables of our analysis, namely the shares of children who "study only" and "work", respectively.

We begin by discussing the results for the share of children who "study only", as reported in Table 4 for both the medium (panel A) and long-run (panel B). To facilitate comparison, we first report in column 1 the estimates obtained from our baseline specification (Table 3, panel B, columns 1 and 2) and in column 2 we report estimates from a specification with state fixed effects but without all other controls. We then report coefficient estimates for a number of different specifications where, in addition to the variables already included in the baseline regression, we control for: (i) longer pre-liberalization trends by adding the change in the dependent variable between 1970 and 1980, $\Delta y_m^{1980-1970}$ (column 3), (ii) a cubic polynomial in the logarithm of per capita income in 1991 (column 4), (iii) a number of characteristics of the local labor markets, including share of unskilled workers (i.e. fraction of workers who did not complete high school), share of workforce in agriculture and mining, share of workforce in manufacturing and share of workforce in informal jobs − all measured at the baseline year of 1991 (column 5), (iv) local participation in selected social programs, as captured by the share of microegion's population impacted by PETI, a program for the eradication of child labor, in 2000 and share of population receiving benefits from the conditional cash transfer program *Bolsa Familia* in December of 2004, following **?** (column 6), (v) local supply of public goods and educational infra-structure, as proxied by the logarithm of microregions' total per capita spending in 1991, the pupil-student ratio in primary schools in 1995 and number of schools per 1,000 inhabitants in 1995 (column 7), and finally (vi) macroeconomic shocks that occurred during the post-liberalization period by adding, similarly to **?**, microregion-specific changes in import tariffs during 1995-2000 (medium-run analysis, panel A) and 1995-2010 (long-run analysis, panel B), regional changes in real exchange rates (both import and export-weighted) during 1991-2000 (panel A) and 1991-2010 (panel B) and

local changes in commodity prices during 1991-2000 (panel A) and 1991-2010 (panel B) based on a measure proposed by **?** (column 8).[16]

Observe that the point estimates reported in Table 4 are very stable across different specifications − with the exception of the larger estimates (in absolute terms) associated with the specification without controls (column 2) − and almost always always significant at conventional levels. The long-run effects (panel B) are particularly large in magnitude and statistically significant, with the point estimates associated with adult-specific tariff shocks ranging from −0.479 to −1.344 and those associated with child-specific tariff shocks ranging from 9.246 to 15.422.

Next, in Table 5 we report the results of the same exercises for the share of children who "work". As before, we show that our main findings are robust to the inclusion of different controls. In particular, we find that in the long-run (panel B) the point estimates associated with adult-specific tariff shocks vary between 0.354 and 0.723 while those associated with child-specific tariff shocks vary between −7.956 and −11.808, with all estimates being statistically significant at conventional levels. Additionally, in Tables A1 and A2 we report the results of the same robustness checks for "idle" and "paid employment" showing that our findings are robust to the inclusion of controls.

Finally, we check the sensitivity of our findings to the influence of each of the 20 industries considered in the construction of our shift-share measures of adult and child-specific tariff exposures by estimating a version of the model in equation (6) where, in addition to all other controls, we also include, one industry at a time, the shares of adults and children working in each industry at the baseline year of 1991.[17] The results reported in Table A3 show that our findings are very robust to the inclusion of these labor shares, with the estimated coefficients remaining generally stable in magnitude and statistically significant.

Heterogeneous Effects. We complement our analysis by examining whether our estimated effects vary according to the characteristics of households within each microregion. Intuitively, we expect the mechanisms underlying our main results to be stronger among

[16]The changes in post-liberalization tariffs were computed based on the UNCTAD TRAINS tariff database. To calculate microregion-specific changes in real exchange rates, we first computed industry-specific real exchange rates based on the average of real exchange rates between Brazil and its trade partners weighted by the share of exports to (or imports from) each country in a particular industry using trade data from 1989. We then take the changes in the logarithm of industry-specific real exchange rates during 1991-2000 and 1991-2010 and calculate microregion-specific shocks weighting each industry by its labor market share as in equation (1).

[17]Consistently with the equations (3) and (4), we adjust these shares by the wage bill, so that we effectively include $Ch_{mj}\omega_{mj}$ and $(1 - Ch_{mj})\omega_{mj}$ in the regressions.

children from less advantaged backgrounds, particularly those belonging to low-income and less-educated families. In Table 6 we report estimates for our basic specification separately for a subsample of children from "poor" (columns 1, 3, 5 and 7) and "non-poor" households (columns 2, 4, 6 and 8) within the same microregion, where a household is defined as "poor" if its income per household member is below the 75th percentile of the distribution for that particular microregion.[18] Note that, as expected, the estimated effects are much larger for the subsample of children from "poor" households. Specifically, the long-run impact of a decrease of 0.003 log points in the child-specific tariff protection is estimated to lead to a relative increase in the share of children who "study only" of about 4.1 pp (13.745×0.003) among "poor" households, but of just 0.7 pp (2.555×0.003) among "non-poor" households (panel B, columns 1 and 2). Moreover, the long-run impact of a reduction in the adult-specific tariff exposure is negative and statistically significant only for "poor" children − in which case a reduction of 0.103 log points is estimated to lead to a relative decrease in the share of "study only" of about 9.1 pp (0.888×0.103). Consistently with these findings, we also obtain similar results for the share of children who "work" (columns 3 and 4) and who have a "paid employment" (columns 7 and 8), suggesting that children from a disadvantaged background are much more sensitive to economic shocks.

Next in Table 7 we report the results of an additional heterogeneity analysis where we estimate our basic specification separately for households with different levels of education. Specifically, a household is considered to be of "low education" if the maximum level of schooling of the head of household, or his or her spouse, is elementary or less, and conversely to be of "medium/high education" if it is above elementary schooling. Similarly as before, we find that the estimated effects are much larger among "low education" households. In particular, the long-run effect of a decrease of 0.003 log points in the child-specific tariff protection is estimated to lead to a relative increase in the share of children who "study only" of about 4.07 pp (13.576×0.003) among "low education" households, but of only 1.2 pp (4.018×0.003) among "medium/high education" households (panel B, columns 1 and 2). Moreover, we find that the long-run impact of a reduction in the adult-specific tariff exposure is negative and statistically significant only for "low education" households, in which case a reduction of 0.103 log points is estimated

[18] We focus on the 75th percentile of the income per household member distribution given that large parts of Brazil are still very poor and extremely unequal. For instance, in 2010 the 75th percentile of the income per household member distribution was R$ 652.50, which corresponded to just about 25% more than the minimum wage at that time. Our results are robust to using the median of the income distribution as the cutoff for our definition of "poor" and "non-poor" households, although, the differences between the two groups become less pronounced in this case.

to lead to a relative decrease in the share of children who "study only" of about 8.15 pp (0.792×0.103).

We also report in Table A4 the estimates of a similar exercise where we compare the effects of tariff shocks on "black" and "non-black" children.[19] Consistently with our previous results, we find the impact on "black" children to be considerably larger − although the estimated differences between "black" and "non-black" children are not as striking as those which we previously obtained for "poor" versus "non-poor" and "low" versus "medium/high education" households. Finally, as one additional exercise we perform a heterogeneity analysis by gender. The results reported in Table A5 show that the estimated effects are slightly larger for boys, especially when considering the shares of children who attend "school only" and have a "paid employment". Overall, our results are consistent with the idea that individuals from disadvantaged backgrounds are much more sensitive to economic shocks, particularly poor and black children with uneducated parents.

5.2 School Enrollment and Age-grade Distortion

Next, we proceed to examine the dynamic effects of adult and child-specific tariff reductions on school enrollment and age-grade distortion rates across Brazilian microregions. As discussed before, school enrollment data has the advantage of being reported annualy by the School Census and of being available for a longer period, providing an alternative and more detailed way of measuring the impact of tariff shocks on educational outcomes. In Figure 3 we plot the point estimates of the effects of both adult and child-specific tariff reductions obtained from estimating separate regressions based on the specification in equation (6), with the dependent variable corresponding to changes in school enrollment between year $\tau \in \{1996, ..., 2022\}$ and the baseline year of 1995. The estimates connected by the solid-line represent the effects of child-specific tariff shocks over time, while those connected by the dashed-line represent the effects of adult-specific tariff shocks.[20] The shaded areas depicted in Figure 3 show the 90% confidence intervals calculated based on standard errors clustered at the mesoregion level.

Consistently with our previous results, we find that larger child-specific tariff reductions lead to substantial relative increases in school enrollment, with larger adult-specific tariff reductions leading to the opposite result. Interestingly, our results show that the

[19] We consider as "black" the individuals classified as "*preto*" or "*pardo*" in the Brazilian Census.

