



Globalization, Gender and Development: The Effect of Parental Labor Supply on Child Schooling

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Abstract

Tariff reductions have gender-specific effects on the labor market that change the relative bargaining power within households, which in turn affects child outcomes. We estimate how changes in parental labor supply due to these tariff reductions affect child schooling by focusing on young school-age children who are otherwise not active in the labor market. Using micro-level data from India, we find that an increase in female labor supply due to the tariff reductions was associated with a 7 percentage points higher schooling probability for children between the ages of 7 and 10. This result explains approximately 26 percent of the improvement in schooling for this age group between the years 1988 and 2000.

JEL-Code: O120, O190, D130.

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1 Introduction

There is a large literature on the relationship between globalization and human capital formation in a macroeconomic context. In this paper, we consider a mechanism that works at the microeconomic level through intra-household bargaining. Within each household, bargaining takes place between the mother and father to determine how their joint income is spent. Assuming that they have different preferences towards fertility and child education, they face a tradeoff between the quality and the quantity of children. Based on studies in the development literature, we assume that women have a stronger relative preference towards quality of children than men do, while men put more weight of the number of children.

If the process of globalization leads to better labor market opportunities for women, the bargaining power of women improves and subsequently shifts child outcomes towards her preferences. If this is the case, we will observe lower fertility and higher child education levels within a household, and therefore, human capital formation will increase. Similarly, if globalization produces relatively better labor market opportunities for the male, then the equilibrium outcome will shift towards his preferences, and human capital formation will fall.

The literature on women empowerment in developing countries generally shows that greater labor market access and participation, which create independent income, improve the decision making power of women and give them more control over the allocation of household resources. In this context, labor supplied outside the household is a factor that affects intra-household bargaining by changing the threat points of the bargaining process. However, parental labor supply is endogenous to child schooling. The time constraint of parents force them to allocate their time between household and market activities, leading to fertility levels that are simultaneously determined with labor market activity, which in turn influences their children's probability of schooling.

After controlling for household income, the effect of differential labor supply on child schooling can be identified using variations in market conditions that are exogenously given to the household. If these changes in market conditions affect the child only through the changes in parental outcomes, they can serve as an instrument for the relationship between intra-household bargaining and child outcomes. In this paper, we identify this relationship by exploiting the variation in tariff rates in India. India experienced substantial trade liberalization since 1991 and has detailed micro-level

data that allows us to understand the extent to which changes in parental labor market activity due to reduced tariffs affect child schooling. We focus on the schooling probability of children who are too young to be productive in the labor market but old enough to attend school. The household survey data shows that children between the ages of 7 and 10 fit these specifications as they are mostly idle if they are not attending school, so we focus our analysis on this age group.

Our results show that lower tariffs are associated with higher market labor supply for both mothers and fathers. In the second stage analysis, we observe that our assumption about preferences holds. Children in households in which the mother supplied more labor hours had higher school attendance and fewer siblings. On the other hand, a higher labor supply for the father was associated with lower school attendance and more siblings.

This paper makes several contributions to the literature. First, we consider market labor supply as a source of bargaining power within the household and test the effect of differential labor supply on child outcomes after controlling for the combined household expenditure and other household characteristics. This approach allows us to separate the effect on child outcomes that originates from female autonomy associated with market labor supply from changes in household income. While testing the effect of labor supply, we consider possible sources of endogeneity related to fertility.

Our second contribution is that we exploit the variation in tariff rates in parental industries and use this variation as an instrument for labor supply. This allows us to identify the effect of changes in differential labor supply due to tariff reductions on the schooling of children. Third, we use the Indian household survey data to generate child data that links each child to parent and household characteristics. We exploit the micro-level information in the survey that provides us with information about the relationship between bargaining power and child outcomes.

The paper is organized as follows. Section 2 briefly describes the literature. Section 3 introduces the data set used in this paper and presents descriptive statistics. Section 4 discusses the trade reform in India and its impact on parental labor supply. Section 5 reports our results and Section 6 concludes.

2 Literature Review

Observed child quality and quantity are considered to be an outcome of a collective decision that is made at the household level. Within each household, individuals are assumed to have heterogeneous preferences. Unitary household models that assume income pooling and a representative household utility function have generally been rejected by the empirical evidence (Browning and Chiappori, 1998; Duflo, 2003; Duflo and Udry, 2001; Pitt, Rosenweig and Nazmul, 1990; Quisumbing and Maluccio, 2003; and Thomas, 1991). Consequently, if the mother and father place different weights on fertility and child quality in their utility functions, then equilibrium outcomes will reflect their relative bargaining power.

Following Anderson and Eswaran (2009), labor supplied outside of the household is considered as a source of female autonomy that increases the value of her outside option and thus her relative bargaining power. They distinguish between the different forms of labor participation for women when analyzing female autonomy and conclude that employment outside of the household contributes to female autonomy rather than overall employment.

Although we don't directly observe the bargaining process, we can infer it by examining the outcome of the bargaining process, which is in this case, child schooling. In this paper, we use the variation in tariff rates to identify the effect of labor supply on schooling rates. First, trade affects the labor market outcomes of parents. These effects may be different for the mother and father, as trade differentially affects industries in which males and females may have relative advantages. Next, the changes in the labor market outcomes affect the tradeoff between child quality and quantity through intra-household bargaining.

The idea behind the empirical approach in this paper follows from the theoretical model developed by Rees and Riezman (2008). They view the globalization process as creating market opportunities for employment in developing countries. Based on the empirical literature, they assume that women have a stronger relative preference towards the quality of children and men have a stronger relative preference towards the quantity of children. In this framework, if the market opportunities created by globalization are higher for women, women's bargaining power within the household improves and the post-globalization equilibrium involves lower fertility and higher child quality. On the other hand, if the opportunities are better for men, then globalization should

increase fertility and lower child quality.