[20] To facilitate the visualization of the results, we divide the estimates associated with child-specific tariff reductions by 10.

impact of both shocks gradually increased over time (in absolute terms), with enrollment rates taking more than a decade to fully adjust to the trade liberalization reform. Specifically, our point estimates imply that during the period between 1995 and 2022 a decrease of 0.003 log points in the child-specific tariff exposure lead to a relative increase in school enrollment of approximately 3.3 pp (11.167×0.003), while a decrease of 0.103 log points in the adult-specific tariff exposure is associated with a relative decrease in enrollment of about 8.0 pp (0.777×0.103). Overall, the impact of the trade liberalization reform on school enrollment is in line with our previous findings obtained for child labor and schooling, providing additional robustness to our general results.

A potential concern related to the results we have obtained so far is that, while we have shown that school enrollment and attendance increased more rapidly in microregions hard hit by a child-specific tariff reduction, there is no guarantee that the children induced to move into school as a result of the shock were actually able to successfully advance in the school system. Similarly, the children induced to drop out of school as a result of adult-specific tariff shocks could be precisely those who would not have been able to move forward anyway. These questions are relevant from a policy perspective, given our ultimate interest on the impact of the shocks on human capital accumulation.

[REVISE THIS PARAGRAPH WITH UPDATED RESULTS] To assess the relevance of these potential concerns, we examine the impact of tariff shocks on the age-grade distortion rate among children aged between 10 and 14 − i.e. the share of children enrolled in a school grade two or more years below that which would be expected based on their age. As before, Figure 4 reports point estimates of the effects of both adult and child-specific tariff shocks obtained from estimating equation 6 separately for each year between 1996 and 2010. Interestingly, while the results suggest that child-specific tariff reductions may have lead to slightly larger increases (or smaller decreases) in the age-grade distortion during the earlier period between 1996 and 2000, the point estimates for both shocks are always small in magnitude and very imprecisely estimated, and in the long-run we find no evidence of any of the two shocks having any impact on the progression of children through school. Finally, as an additional exercise we report in Figure 5 the results of a similar analysis focusing on grade repetition rates in primary school. As before, we find no evidence of tariff reductions impacting the progression of children in Brazil.

5.3 Human Capital Accumulation

In previous subsections we have shown that adult and child-specific tariff reductions affected significantly − and in different ways − the allocation of time of children, particularly their choices between work and study. We now proceed to investigate whether these

changes impacted other educational outcomes in the long run, focusing in particular on the human capital accumulated by individuals from different year-of-birth cohorts. To do so, we estimate the model specified in equation 7 using data from the 2010 Census and focusing on the shares of individuals who completed elementary school, completed high school and have some college education in each cohort.

In Figure 6 we report the point estimates associated with the effects of both adult and child-specific tariff reductions by year of birth, omitting the coefficients associated with the cohort born in 1973. The results show that the trade liberalization reform had no impact on the educational outcomes of the cohorts born around 1980 and before − these are the individuals who were already adolescents or adults when the reform took place. Interestingly, the pattern of the estimates suggests that the impact of the shock is always larger on the younger cohorts, whose members were more exposed to the consequences of the trade reform during their childhood. Moreover, consistently with our previous results, we find that child-specific tarif reductions lead to a relative increase in human capital accumulation while adult-specific tarif reductions lead to the opposite.

Specifically, our estimates imply that for the cohort born in 1992 a decrease of 0.301 log points in the adult-specific tariff exposure is associated with a relative decrease in the share of individuals who completed elementary school by 2010 of 7.5 pp, as well as with reduction in the shares of individuals who completed high school and have at least some college education of 9.0 pp and 6.3 pp respectively. Conversely, a decrease of 0.003 log points in the child-specific tariff exposure is estimated to have lead to a relative increase in the share of individuals who completed elementary school of 2.9 pp and in the shares who completed high school and have at least some college education of 3.8 pp and 2.2 pp respectively. Note that these effects are all sizeable considering that the samples means for the fraction of individuals who completed elementary school, completed high school and have some college education are respectively 69.0 pp, 28.7 pp and 9.3 pp. for the cohort born in 1992.

Finally, we check the robustness of our findings by reporting in Figure A4 the results of a placebo exercise where we estimate the same specification as before but now focusing on human capital levels in 1991.[21] Intuitively, we expect to find no impact of tariff shocks on educational outcomes determined entirely prior to their occurrence. Indeed, our estimates confirm that there is no relationship between tariff changes in the early 1990s and the share of individuals in all cohorts who completed elementary school, high school and have some college education, with the point estimates being generally small

[21] In order to make the analysis completely symmetric with the previous one, we consider the cohorts born in the period 1939-1973 − whose members were between 18 and 52 years old in 1991.

in magnitude and very imprecisely estimated.

5.4 Structural Transformation

In this subsection we examine whether adult and child-specific tariff reductions also affected the structure of local economies in both the medium and long-run. Consistently with previous findings in the literature, the results reported in Table 8 show that larger adult-specific tariff reductions lead to larger relative increases in non-employment and informality, accompanied by larger decreases in average earnings. Moreover, we find that adult-specific tariff shocks were also associated with changes in the structure of local economic activity, with harder hit regions having part of their workforce transitioning away from manufacturing and services and into agriculture. Specifically, we find that in the long-run (panel B) a reduction of 0.103 log points in the adult-specific tariff exposure leads to a relative increase in the informality rate of about 13.4 pp (1.302×0.103) and a relative decline in average earnings and share of workforce in manufacturing of approximately 10.5 pp (1.023×0.103) and 8.1 pp (0.791×0.103) respectively.

Conversely, and in line with our previous results, we find that child-specific tariff reductions are associated with the opposite effects, leading to larger relative declines in non-employment and informality, larger relative increases in average earnings and to a reallocation of the labor force away from agriculture and services and into manufacturing. In particular, our point estimates imply that in the long-run a reduction of 0.003 log points in the child-specific tariff exposure leads to a relative decline in informality of about 3.9 pp (13.309×0.003) and a relative increase in average earnings and share of workforce in manufacturing of 5.3 pp (1.023×0.103) and 0.8 pp (2.847×0.103) respectively.

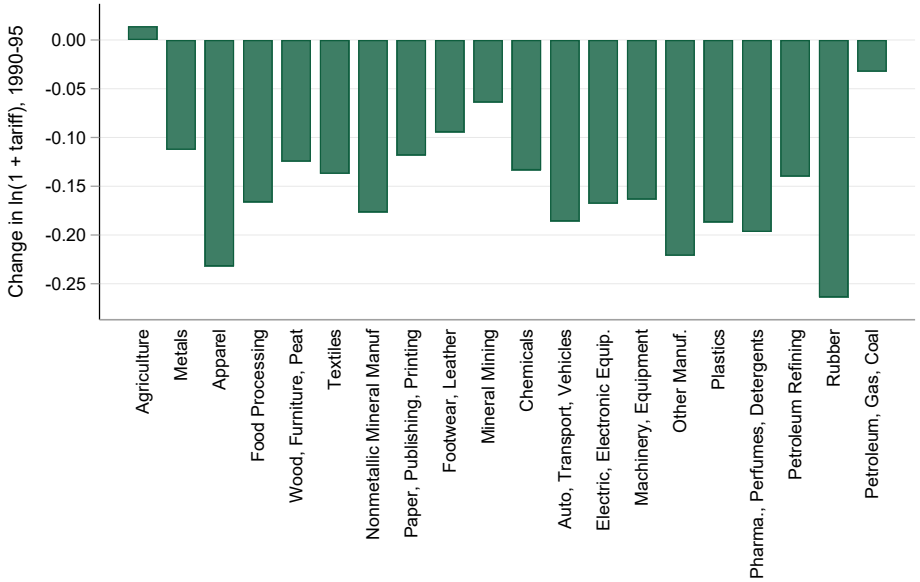
TO DO: Comment on robustness: two-step procedure.