Parental labor supply is often endogenous to child outcomes. Theory on the effects of fertility on labor supply generally focuses on two channels. First, as the number of children increases, there will be more specialization within the household as women allocate more time to childcare (Becker, 1985). Second, fertility has a direct effect on the value of both parent's time in household production, often referred to as the 'home-intensity effect'. As a result, the theory predicts a reduction in the mother's labor supply, but the net effect on the father's labor supply will depend on the relative magnitudes of specialization and home-intensity effects (Kim and Aasve, 2006). Another tradeoff that households face is between the quality and quantity of children. The shadow prices of child quality and quantity are strongly linked, and therefore, exogenous changes may lead to substitution between these two variables (Lam and Duryea, 1999). A mother with a large number of children may choose to allocate more time towards home production and less time in market production. This may lead to higher quality children even though the number of children is large.

Within the empirical literature, the link between labor supply decisions and the child quality-quantity tradeoff has been widely studied. Angrist and Evans (1998) use the gender composition of first two children as an instrument to fertility. If the parents prefer a mixed-gender composition among children and if the first two children are of the same gender, the family will have a higher probability of having a third child.¹ In fact, they show that, in the U.S., having two boys or two girls increases the probability of having a third child by about 6 percent. Using this instrument, they find that having an additional child reduces the female labor market participation probability by 12 percent and labor supply by about 5 hours a week. Although they find no significant effect on the father's labor supply, later studies that use the same data set have identified a positive effect.

If a mother's and a father's labor supply are perfect substitutes, the reduction in a mother's labor supply may be balanced by a proportional increase in a father's labor supply. In this case, we should see a positive effect for the father. Lundberg and Rose (2000) compare families before

¹Earlier literature uses twins as an instrument for fertility. For example, see Rosenzweig and Wolpin (1980), Bronars and Grogger (1994), and Gangadharan and Rosenbloom (1996). However, having twins at the first birth is a sparse occurrence in the data. Second, the age difference between the second and third child is necessarily larger if the first two children are twins. This would bias the estimates since the effect on labor supply is larger when the children are younger. For these reasons, the gender composition approach has been generally preferred over using twins as an instrument in this context.

and after their first birth in a difference-in-difference framework, using households with no children as the control group. Their findings suggest that the first child leads to a 5 percent reduction in the mother's wages and a 9 percent increase in the father's wages. They also note that even before the first child, the labor market activities of the male and female are significantly different, and mothers make about 9 percent less than fathers on average. In another study (Lundberg and Rose, 2002), they test whether the father's labor market response depends on the gender of the child and find that the father's labor supply and wages increase more in response to a birth of a son than to the birth of a daughter.

Most of these results seem to hold in developing countries as well as developed countries, especially in rural areas. For example, Kim and Aasve (2006) use data from Indonesia, a country that moved from a high fertility-low income equilibrium to a low fertility-high income equilibrium between 1970 and 1995. They find that in rural areas, mothers decrease hours of work by 1.1 hours per child whereas men increase their labor supply by 0.9 hours. In urban areas, they find similar results for women, but no significant effect for men. Jungmin Lee (2008) uses the preference for sons to identify the tradeoff between child quality and quantity in South Korea. He estimates a reproduction function to show that families have a strong preference towards sons and that the probability of having a second child is much higher if the first child is a daughter. Based on these results, he uses the gender of the first child as an instrument to identify the child quality-quantity relationship and estimates a negative elasticity of per-child education investment with respect to fertility.

Atkin (2009) analyzes the effect of factory openings on child health in Mexico. In order to account for the unobserved characteristics of women who choose to work, he uses women whose first job was in the manufacturing sector as an instrument. He finds that the expansion in employment opportunities due to factory openings induce women to work which improve their bargaining power within the household. In addition, women who began to work after the factory opens have significantly healthier children.

Edmonds et al. (2007) look at the effect of medium and short-term adjustment costs on schooling rates using the variation between Indian districts, and find that districts that experienced an average tariff reduction have 2 percentage points less improvement in schooling rates compared to districts with no tariff reduction. The current paper employs a very different approach than Edmonds et

al. (2007). We are interested in the effect of intra-household bargaining power of individuals due to their market activity as it translates into child schooling rates after controlling for the combined wealth of the households. In particular, we look at the effects of the changes in these market activities resulting from tariff changes. For this reason, the results of the current paper should be interpreted within this particular framework.

3 Data and Descriptive Statistics

We use the Employment and Unemployment Survey conducted by the Indian National Sample Survey Organization (NSSO). The NSSO adopted a quinquennial survey program that incorporates a nationally representative sample.² This is one of the largest and oldest household surveys for a developing country. Our analysis relies on the 43rd, 50th, and 55th rounds of this survey in rural and urban India and covers a time period of 12 years from 1988 to 2000. The collected information includes household characteristics, as well as individual level variables that are related to labor market outcomes. Each individual reports up to five activities and time spent in each activity. The types of activities include: working in a household enterprise as an own account worker, employer, or unpaid family worker; working as a regular salaried/wage employee; working as a casual wage laborer in public works or in other types of work; attending an educational institution; attending to domestic duties; and engaging in the free collection of goods for household use. Because we are interested in market labor provided by the mother and father even when it is not their most important activity, we exploit this aspect of the data when determining parental labor supply levels.

Once we determine the parental labor market variables for each child, we convert the individual level data so that each observation is for one child, and other variables such as education level, parental labor market variables, and household characteristics are also specified for each child. We exclude multiple family households as the interaction between different families within these household may alter the child outcomes. We also exclude households in which one of the parents is absent.

Our identification strategy relies on the tariff rates in parental industries; therefore, the indirect effect of tariffs on children's educational outcomes through parental labor supply should be

²In addition to the quinquennial surveys based on 'thick samples', NSS implements additional surveys between the successive quinquennial rounds that are based on much smaller 'thin samples'.

significant, but the direct effect should be minimal or insignificant. We focus on children between the ages of 7 to 10 years old, because this age group is unlikely to actively participate in the labor market, especially menial labor, while they are old enough to attend primary school.³ The pattern in the data suggests that children within this age group are mostly idle if they are not attending school. This can be seen in Table 1, which summarizes children's principal activities by age group and gender. Between the ages of 7 and 10, only 52 percent of girls were reported to have attended school in 1988, which increases to 74 and 79 percent in 1993 and 2000, respectively. Over the same time period, the proportion of girls who are idle has decreased from 43 percent to 18 percent. Hence, in a period of twelve years there has been a 27 percentage point improvement in schooling and a 25 percentage point reduction in being idle among girls within this age group. Similarly, the schooling rate among boys was 59 percent in 1988 and 86 percent in 2000, recording a 27 percentage point improvement. At the same time, the proportion of boys who are idle decreased by 25 percentage points from 38 percent to 13 percent.

There was little change in market and domestic work for both boys and girls, suggesting that almost the entire improvement in schooling within this age group came from children who previously were idle and not actively participating in domestic work or market labor. On the other hand, a significant proportion of children between the ages of 11 and 14 are engaged in child labor and thus facing a tradeoff between schooling and work. This is consistent with the approach followed by Edmonds et al. (2007), which focuses on older school age children while analyzing the effect of trade liberalization on the tradeoff between child labor and schooling. The most improvement in this time period was among girls between ages 11 and 14, of whom 9 percent reported market labor and 18 percent reported domestic labor as their principal activity in 1988. These ratios decreased to 5 percent and 11 percent in 2000. Among boys, there was an 8 percentage point improvement in schooling and a 5 percentage point reduction in market labor. A very small percentage of boys reported domestic labor as their principal activity.

Next, we move to the characteristics of the household. The upper left panel in Table 2 reports the fertility rates by year and sector. Over the sample period, the average number of children per household has decreased by 0.21 for urban households and 0.08 for rural households. Rural

³Although some children are reported to attend school at ages 5 or 6, we do not include this age group in our analysis. The reason is that a significant proportion of these children are attending pre-school from which some parents may opt out even when they have strong preferences towards education.

households have higher levels of fertility and lower per capita income levels in all rounds. We observe a significant increase in per capita income levels for both rural and urban households, even after correcting for inflation.

Parental education is an indicator variable that switches on if the parent had any education in the past. Using this definition, only 24 percent of rural mothers reported that they had any schooling in 1988, with this ratio increasing to 34 percent by 2000. On the other hand, the percentage of urban fathers who had any education was 80 percent in 1988 and 83 percent in 2000. The percentage of urban mothers who had any education was 58 percent in 1988 and 67 percent in 2000. Only 53 percent of rural fathers had any education in 1988, while this ratio has increased to 60 percent in 2000. This clearly shows that education levels are substantially higher among fathers which will be taken into account in the empirical analysis.

NSS reports weekly labor supply for each individual for different activities. Because we are interested in labor supply which can generate bargaining power within the household, we exclude domestic labor and labor provided to household enterprises. It is not likely that these types of activities improve female autonomy and move the child quality/quantity equilibrium towards her preferences.

Market activities considered in this paper are the following: regular employee wage/salaried labor, casual wage labor in public works, and casual wage labor in other types of works. Participation and labor supply variables reported in Table 2 are based on these activities. Only 12 percent of urban mothers and 26 percent of rural mothers participated in these activities in 1988. These rates increased to 14 percent and 32 percent by 2000, indicating a 2.1 and 6.4 percentage point increase in twelve years.

Participation in market activities is much higher among fathers. Fifty-nine percent of urban fathers and 41 percent of rural fathers participated in market activities in 1988. By 2000, these rates increased very little to 59 percent and 47 percent for urban and rural fathers, respectively. An interesting observation is that in urban areas, participation in market activities is lower among mothers and higher among fathers relative to rural areas. This may be due to lower overall labor market production among females in urban areas. In fact, if we include labor provided to household enterprises in our definition, the participation ratio of urban mothers remains significantly lower than rural mothers (17 percent and 37 percent), while the participation ratios of urban and rural

fathers becomes very similar (97 percent and 98 percent).

The labor supply in market activities is reported in terms of days per week and includes non-participation.⁴ In rural areas, maternal labor supply in market activities was 0.77 days a week in 1988 and 0.87 days a week in 2000, indicating a 13 percent increase. On the other hand, urban fathers supplied much more labor than urban mothers and had a relatively modest increase of 5 percent. In rural areas, both maternal and paternal labor supply in market activities increased by approximately 13 percent. The labor supply levels reported in Table 2 are lower than overall labor supply since we focus only on specific activities.

Let's now turn to the tradeoff between child quality and quantity which is presented in Figure 1. Schooling rates are shown for children between the ages of 7 and 10. The probability that a child attends school decreases significantly as the number of children within a household increases. For example, in urban areas in the year 1988, the average schooling rate for households with 1 child was approximately 82 percent, and decreased to 61 percent for households with 7 children. This negative relationship holds for both rural and urban households for each survey round. In general, attendance rates are lower in rural areas than in urban areas. However, they possess a similar structure in terms of the child quality and quantity tradeoff.