6 Concluding Remarks

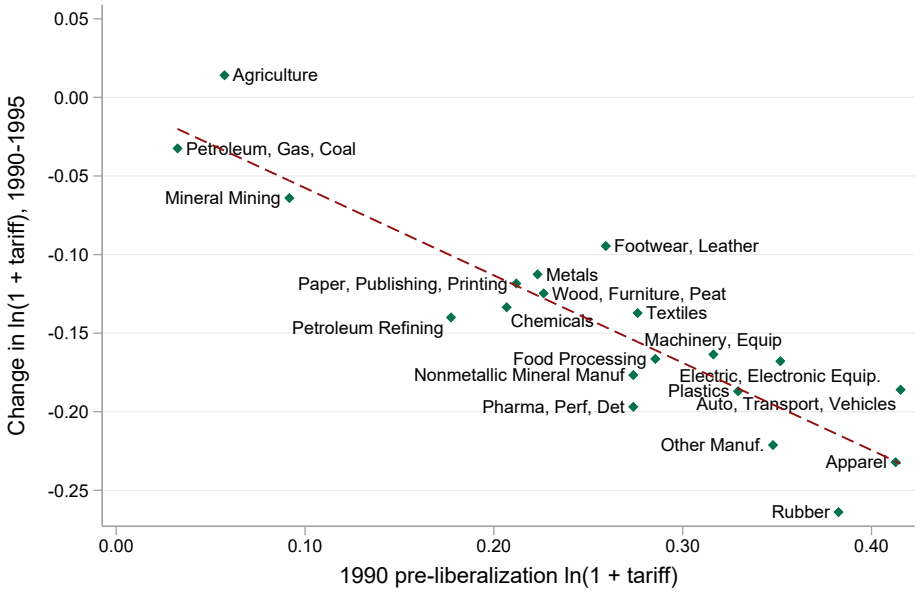
Figures

Figure 1: Change in Tariffs

(a) Changes in ln(1+tariff), 1990-1995



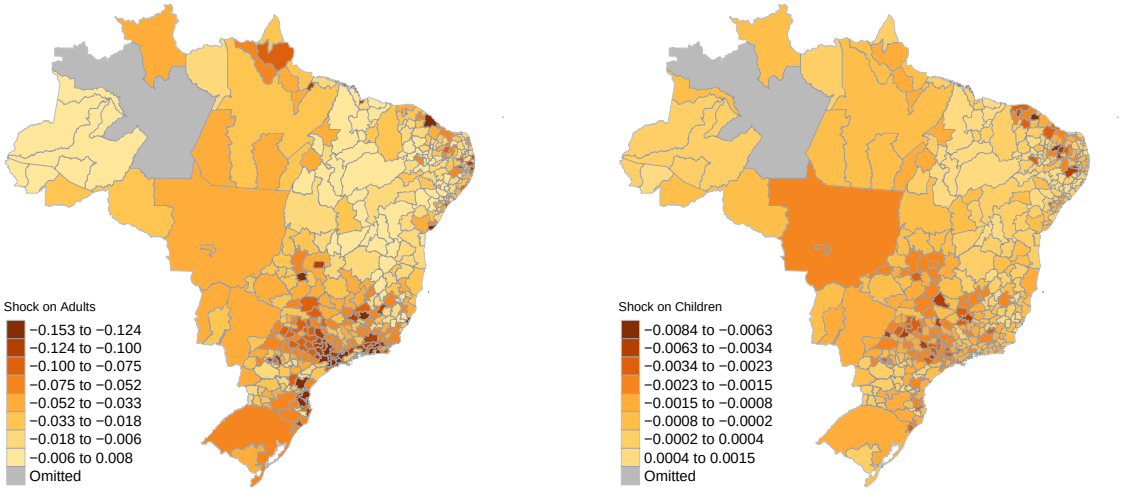
(b) Tariff Changes vs Pre-Liberalization Tariff Levels



Notes: Figure 1a plots the changes in the ln of one plus the nominal tariffs between 1990 and 1995 by industry. Industries are sorted from the largest to smallest according to the value added in 1990. Figure 1b plots the relationship between tariff changes and tariff levels in 1990. Source: **?** and **?**.

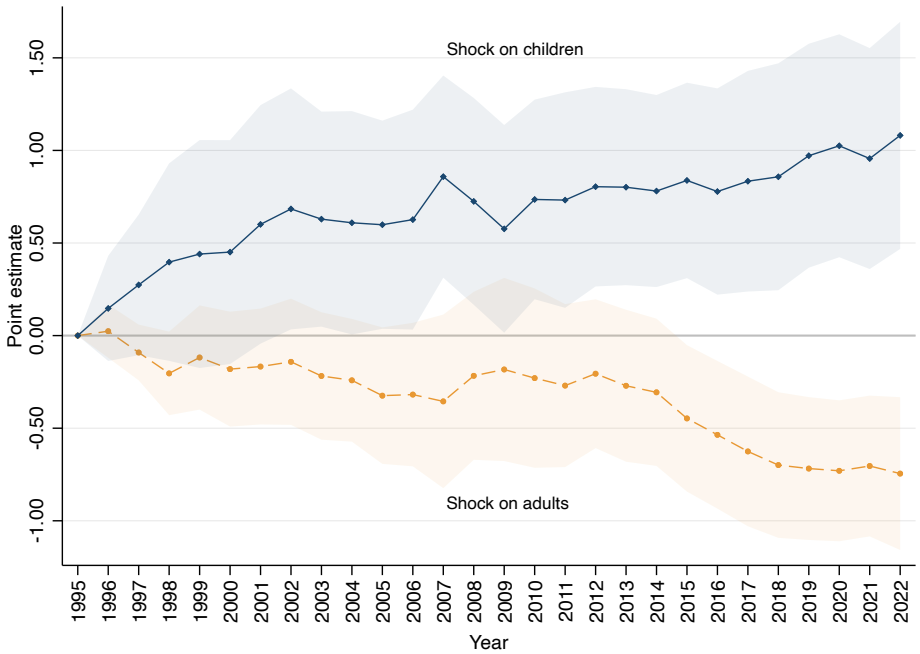
Figure 2: Regional Distribution of Tariff Shocks

(a) $\Delta Tariff_m^{Adult}$ (b) $\Delta Tariff_m^{Child}$



Notes: This figure displays the distribution of regional tariff shock measures across microregions calculated using Equations 3 and 4. Figure 2a presents the regional distribution of adult-specific industry tariff shock, while Figure 2b exhibits the distribution of child-specific industry tariff shock.

Figure 3: Dynamic Effects of Tariff Shocks on Scholl Enrollment



Notes: This figure plots the estimated effects of local exposure to tariff shocks on schooling. Each point represents an individual regression coefficient estimated using Equation (6). We divide the estimated coefficients for child-specific industries by 10 to make it easier to visualize the results. The dependent variable is the change in the share of 10-14-year-old children enrolled in school between the indicated year and 1995. The blue line presents the estimations for child industry shock, and the red line displays the coefficients estimated for adult industry shock. Shaded areas denote 90 percent confidence intervals based on clustered standard errors at the mesoregion level. All regressions control for state fixed effects and the following demographic controls computed at the baseline year 1991: share of urban population, poverty (measured as the percentage of population living with less than half the minimum wage), Gini inequality index, logarithm of the population, share of child population, and illiteracy rate. Regressions additionally include the lagged dependent variable (Δ1980-1991) and are weighted by the baseline population.