4 Tariff Rates and Labor Supply

Table 3 reports summary statistics on tariff rates in India. India's post-independence development strategy has relied heavily on self-sufficiency. There were heavy restrictions on almost all tradable sectors prior to the trade reform. In 1988, the average ad-valorem tariff for the agriculture sector was 116.2 percent while in manufacturing it was 117.5 percent. In 1991, India went through very extensive trade liberalization in compliance with the conditions imposed by the IMF. Subsequently, the average tariff in the agriculture sector was reduced to 35.9 percent by 2000 and the average tariff in the manufacturing sector was reduced to 38.3 percent. Trade liberalization came as a surprise to the political community as well as to the production markets. As a result, there was little or no room for political economy concerns in the extent and dispersion of the tariff reductions. The IMF conditions required reductions in all industries regardless of the pre-reform tariff rates. The

⁴NSS reports labor supply as number of days in a week, which we use throughout this study. One could multiply these numbers by the usual work hours per day in India.

reductions in tariffs were not significantly correlated with the initial tariff rates, skill intensities, or the initial productivity levels of the industries (Topalova, 2004).

We use the variation in tariff rates to identify the effect of parental labor supply on schooling. Because it would take some time for trade policy to affect labor supply, we use 2-year lagged tariff rates.⁵ The household survey we use reports the industry affiliation for each individual, allowing us to merge these tariff rates to parental industry affiliation for each child. This restricts our sample to children whose parents are working in traded industries, reducing our sample size to 30,512 children.

The extent to which trade reform affects labor supply works mainly through the increase in labor demand and earning opportunities, which are affected by changes in the relative prices of the domestic economy. If the labor market opportunities created by trade liberalization affect males differently than females, then it will affect the relative bargaining position within the household.

The effect could be systematic if, for example, male workers have a comparative advantage in ‘brawn’ intensive industries and female workers have a comparative advantage in ‘brain’ intensive industries. More specifically, if male and female workers have the same amounts of ‘brains’, but males have more ‘brawn’, then industries can be characterized as female relative advantage industries and male relative advantage industries (Saure and Zoabi, 2009). If trade liberalization causes specialization in female relative advantage industries, then employment opportunities should increase more for female workers relative to male workers. Saure and Zoabi (2009) show that if the labor markets are perfectly flexible, this may result in an inflow of male workers to female relative advantage industries, where the marginal productivity of females would decrease and females would be driven out of the labor market.

As far as the overall employment effects of tariff reductions are concerned, there is a strand of empirical literature on India that finds estimates that are not consistent with the predictions of Hecksher-Ohlin model. One crucial assumption of this model, perfect factor mobility may be violated in developing countries due to rigid labor laws and industry regulations. Although a comprehensive review of these regulations is beyond the scope of this paper, the implications in

⁵Specifically, we use the 1986 tariffs for the 43rd round, the 1991 tariffs for the 50th round, and the 1998 tariffs for the 55th round. The 1986 tariff rates are extrapolated using the percentage reduction between 1988 and 1999. Because tariff rates remained almost constant prior to the trade liberalization in 1991, the extrapolation provides tariff rates that are very close to the true tariff rates.

terms of the trade-employment relationship has been widely studied in the literature. In a recent study, Hasan, Mitra, and Ranjan (2009) look at the effect of trade liberalization on unemployment in India and they find almost no evidence that unemployment rises with trade liberalization. In contrast, they find that unemployment decreases with reduced protection, especially in states with flexible labor markets and in urban areas.

In addition, employment can rise with trade liberalization due to the high productivity gains that were experienced in India (Felbermayr, Prat, and Schemenr, 2008). If trade reduces variable costs and induces more productive firms to enter the industry, then trade liberalization will increase employment. Khadelwal and Topalova (2010) find that tariff reductions in India increased total factor productivity through a pro-competitive effect due to lower output tariffs, and through access to better inputs due to lower input tariffs. Other studies such as Goldar (2002) show that growth in employment has accelerated in India after 1991, and that export oriented industries employed relatively more women than import competing industries.

5 Empirical Approach and Discussion of the Results

5.1 Schooling and Parental Labor Supply

In each household, both mothers and fathers face a tradeoff between home production and market production. In addition, there is a substantial amount of specialization within the household. Empirical evidence suggests that an increase in the number of children can cause women to specialize in home production and men to specialize in market production, even when there is no specialization at the initial equilibrium. Thus, in analyzing the impact of trade on labor supply, the effect of heterogeneous fertility should be taken into account. Consider the following schooling regression:

$$y_{iht} = \alpha_0 + \alpha_1 M_{hjt} + \alpha_2 P_{hkt} + \alpha_3 n_{ht} + \alpha_4 X_{ht} + \alpha_5 C_{iht} + \gamma_t + \phi_{jt} + \phi_{kt} + \epsilon_{iht} \quad (1)$$

where y_{iht} is a binary variable for whether or not child i in household h at time t attends school. M_{hjt} is the labor supply of a mother in household h and industry j at time t and P_{hkt} is the labor supply of a father in household h and industry k at time t . n_{ht} is the number of children in household h at time t . X_{ht} is a variable of household characteristics such as religion, social class,

and per capita expenditure, as well as labor market characteristics of the mother and father such as education and age. C_{iht} represents the characteristics of the child including age and age-squared and a binary variable for boys. γ_t is year fixed effects that controls for macroeconomic shocks that are common to all individuals, while the industry fixed effects ϕ_{jt} and ϕ_{kt} control for industry specific shocks other than the tariff reductions in the maternal industry j and the paternal industry k . Finally, ε_{iht} is an *i.i.d.* error term that is assumed to be uncorrelated to child schooling.

The above equation is estimated with and without the fertility variable n_{ht} using the linear probability model. The results are reported in Table 4, columns 1 and 2.⁶ Maternal labor supply is estimated to have a positive and significant effect on child schooling, whereas paternal labor supply is found to have no significant effect. A one day increase in maternal labor supply increases the child schooling rate by 0.5 percentage points. Household characteristics have the expected effects on schooling probability. A one percent increase in per capita household expenditure increases the schooling probability by 7.7 percent and a one percent increase in land owning increases the schooling probability by 0.9 percent. Rural children were approximately 10 percent less likely, and boys were approximately 14 percent more likely, to attend school. Age controls turned out to be insignificant for these children as age was not a strong determinant of schooling probability.

There were significant differences between the mothers and fathers in terms of their labor market characteristics. The mother's age was negatively related, and father's age was positively related, to the schooling probability. As the mother gets one year older, the schooling probability decreased by 1.2 percentage points. And as the father gets one year older, the schooling probability increased by 0.8 percentage points, after controlling for per capita expenditure and number of children within the household for both genders. Children were 16 percent more likely to attend school if their mother had any schooling and 18 percent more likely to attend school if their father had any schooling.⁷ Each additional child reduced the schooling probability by 3.3 percentage points.⁸

⁶In order to account for within-household correlation, all reported standard errors are clustered at the household level. Sampling weights are used in the analysis.

⁷Other household control variables, such as religion, social class, location, year fixed effects, and industry fixed effects for the mother and father turned out to be important determinants of schooling, although they are not reported in the table.

⁸According to the estimation results that are reported in the Appendix, we find no significant intra-household bargaining effects for children between the ages of 11-14. Other coefficients are also different for this age group. Boys are approximately 25 percentage points more likely to attend school and age significantly reduces schooling probability at a diminishing rate. Land owned has a much smaller impact on the schooling probability. Because children in this age group are old enough to be productive in the labor market, one would need to interpret these results with respect to the labor market opportunities available to them, which is beyond the scope of this paper.

In order to reduce the dimensionality of the problem, we define a new variable which indicates when the mother supplies more market labor than the father. This new variable, Maternal minus Paternal Labor Supply, which we call $MPLS$, is defined as follows:

$$MPLS_{ht} = \begin{cases} 1 & \text{if } [M_{ht} - P_{ht}] > 1 \\ 0 & \text{if } [M_{ht} - P_{ht}] \leq 1 \end{cases} \quad (2)$$

This variable essentially marks the households in which the mother supplies one day or more market labor than the father, and allows us to compare these households to the households in which the mother supplies less or equal amount of market labor, where ‘equal’ means that the difference is less than one work day a week. If the labor supplied to the market is a source of bargaining power, households with $[M_{ht} - P_{ht}] > 1$ should have higher levels of schooling after controlling for per capita household expenditure. The results are presented in columns (5) and (6) of Table 4. The results indicate that children in households in which the mother supplied more market labor had approximately 4.5 percentage points more schooling relative to the other households (column 5). This estimate decreases to 3.9 percentage points if we control for the number of children (column 6), indicating that there is a significant amount of re-allocation between home and market production.

5.2 Schooling, Labor Supply and Tariff Reduction

Individuals face a tradeoff between home and market production. In households with a large number of children, the value of home production is relatively higher, therefore we should see less market labor supply, especially for the mother. In addition, the specialization between the mother and father will be more significant for households with a larger number of children. Both of these effects point to lower labor supply of mothers in households with a larger number of children.

In addition, we know as an empirical fact that households with a large number of children also have lower school attendance rates. This is presumably due to the binding budget constraint and the tradeoff between child quality and quantity. Considering this mechanism within a household, it is very hard to argue that labor supply is exogenous to child quality. Households where the mother supplies relatively more labor to the market would systematically choose a low fertility-high quality equilibrium. At the same time, higher schooling rates require the parents to supply more labor

to the market in order to provide for the schooling costs. In this case, the effect of an exogenous increase in labor supply on child quality will be overestimated.

We estimate equation (1) with 2SLS by instrumenting the labor supply variables with a two-year lag of log tariff rates, $\ln(\tau_{j,t-2})$ and $\ln(\tau_{k,t-2})$, in the maternal and paternal industries j and k , respectively. Changes in tariff rates significantly affect the labor supply of parents and thus the schooling probability of children. In this section, we present our results with various specifications that incorporate tariff rates in parental industries.

The first column in Table 5 reports the results with maternal and paternal labor supply instrumented with tariff rates in maternal and paternal industries, respectively. The effect of maternal labor supply remains positive and significant after it is instrumented with the tariff rate in her industry. In fact, the magnitude of the estimate is much higher; a one day a week increase in a mother's market labor supply corresponds to a 6.7 percentage point increase in schooling probability. If we do not incorporate paternal labor supply into the regression, the effect remains significant, although it decreases to 4.5 percentage points. Paternal labor supply remains insignificant under all specifications. First stage results are reported in the lower portion of Table 5. Both tariff rates in maternal and paternal industries are significant determinants of the labor supplied to market activities. The tariff rate is generally a stronger determinant of the mother's labor supply, as indicated by higher first stage F-statistics in these regressions.

The results suggest a one work day a week increase in female labor supply is associated with an approximately 5 percentage point increase in the schooling probability of children between the ages of 7 and 10. This estimate is higher than our OLS estimates, which suggests that the covariance between female labor supply and the error term is negative in the OLS regressions. In addition to the mechanism described above, this would happen when women with low labor supply have disproportionately high schooling among their children due to some unobserved characteristics.

For example, women with low labor market attachment may have relatively high bargaining power due to assets brought to the marriage, or other factors that may affect female autonomy that are not observable to us. If these women also have a lower tendency to participate in the labor market, OLS would underestimate the effect. Endogenous family formation can be another explanation of the direction of the bias of the OLS estimates. If women with low interest in the labor market are matching to men with relatively high preferences towards child quality, the selection

bias arising from the endogenous family formation would bias the OLS estimates downward. Unfortunately, we observe these couples after they match and do not have information on the matching process. All of these explanations lead us toward the existence of endogeneity bias that leads to a negative correlation between the coefficient of interest and the error term, which is corrected by instrumentation.