Figure 4: Age-Grade Distortion Rate

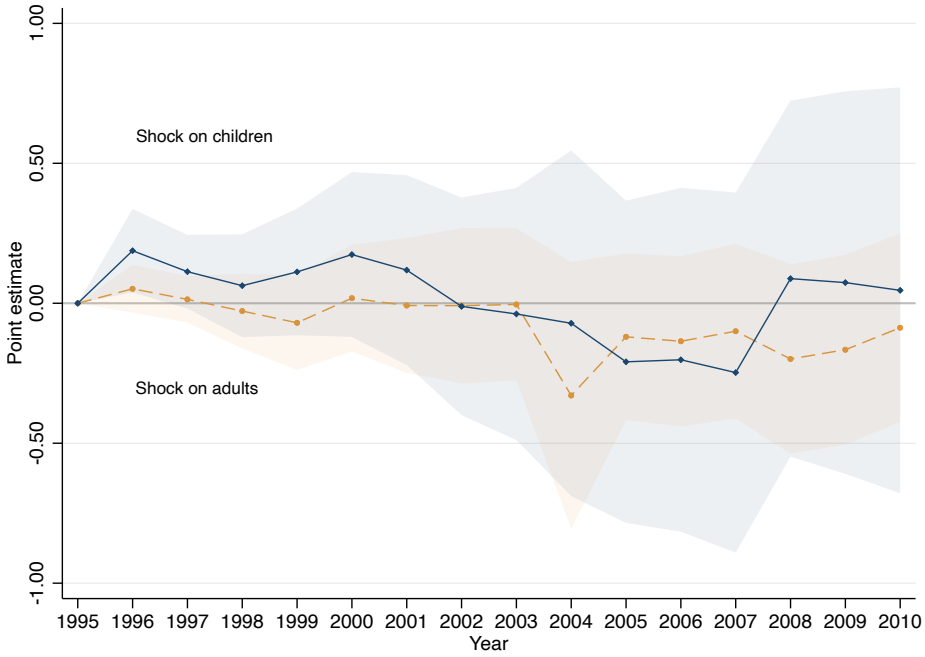


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Figure 5: Retention Rate

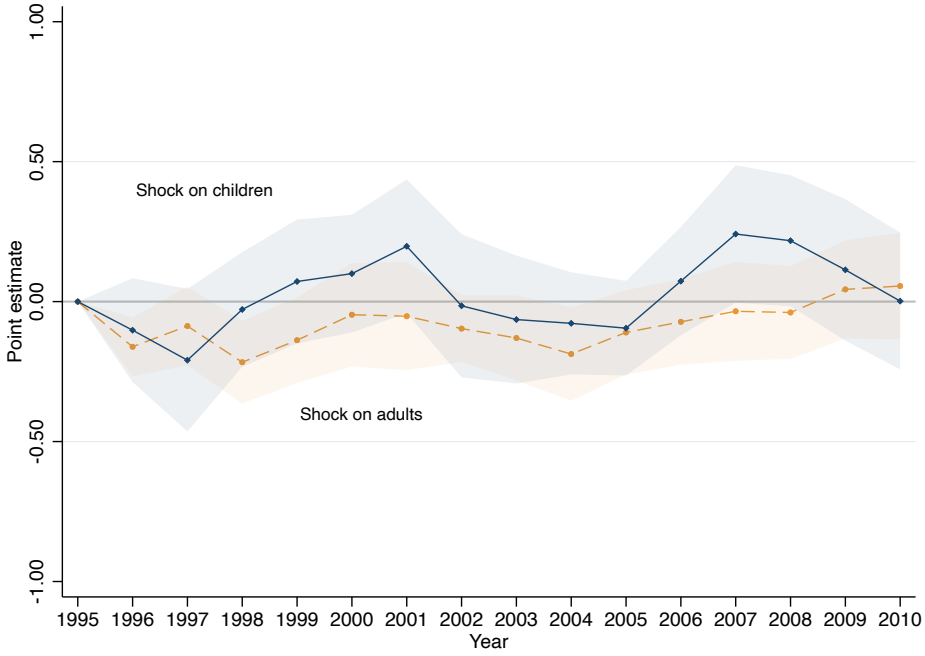

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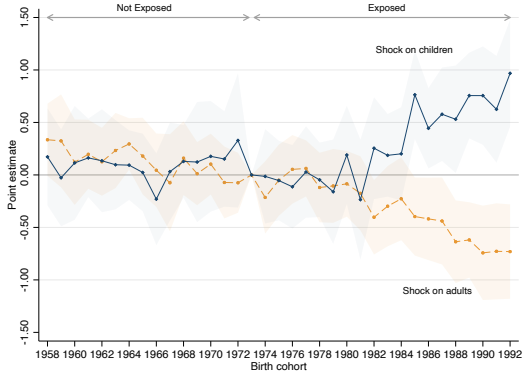
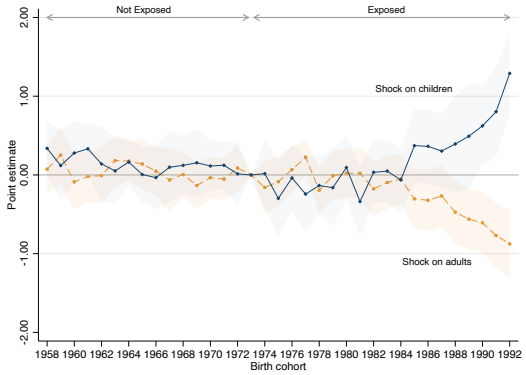
Figure 6: Main Results: Human Capital Accumulation

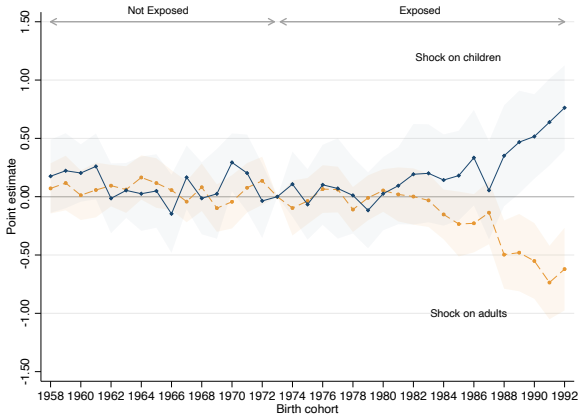
(a) Completed Elementary/Middle School



(b) Completed High School



(c) College Education



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Tables

Table 1: Child Labor in Brazil

	1980	1991	2000	2010
Panel A. Children's activities				
% School only	0.652	0.765	0.893	0.919
% Work	0.128	0.084	0.064	0.051
% Idle	0.220	0.151	0.044	0.029
% Paid employment	0.079	0.057	0.029	0.023
Panel B. Child labor (% Work)				
By population size				
Small	0.158	0.117	0.100	0.078
Large	0.123	0.079	0.058	0.048
By area				
Rural	0.174	0.113	0.113	0.092
Urban	0.107	0.070	0.043	0.035
By income				
Low	0.163	0.109	0.103	0.084
High	0.111	0.072	0.045	0.037
By region				
Centerwest	0.118	0.091	0.062	0.059
North	0.105	0.068	0.089	0.085
Northeast	0.143	0.103	0.098	0.078
Southeast	0.155	0.123	0.091	0.085
South	0.104	0.078	0.045	0.037
By sector | work				
Agriculture/Extractive	0.602	0.506	0.540	0.553
Manufacturing	0.106	0.106	0.084	0.077
Nontradable	0.292	0.388	0.376	0.370

Notes: This table reports child labor in Brazil based on data from 1980, 1991, 2000, and 2010 Censuses. Panel A contains information on the share of 10-14-year-old children in the indicated activity. Panel B displays statistics for working children separated by the household area, country's region, household income (measured as the percentage of population living with less than half the minimum wage), and sector of activity. In all panels, we use the sample weights to estimate the totals.

Table 2: Summary Statistics

	Mean	Std. Dev.	Min	Max
Panel A. Children's activities (Δ 1991-2000)				
% School only	0.157	0.062	0.001	0.397
% Work	-0.024	0.041	-0.151	0.119
% Idle	-0.133	0.071	-0.401	-0.033
% Paid employment	-0.035	0.028	-0.126	0.029
Panel B. Children's activities (Δ 1991-2010)				
% School only	0.199	0.076	0.037	0.447
% Work	-0.043	0.044	-0.207	0.130
% Idle	-0.156	0.085	-0.492	-0.031
% Paid employment	-0.044	0.033	-0.135	0.085
Panel C. Demographic controls in 1991				
Share urban (1991)	0.612	0.198	0.160	0.997
Poverty rate (1991)	0.719	0.191	0.204	0.968
Gini inequality index 1991	0.552	0.040	0.438	0.720
Log of the population (1991)	12.064	0.995	9.452	16.275
Share child population (1991)	0.123	0.014	0.094	0.164
Illiteracy rate (1991)	0.303	0.166	0.051	0.696
Panel D. Tariff changes (Δ 1991-1995)				
$\Delta Tariff_m$	0.044	0.040	-0.010	0.154
$\Delta Tariff_m^{Adult}$	0.043	0.039	-0.008	0.153
$\Delta Tariff_m^{Child}$	0.001	0.001	-0.002	0.008

Notes: This table reports descriptive statistics based on data from 1991, 2000, and 2010 Censuses averaged at the microregion level. Panels A and B contain the difference between 1991-2000 and 1991-2010 in the share of 10-14-year-old children in the indicated activity. Panel C displays summary statistics for demographic variables in 1991; poverty is computed as the percentage of individuals living with less than half the minimum wage. Panel D shows descriptive statistics for the regional tariff shock measures calculated using Equation (1). In all panels, the sample consists of 411 microregions whose boundaries are consistent over time.