Within this time period, tariff rates in manufacturing industries were reduced approximately 70 percent. According to our estimates, this tariff reduction leads to a 1.6 day a week increase in a mother's labor supplied outside of the household. This in turn, increased the schooling probability of children by approximately 7 percentage points. Male labor supply also increased as a result of the tariff reduction, but this has no significant effect on schooling probability.

5.3 Endogeneous Number of Children

When analyzing the effect of parental labor supply on schooling probability, the number of children is a potential source of bias, as it changes the value of household labor and is thus endogenous to the schooling probability. Equation (1) includes the endogenous choice of number of children by the decision maker, which may bias our estimates of α_1 and α_2 . Households with a large number of children may be composed of parents who have weak preferences for schooling. Hence, fertility and schooling rates may be simultaneously determined. This would bias our estimates if these households are also structurally different in terms of the amount of labor they supply to the market. Next, we develop an instrument for the number of children.

5.3.1 Gender Composition among the First Two Children

Following the definition by Angrist and Evans (1998), we define the gender composition as the following:

$$s_h = b_{1h}b_{2h} + g_{1h}g_{2h} = b_{1h}b_{2h} + (1 - b_{1h})(1 - b_{2h}) \quad (3)$$

where b_{1h} is an indicator variable that marks the households in which the first child is a boy, b_{2h} marks the households in which the second child is boy, g_{1h} marks the households in which the first child is a girl, and g_{2h} marks the households in which the second child is a girl. Naturally, we have

$g_{1h} = 1 - b_{1h}$ and $g_{2h} = 1 - b_{2h}$. Our first gender composition variable s_h will be an indicator variable that takes the value of one if the first two children are of the same gender. In what follows we will call these households same-gender households.

What makes the gender composition a strong exogenous determinant for fertility is that it is given to the family by nature. Families are not able to determine the gender of their children.⁹ If gender composition is completely random, then the only way it can affect child schooling would be through fertility, making it a strong exclusion restriction. The argument is the following: if families have a preference for a mixed-gender composition among their children, and if the first two children are of the same gender, then they will have a higher probability of having a third child and on average they will have higher fertility rates. Because the instrument is an indicator variable, our identifying assumption is straightforward. Identification requires that same-gender households are not structurally different than other households after controlling for household and parent characteristics. In other words:

$$E[y_{iht} | X_h, X_{mjh}, X_{pkh}, n_h; s_h = 0] = E[y_{iht} | X_h, X_{mjh}, X_{pkh}, n_h; s_h = 1] \quad (4)$$

where y_{iht} is a binary variable for whether or not child i in household h in time t attends school, X_h contains household characteristics, X_{mjh} and X_{pkh} are labor market characteristics and industry characteristics of the mother and father who are working in industry j and industry k , respectively, and n_h is the number of children in household h .

In order to test the validity of the same-gender variable as an instrument for fertility, we decompose s_h into households in which the first two children are both boys or both girls and test whether there are structural differences between these families and the rest of the population. We will call these households two-boy and two-girl households.

Table 6 presents some summary statistics for the three gender composition variables. Same-gender households have 0.12 more children on average, which is statistically significant. Two-girl households have on average 0.09 more children and two-boy households have on average 0.07 more children, both statistically significant. The first piece of evidence towards boy-preference is that

⁹One criticism of this view is the possibility of pre-birth gender selection which argues that if families have strong preferences toward boys, then they may choose to terminate the pregnancy once they learn the baby is a girl. Also, if infant mortality is higher among girls, families will have more boys among their living children. In either case, gender composition will not be random.

two-girl households tend to have more children than two-boy households.

In terms of average per capita expenditure, there is no statistically significant difference between same-gender (two-boy or two-girl) households relative to the rest of the households. However, we observe an interesting pattern in the maternal and paternal education variables. Education is defined as an indicator variable that takes the value of one if the parent had any schooling. Parents in two-boy households have significantly less education. Specifically, in two-boy households 2.4 percent fewer mothers and 1.9 percent fewer fathers had any education. The education levels of families with two girls are not significantly different than the rest of the population.

Because s_h is composed of these two groups, we observe that parents in same-gender households also have significantly less education. Further, there are a disproportionately high number of households with two boys. Assuming that there is a 50 percent probability for each gender, the probability of two-boy and two-girl combinations should each be 25 percent. However, about 26 percent of households had two boys and 24 percent of households had two girls in the first two births. Although the data does not contain information on gender selection prior to birth, these three pieces of evidence point toward a preference for male children. The data also suggest that the gender selection occurs among less educated households. The two-girl indicator is thus our preferred instrument for fertility.

5.3.2 Schooling, Labor Supply and Number of Children:

In this section, we instrument the number of children with the gender composition variables. The first column in Table 7 reports results that use the same-gender instrument. Paternal labor supply turns out to be significant under this specification. A one work day increase in paternal labor supply was associated with a 0.3 percentage point reduction in schooling. Results with our preferred instrument, the two-girl indicator, are presented in Column (4). The effect of maternal labor supply is higher under this specification relative to the specifications in Table 4 and the effect of paternal labor supply is insignificant. These results indicate that households in a large number of children-low schooling equilibrium report significantly lower maternal labor supplied to the market. Once the endogenous fertility is taken into account, the effect of maternal labor supply is increased.

The number of children, once instrumented, turned out to be insignificant under both instruments. The same gender households had on average 0.13 more children, and two girl households

had on average 0.21 more children. Although the fertility coefficient on the number of children becomes insignificant once instrumented, the impact of maternal labor supply remains positive and significant.

In our last specification we use both tariff and gender composition instruments in order to determine whether our labor supply results are robust to the inclusion of endogenous fertility. These results are presented in Table 8. Column (1) incorporates both maternal and paternal labor supply. The point estimates of α_1 and α_2 are slightly higher under this specification relative to Table 4, however, the difference is small. According to the estimates in Column (1), a one day a week increase in maternal labor supply increases schooling probability by 7 percentage points, while paternal labor supply has no significant effect on schooling. Combined with the first stage estimates, the results suggest that tariff reductions increased maternal labor supply by 1.56 days per week which translates into an increase in the schooling probability of 7.6 percentage points.

6 Conclusion

To our knowledge, this is the first paper that studies the relationship between globalization and human capital formation in an intra-household bargaining framework. Within each household, the mother and father face a tradeoff between home production and market production. Parental labor supply is thus simultaneously determined with child outcomes, which may lead to an overestimation of the effect on child schooling. This paper uses variations in tariff rates to identify this relationship. Substantial trade liberalization that took place in India and the accompanying employment surveys allow us to investigate the differential effects of changes in maternal and paternal labor supply induced by tariff reductions on child schooling.

In the first stage, this paper investigates the link between tariff reductions and labor market opportunities by focusing on the kind of labor that can generate independent income for women and improve female autonomy. If the overall labor market effects are gender-specific, then maternal and paternal labor supply will be differentially affected which will subsequently shift the relative bargaining power within the household. In the second stage, the change in labor market opportunities in addition to heterogeneous preferences of mothers and fathers lead to changes in child schooling rates.

Our results show that lower tariffs are associated with higher market labor supply for both the mother and father. An increase in maternal labor supply induced by tariff reductions has increased the schooling probability of children between the ages of 7 and 10 by 7 percentage points, whereas an increase in paternal labor supply has an insignificant effect on this probability. This channel explains approximately 26 percent of the improvement in schooling for this age group between the years of 1988 and 2000.

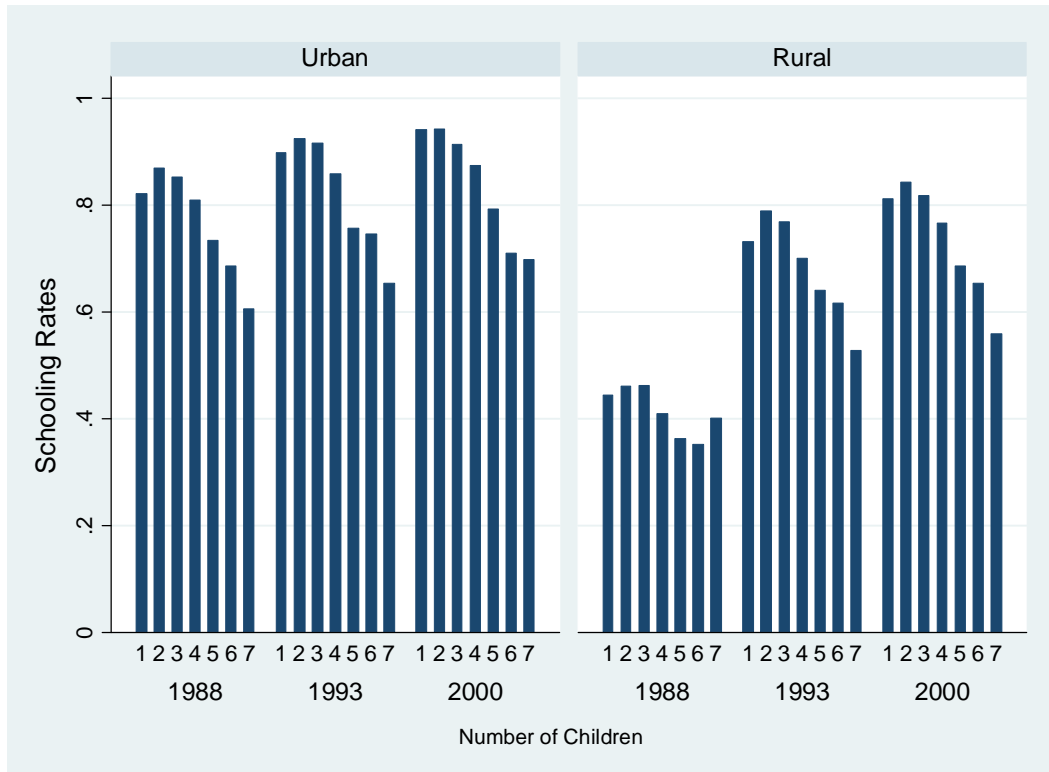
References

- [1] Anderson, Siwan and Mukesh Eswaran. 2009. "What Determines Female Autonomy? Evidence from Bangladesh." *Journal of Development Economics*, 90(2): 179-191.
- [2] Angrist, Joshua D. and William N. Evans. 1998. "Children and Their Parent's Labor Supply: Evidence from Exogenous Variation in Family Size." *The American Economic Review*, 88(3): 450-477.
- [3] Atkin, David. 2009. "Working for the Future: Female Factory Work and Child Health in Mexico." Unpublished Manuscript, Economic Growth Center, Yale University.
- [4] Becker, Gary S. 1985. "Human Capital, Effort and the Sexual Division of Labor." *Journal of Labor Economics*, 3(1): 33-58.
- [5] Bronars, Stephen G. and Jeff Grogger. 1994. "The Economic Consequences of Unwed Motherhood: Using Twins as Natural Experiment." *American Economic Review*, December 1994, 84(5): 1141-1156.
- [6] Browning, Martin and Pierre Chiappori. 1998. "Efficient Intra-Household Allocation: A General Characterization and Empirical Tests." *Econometrica*, 66(6): 1241-1278.
- [7] Duflo, Esther. 2003. "Grandmothers and Granddaughters: Old Age Pension and Intra-Household Allocation in South Africa." *World Bank Economic Review*, 17(1): 1-25.
- [8] Duflo, Esther and Christopher Udry. 2001. "Intra-Household Resource Allocation in Côte d'Ivoire: Social Norms, Separate Accounts and Consumption Choices." *NBER Working Paper Series*, No: 10498.