Table 3: Effects of Tariff Shocks on Child Labor and Schooling

	School only		Work		Idle		Paid work	
	1991-2000	1991-2010	1991-2000	1991-2010	1991-2000	1991-2010	1991-2000	1991-2010
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. Overall tariff shock								
$\Delta Tariff_m$	−0.132	−0.442**	0.258**	0.551***	−0.101	−0.103	0.278***	0.339***
	(0.169)	(0.182)	(0.102)	(0.098)	(0.111)	(0.133)	(0.081)	(0.100)
R-squared	0.80	0.86	0.56	0.59	0.91	0.92	0.65	0.64
Panel B. Adult industry vs child industry shock								
$\Delta Tariff_m^{Adult}$	−0.267	−0.647***	0.361***	0.691***	−0.084	−0.069	0.391***	0.495***
	(0.184)	(0.199)	(0.108)	(0.100)	(0.129)	(0.158)	(0.082)	(0.092)
$\Delta Tariff_m^{Child}$	7.456*	11.058***	−6.676***	−8.822***	−1.141	−2.131	−7.369***	−10.213***
	(3.975)	(3.740)	(2.182)	(2.273)	(2.411)	(2.550)	(1.722)	(1.821)
R-squared	0.81	0.87	0.59	0.63	0.91	0.92	0.70	0.71
Observations	411	411	411	411	411	411	411	411
Mean dep. var.	0.157	0.199	-0.024	-0.043	-0.133	-0.156	-0.035	-0.044

Notes: This table reports the estimated effects of local exposure to tariff shocks on child labor and schooling. The dependent variables are given by the changes over the indicated period. Panel A presents the results from the estimation of Equation (5). Panel B exhibits the results of estimating Equation (6) by replacing the overall tariff shock with the age-specific tariff shocks. All regressions control for state fixed effects and the following demographic controls computed at the baseline year 1991: share of urban population, poverty (measured as the percentage of population living with less than half the minimum wage), Gini inequality index, logarithm of the population, share of child population, and illiteracy rate. Regressions additionally include the lagged dependent variable (Δ1980-1991) and are weighted by the baseline population. Standard errors clustered at the mesoregion level are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: Robustness Checks: Controlling for Possible Confounding Effects

	Dep. variable: School only							
	Baseline	No controls	Longer pre-trends	Income per capita	Labor market	Social programs	Educ./Pub. spending	Macro shocks
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. 1991-2000								
$\Delta Tariff_m^{Adult}$	−0.267	−0.964***	−0.239	−0.294*	−0.277	−0.241	−0.347*	−0.182
	(0.184)	(0.072)	(0.172)	(0.169)	(0.201)	(0.159)	(0.188)	(0.154)
$\Delta Tariff_m^{Child}$	7.456*	9.805***	6.686*	5.503	10.900***	6.357*	7.398*	6.862**
	(3.975)	(2.543)	(4.003)	(3.714)	(3.711)	(3.217)	(3.839)	(3.160)
R-squared	0.81	0.73	0.81	0.83	0.83	0.82	0.82	0.83
Panel B. 1991-2010								
$\Delta Tariff_m^{Adult}$	−0.647***	−1.344***	−0.599***	−0.675***	−0.539**	−0.607***	−0.686***	−0.479***
	(0.199)	(0.069)	(0.166)	(0.191)	(0.229)	(0.159)	(0.202)	(0.148)
$\Delta Tariff_m^{Child}$	11.058***	12.817***	9.763***	9.246**	15.422***	9.570***	11.190***	10.103***
	(3.740)	(2.392)	(3.697)	(3.537)	(3.513)	(2.698)	(3.603)	(3.762)
R-squared	0.87	0.82	0.88	0.88	0.89	0.89	0.88	0.89
Observations	411	411	411	411	411	396	409	411

Notes: This table complements Table 3 by checking the robustness of the main results to alternative specifications and to confounding effects from other shocks to local labor markets. Panel A presents the results for changes in the dependent variable between 1991 and 2000. Panel B exhibits the results for the period between 1991 and 2010. All regressions follow the specification in Equation (6). Standard errors clustered at the mesoregion level are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Robustness Checks: Controlling for Possible Confounding Effects

	Dep. variable: Work							
	Baseline	No controls	Longer pre-trends	Income per capita	Labor market	Social programs	Educ./Pub. spending	Macro shocks
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. 1991-2000								
$\Delta Tariff_m^{Adult}$	0.361***	0.171***	0.358***	0.377***	0.454***	0.360***	0.380***	0.266**
	(0.108)	(0.063)	(0.101)	(0.106)	(0.119)	(0.100)	(0.107)	(0.102)
$\Delta Tariff_m^{Child}$	−6.676***	−9.663***	−6.496***	−5.262**	−8.361***	−6.215***	−6.240***	−5.847***
	(2.182)	(3.010)	(2.122)	(2.304)	(1.967)	(1.845)	(2.228)	(2.091)
R-squared	0.59	0.48	0.59	0.63	0.61	0.59	0.60	0.62
Panel B. 1991-2010								
$\Delta Tariff_m^{Adult}$	0.691***	0.354***	0.686***	0.723***	0.670***	0.691***	0.659***	0.623***
	(0.100)	(0.071)	(0.091)	(0.108)	(0.118)	(0.095)	(0.108)	(0.106)
$\Delta Tariff_m^{Child}$	−8.822***	−11.808***	−8.512***	−7.956***	−11.398***	−8.282***	−8.457***	−7.994***
	(2.273)	(2.960)	(2.204)	(2.517)	(2.003)	(1.938)	(2.348)	(2.887)
R-squared	0.63	0.51	0.65	0.66	0.66	0.64	0.63	0.67
Observations	411	411	411	411	411	396	409	411

Notes: This table complements Table 3 by checking the robustness of the main results to alternative specifications and to confounding effects from other shocks to local labor markets. Panel A presents the results for changes in the dependent variable between 1991 and 2000. Panel B exhibits the results for the period between 1991 and 2010. All regressions follow the specification in Equation (6). Standard errors clustered at the mesoregion level are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: Heterogeneous Effects: Household Income

	School only		Work		Idle		Paid work	
	Poor	Not poor	Poor	Not poor	Poor	Not poor	Poor	Not poor
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. 1991-2000								
$\Delta Tariff_m^{Adult}$	−0.424**	0.323**	0.456***	−0.008	−0.027	−0.325***	0.464***	0.118
	(0.211)	(0.161)	(0.121)	(0.103)	(0.149)	(0.091)	(0.094)	(0.077)
$\Delta Tariff_m^{Child}$	9.191**	1.600	−6.856***	−4.252**	−2.473	2.670**	−7.740***	−4.562***
	(4.556)	(2.830)	(2.423)	(1.930)	(2.774)	(1.320)	(2.047)	(1.633)
R-squared	0.79	0.76	0.64	0.31	0.91	0.85	0.72	0.40
Panel B. 1991-2010								
$\Delta Tariff_m^{Adult}$	−0.888***	0.274*	0.854***	0.046	−0.002	−0.364***	0.598***	0.095
	(0.231)	(0.144)	(0.112)	(0.108)	(0.180)	(0.095)	(0.102)	(0.092)
$\Delta Tariff_m^{Child}$	13.745***	2.555	−9.636***	−4.623**	−3.757	2.365*	−10.748***	−6.898***
	(4.316)	(2.753)	(2.558)	(2.109)	(2.884)	(1.233)	(2.174)	(1.724)
R-squared	0.86	0.82	0.66	0.44	0.92	0.88	0.72	0.47
Observations	411	411	411	411	411	411	411	411
Mean dep. var.	0.223	0.084	-0.043	-0.014	-0.179	-0.069	-0.048	-0.027

Notes: This table reports the estimated effects of local exposure to tariff shocks on child labor and schooling by household income. Panel A presents the results from the estimation of Equation (6) for changes in the dependent variable between 1991 and 2000. Panel B exhibits the results for the period between 1991 and 2010. All regressions control for state fixed effects and the following demographic controls computed at the baseline year 1991: share of urban population, poverty (measured as the percentage of population living with less than half the minimum wage), Gini inequality index, logarithm of the population, share of child population, and illiteracy rate. Regressions additionally include the lagged dependent variable (Δ1980-1991) and are weighted by the inverse of the squared standard errors estimated in the first stage. Standard errors clustered at the mesoregion level are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 7: Heterogeneous Effects: Household's Head Education

	School only		Work		Idle		Paid work	
	Unskilled	High-skilled	Unskilled	High-skilled	Unskilled	High-skilled	Unskilled	High-skilled
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. 1991-2000								
$\Delta Tariff_m^{Adult}$	−0.362*	0.100	0.416***	−0.008	−0.031	−0.098*	0.466***	0.060
	(0.200)	(0.100)	(0.126)	(0.068)	(0.137)	(0.058)	(0.098)	(0.065)
$\Delta Tariff_m^{Child}$	9.395**	1.811	−7.703***	−3.250***	−2.259	1.270	−8.636***	−2.961***
	(4.553)	(1.913)	(2.606)	(1.222)	(2.581)	(1.114)	(2.231)	(0.946)
R-squared	0.76	0.38	0.62	0.24	0.90	0.50	0.71	0.34
Panel B. 1991-2010								
$\Delta Tariff_m^{Adult}$	−0.792***	0.030	0.774***	0.028	0.007	−0.058	0.587***	0.029
	(0.221)	(0.110)	(0.120)	(0.068)	(0.173)	(0.060)	(0.113)	(0.070)
$\Delta Tariff_m^{Child}$	13.576***	4.018**	−10.124***	−4.689***	−3.553	0.484	−11.512***	−4.143***
	(4.530)	(1.921)	(2.870)	(1.159)	(2.764)	(1.209)	(2.398)	(0.987)
R-squared	0.84	0.39	0.64	0.34	0.91	0.57	0.71	0.45
Observations	411	410	411	410	411	410	411	410
Mean dep. var.	0.209	0.031	-0.043	-0.004	-0.166	-0.026	-0.046	-0.020

Notes: This table reports the estimated effects of local exposure to tariff shocks on child labor and schooling by household's head education. Panel A presents the results from the estimation of Equation (6) for changes in the dependent variable between 1991 and 2000. Panel B exhibits the results for the period between 1991 and 2010. All regressions control for state fixed effects and the following demographic controls computed at the baseline year 1991: share of urban population, poverty (measured as the percentage of population living with less than half the minimum wage), Gini inequality index, logarithm of the population, share of child population, and illiteracy rate. Regressions additionally include the lagged dependent variable (Δ1980-1991) and are weighted by the inverse of the squared standard errors estimated in the first stage. Standard errors clustered at the mesoregion level are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

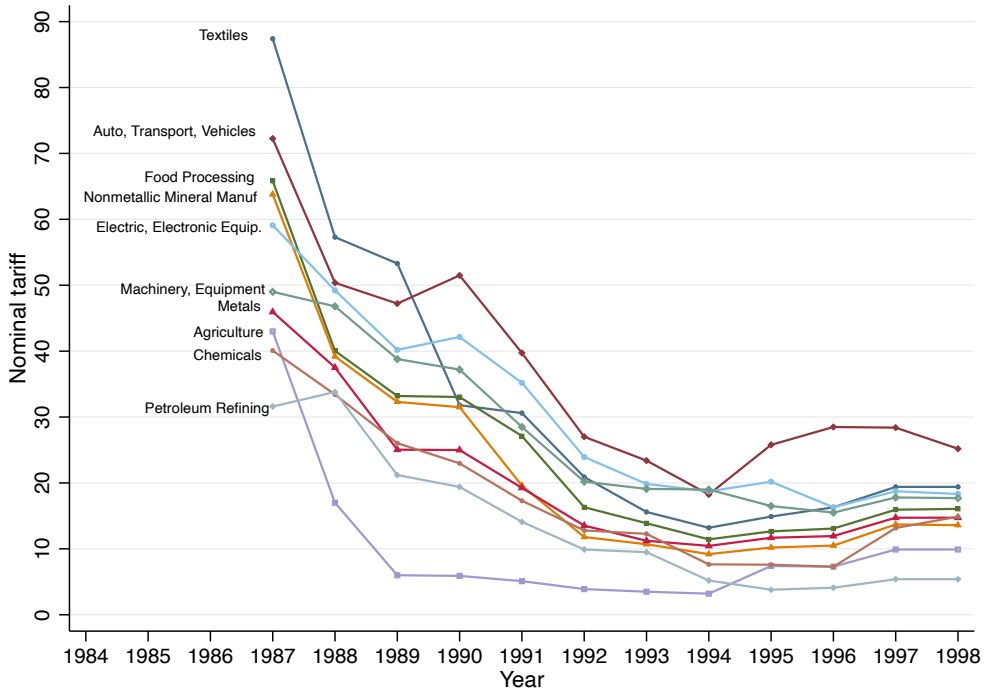
Table 8: Main Results: Structural Transformation

				Conditional on work		
	Non-employment	Informal employment	Earnings	Agro. mining	Manuf.	Non-tradable
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. 1991-2000						
$\Delta Tariff_m^{Adult}$	0.497***	0.936***	−0.273	0.413***	−0.464***	0.039
	(0.109)	(0.182)	(0.309)	(0.119)	(0.078)	(0.132)
$\Delta Tariff_m^{Child}$	−5.726**	−10.698***	5.773	0.205	5.127***	−7.180***
	(2.204)	(2.181)	(4.294)	(2.224)	(1.714)	(2.429)
R-squared	0.47	0.79	0.77	0.72	0.86	0.67
Panel B. 1991-2010						
$\Delta Tariff_m^{Adult}$	0.382***	1.302***	−1.023**	1.107***	−0.791***	−0.480**
	(0.117)	(0.206)	(0.392)	(0.180)	(0.106)	(0.189)
$\Delta Tariff_m^{Child}$	−9.371***	−13.309***	17.907***	−1.297	2.847*	−8.033**
	(3.213)	(2.648)	(6.373)	(3.567)	(1.615)	(3.407)
R-squared	0.69	0.74	0.88	0.85	0.85	0.82
Observations	411	411	411	411	411	411

Notes: This table reports ... * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Appendix A

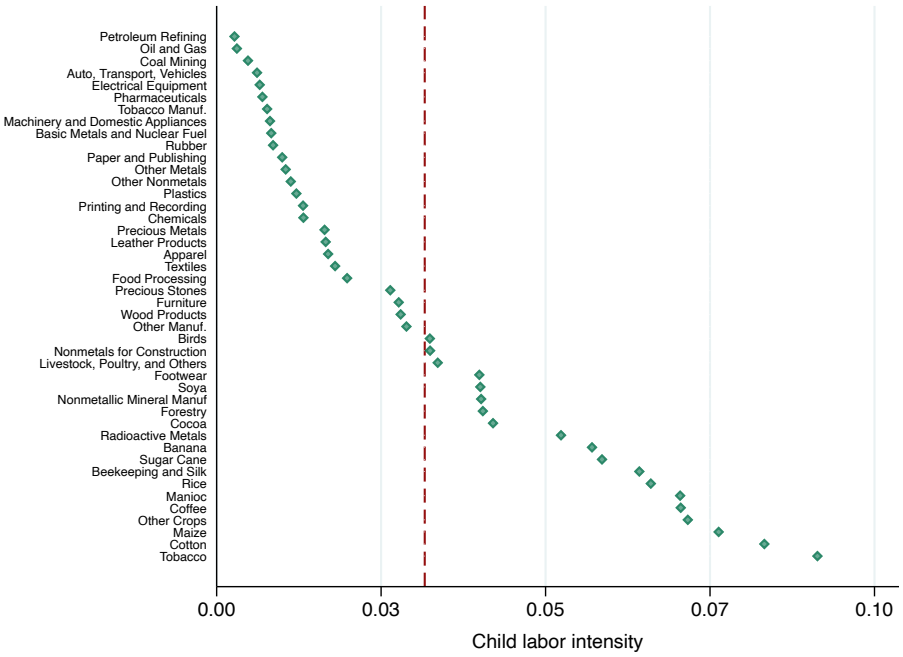
Figure A1: Evolution of Nominal Tariffs (1987-1998)



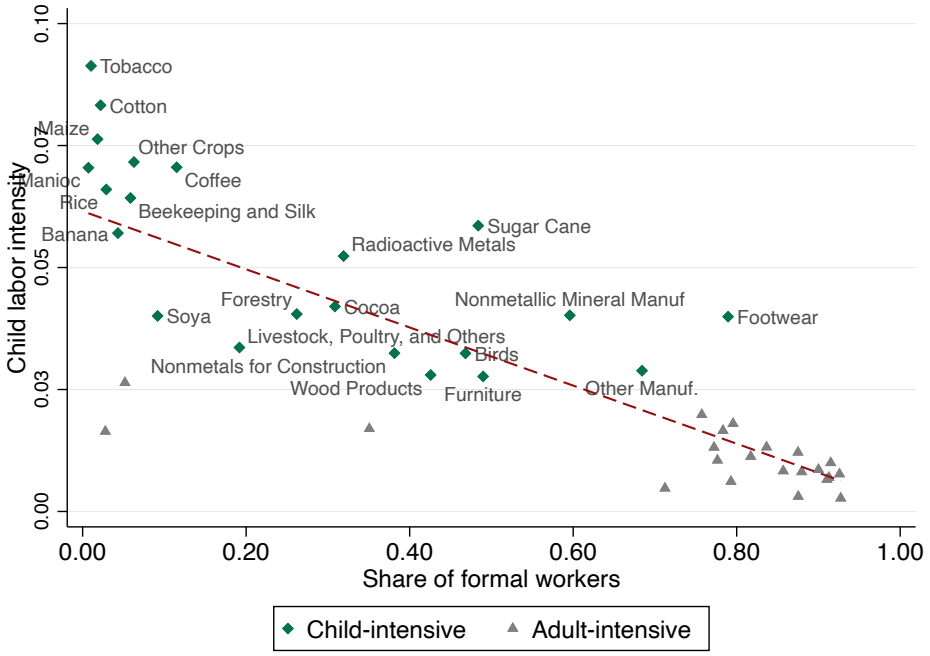
Notes: This figure presents the evolution of nominal tariffs from 1987 to 1998 for the ten largest industries by value added in 1990. Source: **?**.

Figure A2: Child Labor Intensity

(a) Child Labor Intensity



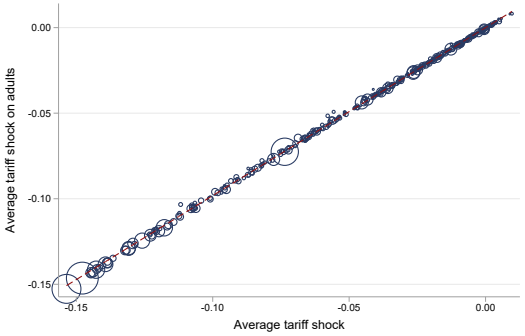
(b) Child Labor Intensity vs Formal Workers



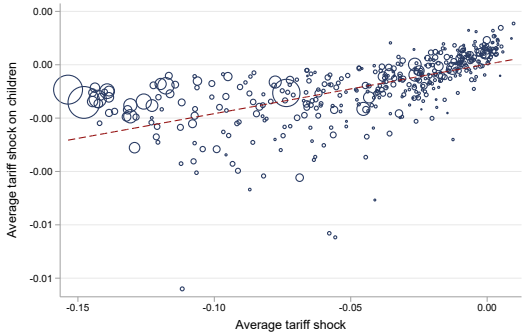
Notes: This figure displays the relationship between the child labor intensity and the fraction of adult workers in each industry who are formally employed. Child labor intensity is measured by the ratio of child to adult workers in each industry. Formal workers are those who hold a formal contract characterized by a signed card. Source: 1991 Census.

Figure A3: Regional Tariff Shocks

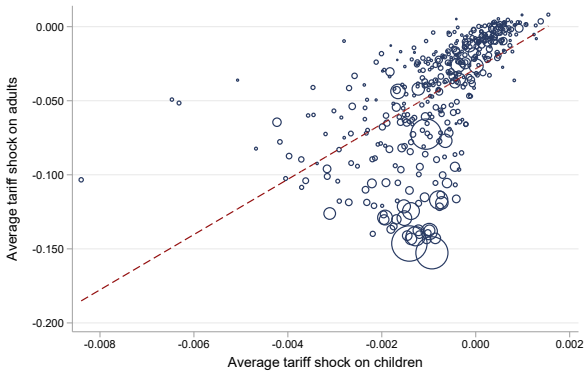
(a) $\Delta Tariff_m^{Adult}$ vs $\Delta Tariff_m$



(b) $\Delta Tariff_m^{Child}$ vs $\Delta Tariff_m$



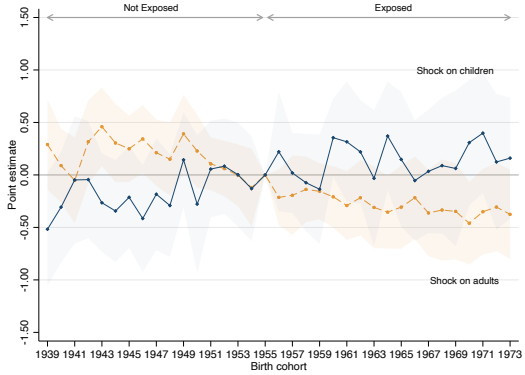
(c) $\Delta Tariff_m^{Adult}$ vs $\Delta Tariff_m^{Child}$



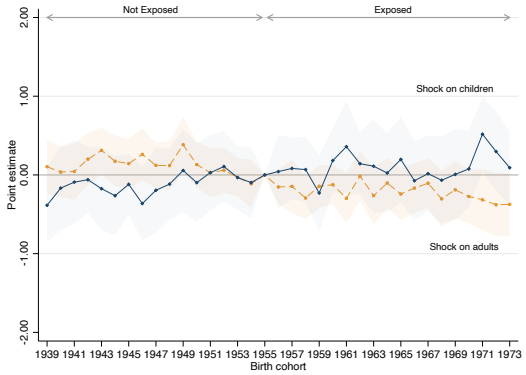
Notes: This figure plots the relationship between the measures for the overall tariff shock, adult and child industry shocks. These measures are computed following Equations (3) and (4). Weights are given by population at each microregion in 1991.

Figure A4: Robustness Checks: Human Capital Accumulation

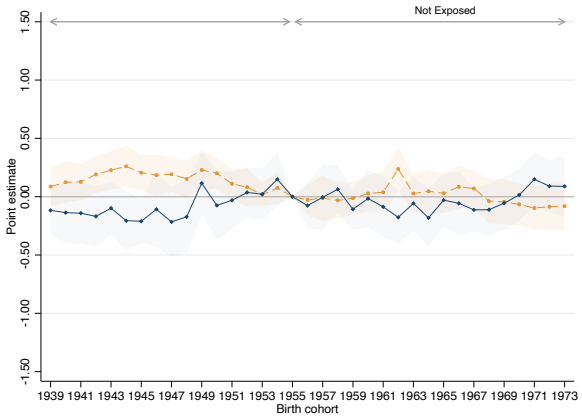
(a) Completed Elementary/Middle School



(b) Completed High School



(c) College Education



Notes: This figure plots ...

Table A1: Robustness Checks: Controlling for Possible Confounding Effects

	Dep. variable: Idle							
	Baseline	No controls	Longer pre-trends	Income per capita	Labor market	Social programs	Educ./Pub. spending	Macro shocks
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. 1991-2000								
$\Delta Tariff_m^{Adult}$	−0.084	0.793***	−0.052	−0.091	−0.209	−0.119	−0.041	−0.097
	(0.129)	(0.102)	(0.118)	(0.122)	(0.141)	(0.115)	(0.145)	(0.114)
$\Delta Tariff_m^{Child}$	−1.141	−0.142	−1.084	−0.590	−2.116	−0.396	−1.378	−1.264
	(2.411)	(2.525)	(2.703)	(2.107)	(2.236)	(2.099)	(2.264)	(1.998)
R-squared	0.91	0.79	0.92	0.91	0.92	0.91	0.92	0.91
Panel B. 1991-2010								
$\Delta Tariff_m^{Adult}$	−0.069	0.990***	−0.029	−0.093	−0.202	−0.116	−0.015	−0.192
	(0.158)	(0.115)	(0.141)	(0.151)	(0.186)	(0.136)	(0.177)	(0.120)
$\Delta Tariff_m^{Child}$	−2.131	−1.009	−2.062	−1.081	−3.274	−1.088	−2.403	−2.450
	(2.550)	(2.888)	(2.845)	(2.253)	(2.295)	(2.110)	(2.372)	(2.612)
R-squared	0.92	0.81	0.93	0.92	0.93	0.92	0.92	0.92
Observations	411	411	411	411	411	396	409	411

Notes: This table complements Table 3 by checking the robustness of the main results to alternative specifications and to confounding effects from other shocks to local labor markets. Panel A presents the results for changes in the dependent variable between 1991 and 2000. Panel B exhibits the results for the period between 1991 and 2010. All regressions follow the specification in Equation (6). Standard errors clustered at the mesoregion level are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A2: Robustness Checks: Controlling for Possible Confounding Effects

	Dep. variable: Paid work							
	Baseline	No controls	Longer pre-trends	Income per capita	Labor market	Social programs	Educ./Pub. spending	Macro shocks
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. 1991-2000								
$\Delta Tariff_m^{Adult}$	0.391***	0.236***	0.313***	0.398***	0.475***	0.406***	0.401***	0.374***
	(0.082)	(0.048)	(0.066)	(0.081)	(0.097)	(0.079)	(0.084)	(0.073)
$\Delta Tariff_m^{Child}$	−7.369***	−10.537***	−5.072***	−6.336***	−8.036***	−6.951***	−6.969***	−6.812***
	(1.722)	(2.903)	(1.787)	(1.738)	(1.685)	(1.372)	(1.724)	(1.456)
R-squared	0.70	0.55	0.75	0.74	0.71	0.72	0.72	0.73
Panel B. 1991-2010								
$\Delta Tariff_m^{Adult}$	0.495***	0.306***	0.401***	0.495***	0.720***	0.512***	0.517***	0.491***
	(0.092)	(0.057)	(0.080)	(0.093)	(0.108)	(0.090)	(0.091)	(0.084)
$\Delta Tariff_m^{Child}$	−10.213***	−14.220***	−7.455***	−8.844***	−9.875***	−9.755***	−9.596***	−9.321***
	(1.821)	(3.174)	(1.993)	(1.904)	(1.697)	(1.476)	(1.800)	(1.973)
R-squared	0.71	0.56	0.76	0.74	0.73	0.72	0.74	0.72
Observations	411	411	411	411	411	396	409	411

Notes: This table complements Table 3 by checking the robustness of the main results to alternative specifications and to confounding effects from other shocks to local labor markets. Panel A presents the results for changes in the dependent variable between 1991 and 2000. Panel B exhibits the results for the period between 1991 and 2010. All regressions follow the specification in Equation (6). Standard errors clustered at the mesoregion level are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A3: Robustness Checks: Controlling For Each Industry

Industry	Rotemberg weights	Estimate of β controlling for each industry share							
		School only				Work			
		1991-2000		1991-2010		1991-2000		1991-2010	
		Adult	Child	Adult	Child	Adult	Child	Adult	Child
Baseline	-	-0.267	7.456	-0.647	11.058	0.361	-6.676	0.691	-8.822
Apparel	0.338	-0.328	12.360	-0.644	14.418	0.421	-8.982	0.712	-9.030
Food Processing	0.102	-0.350	9.026	-0.697	11.785	0.418	-7.566	0.727	-9.200
Textiles	0.100	-0.328	9.575	-0.686	13.068	0.366	-7.048	0.670	-8.819
Metals	0.096	-0.118	4.852	-0.500	8.266	0.261	-4.774	0.611	-6.867
Agriculture	0.075	-0.389	7.386	-0.699	12.050	0.199	-8.083	0.467	-11.684
Nonmetallic Mineral Manuf	0.054	-0.297	7.783	-0.699	11.816	0.371	-6.749	0.695	-9.213
Wood, Furniture, Peat	0.052	-0.305	5.131	-0.660	8.106	0.347	-4.948	0.641	-6.654
Paper, Publishing, Printing	0.044	-0.193	6.976	-0.603	10.780	0.306	-6.357	0.639	-8.603
Other Manuf.	0.031	-0.242	7.104	-0.660	10.731	0.309	-6.184	0.669	-8.366
Auto, Transport, Vehicles	0.030	-0.220	6.789	-0.620	10.686	0.325	-6.162	0.674	-8.565
Electric, Electronic Equip.	0.026	-0.175	6.271	-0.611	10.571	0.293	-5.782	0.651	-8.292
Plastics	0.026	-0.133	5.702	-0.534	9.372	0.288	-5.572	0.642	-7.949
Machinery, Equipment	0.025	-0.263	7.433	-0.689	11.831	0.352	-6.455	0.709	-9.074
Pharma., Perfumes, Detergents	0.022	-0.173	6.677	-0.584	10.540	0.314	-6.274	0.677	-8.693
Petroleum Refining	0.016	-0.229	7.146	-0.620	10.866	0.360	-6.693	0.721	-9.166
Rubber	0.003	-0.234	7.015	-0.634	10.995	0.338	-6.286	0.684	-8.735
Petroleum, Gas, Coal	0.003	-0.268	7.450	-0.644	11.027	0.367	-6.720	0.696	-8.870
Chemicals	0.001	-0.249	6.938	-0.628	10.405	0.356	-6.786	0.687	-8.972
Mineral Mining	-0.005	-0.266	7.448	-0.640	10.920	0.349	-6.511	0.674	-8.589
Footwear, Leather	-0.039	-0.236	5.986	-0.617	9.618	0.334	-5.487	0.658	-7.438

Notes: This table

Table A4: Heterogeneous Effects: Race

	School only		Work		Idle		Paid work	
	Black	Non-black	Black	Non-black	Black	Non-black	Black	Non-black
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. 1991-2000								
$\Delta Tariff_m^{Adult}$	−0.642***	−0.167	0.618***	0.277**	0.058	−0.115	0.575***	0.346***
	(0.217)	(0.192)	(0.133)	(0.112)	(0.152)	(0.130)	(0.109)	(0.081)
$\Delta Tariff_m^{Child}$	10.953**	8.640**	−8.385***	−6.662***	−2.991	−2.341	−9.098***	−7.074***
	(5.070)	(3.455)	(2.643)	(2.228)	(2.931)	(2.177)	(2.628)	(1.711)
R-squared	0.72	0.72	0.64	0.55	0.87	0.84	0.69	0.63
Panel B. 1991-2010								
$\Delta Tariff_m^{Adult}$	−1.147***	−0.452**	1.007***	0.571***	0.148	−0.128	0.755***	0.427***
	(0.255)	(0.172)	(0.134)	(0.104)	(0.187)	(0.130)	(0.123)	(0.097)
$\Delta Tariff_m^{Child}$	16.649***	10.866***	−11.455***	−8.501***	−5.368*	−2.541	−12.512***	−9.915***
	(4.987)	(2.879)	(2.789)	(2.199)	(3.048)	(2.169)	(2.760)	(1.760)
R-squared	0.81	0.81	0.68	0.62	0.88	0.87	0.71	0.66
Observations	411	411	411	411	411	411	411	411
Mean dep. var.	0.235	0.160	-0.059	-0.029	-0.176	-0.132	-0.058	-0.033

Notes: This table reports the estimated effects of local exposure to tariff shocks on child labor and schooling by household's head education. Panel A presents the results from the estimation of Equation (6) for changes in the dependent variable between 1991 and 2000. Panel B exhibits the results for the period between 1991 and 2010. All regressions control for state fixed effects and the following demographic controls computed at the baseline year 1991: share of urban population, poverty (measured as the percentage of population living with less than half the minimum wage), Gini inequality index, logarithm of the population, share of child population, and illiteracy rate. Regressions additionally include the lagged dependent variable (Δ1980-1991) and are weighted by the inverse of the squared standard errors estimated in the first stage. Standard errors clustered at the mesoregion level are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A5: Heterogeneous Effects: Gender

	School only		Work		Idle		Paid work	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. 1991-2000								
$\Delta Tariff_m^{Adult}$	−0.399*	−0.191	0.429***	0.324***	−0.069	−0.089	0.473***	0.336***
	(0.204)	(0.172)	(0.146)	(0.081)	(0.136)	(0.132)	(0.115)	(0.062)
$\Delta Tariff_m^{Child}$	9.427*	6.090*	−7.100**	−6.396***	−2.425	0.022	−8.122***	−6.647***
	(4.920)	(3.180)	(3.321)	(1.457)	(2.768)	(2.225)	(2.997)	(1.142)
R-squared	0.79	0.79	0.51	0.64	0.90	0.89	0.64	0.67
Panel B. 1991-2010								
$\Delta Tariff_m^{Adult}$	−0.930***	−0.398**	0.885***	0.509***	−0.033	−0.104	0.580***	0.433***
	(0.208)	(0.193)	(0.141)	(0.080)	(0.165)	(0.161)	(0.129)	(0.068)
$\Delta Tariff_m^{Child}$	13.368***	9.208***	−9.265***	−8.489***	−3.666	−0.693	−11.786***	−8.640***
	(4.259)	(3.277)	(3.171)	(1.674)	(2.883)	(2.342)	(3.027)	(1.228)
R-squared	0.90	0.81	0.62	0.67	0.92	0.90	0.67	0.68
Observations	411	411	411	411	411	411	411	411
Mean dep. var.	0.218	0.179	-0.074	-0.011	-0.144	-0.168	-0.061	-0.026

Notes: This table reports the estimated effects of local exposure to tariff shocks on child labor and schooling by household income. Panel A presents the results from the estimation of Equation (6) for changes in the dependent variable between 1991 and 2000. Panel B exhibits the results for the period between 1991 and 2010. All regressions control for state fixed effects and the following demographic controls computed at the baseline year 1991: share of urban population, poverty (measured as the percentage of population living with less than half the minimum wage), Gini inequality index, logarithm of the population, share of child population, and illiteracy rate. Regressions additionally include the lagged dependent variable (Δ1980-1991) and are weighted by the inverse of the squared standard errors estimated in the first stage. Standard errors clustered at the mesoregion level are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.