- [9] Edmonds, Eric, Nina Pavcnik and Petia Topalova. 2007. "Trade Adjustment and Human Capital Investments: Evidence from Indian Tariff Reform." *NBER Working Paper Series*, No: 12884.
- [10] Felbermayr, Gabriel, Julien Prat and Hans-Jörg Schmerer. 2008. "Globalization and Labor Market Outcomes: Wage Bargaining, Search Frictions, and Firm Heterogeneity." *IZA Discussion Papers*, No: 3363.
- [11] Gangadharan, Jaisri, Josua Rosenbloom, Joyce Jacobson and James Pearre. 1996. "The Effect of Child-bearing on Married Women's Labor Supply and Earnings: Using Twin Births as a Natural Experiment." *NBER Working Paper Series*, No: 5647.
- [12] Goldar, Bishwanat N. 2002. "Trade Liberalization and Manufacturing Employment: The Case of India." *International Labor Organization Employment Paper*, No: 2002/34.
- [13] Hasan, Rana, Devashish Mitra and Priya Ranjan. 2009. "Trade Liberalization and Unemployment: Evidence from Indian States." Unpublished Manuscript, Syracuse University.
- [14] Khandelwal, Amit and Petia Topalova. Forthcoming. "Trade Liberalization and Productivity: The Case of India." *The Review of Economics and Statistics*.
- [15] Kim, Jungho and Aassve Arnstein. 2006. "Fertility and Its Consequence on Family Labor Supply." *IZA Discussion Paper Series*, No: 2162.
- [16] Lam, David and Suzanne Duryea. 1999. "Effects of Schooling on Fertility, Labor Supply, and Investments in Children, with Evidence from Brazil." *The Journal of Human Resources*, 34(1): 160-192.
- [17] Lee, Jungmin. 2008. "Sibling Size and Investment in Children's Education: An Asian Instrument." *Journal of Population Economics*, 21: 855-875.
- [18] Lundberg, Shelly and Elania Rose. 2000. "Parenthood and the Earnings of Married Men and Women." *Labour Economics*, 7: 689-710.
- [19] Lundberg, Shelly and Elania Rose. 2002. "The Effects of Sons and Daughters on Men's Labor Supply and Wages." *Review of Economics and Statistics*, 84(2): 251-268.

- [20] Quisumbing, Agnes and John Maluccio. 2003. "Resources at Marriage and Intrahousehold Allocation: Evidence from Bangladesh, Ethiopia, Indonesia and South Africa." *Oxford Bulletin of Economics and Statistics*, 65(3): 283-327.
- [21] Pitt, Mark, Mark R. Rosenzweig and Nazmul HAsan. 1990. "Productivity, Health and Inequality in the Intrahousehold Distribution of Food in Low Income Countries." *American Economic Review*, 80(5): 1139-1156.
- [22] Rees, Ray and Raymond Riezman. 2008. "Globalization, Gender and Growth", manuscript, University of Iowa.
- [23] Rosenzweig, Mark and Kenneth Wolpin. 1980. "Testing the Quality-Quantity Fertility Model: The use of Twins as a Natural Experiment." *Econometrica*, 48(1): 227-240.
- [24] Sauré, Philip and Hosny Zoabi. 2009. "Effects of Trade on Female Labor Force Participation." *Swiss National Bank Working Paper Series*, 2009-12.
- [25] Thomas, Duncan. 1991. "Intra-Household Resource Allocation: An Inferential Approach." *Journal of Human Resources*, 25(4): 635-664.

Figure 1: Schooling and Number of Children



Notes: Schooling rates are shown for children between the ages of 7 and 10. Each bar represents schooling rates within a cell specified by year, sector and number of children. Households with more than 7 children are not shown due to low number of observations in these cells.

Table 1: Activities of Children by Age Groups

PANEL 1: 1988

Age	Girls					Boys				
	Schooling	Market Work	Domestic Work	Idle	Total	Schooling	Market Work	Domestic Work	Idle	Total
0-6	3,823	14	24	32,881	36,742	4,650	18	14	35,242	39,924
	<i>0.10</i>	<i>0.00</i>	<i>0.00</i>	<i>0.89</i>	<i>1.00</i>	<i>0.12</i>	<i>0.00</i>	<i>0.00</i>	<i>0.88</i>	<i>1.00</i>
7-10	12,626	432	794	10,578	24,430	15,994	576	141	10,378	27,089
	<i>0.52</i>	<i>0.02</i>	<i>0.03</i>	<i>0.43</i>	<i>1.00</i>	<i>0.59</i>	<i>0.02</i>	<i>0.01</i>	<i>0.38</i>	<i>1.00</i>
11-14	11,972	1,790	3,675	2,613	16,375	17,744	2,715	309	2,547	23,315
	<i>0.60</i>	<i>0.09</i>	<i>0.18</i>	<i>0.13</i>	<i>1.00</i>	<i>0.76</i>	<i>0.12</i>	<i>0.01</i>	<i>0.11</i>	<i>1.00</i>

PANEL 2: 1993

Age	Girls					Boys				
	Schooling	Market Work	Domestic Work	Idle	Total	Schooling	Market Work	Domestic Work	Idle	Total
0-6	5,157	10	37	23,486	28,690	6,266	13	11	24,804	31,094
	<i>0.18</i>	<i>0.00</i>	<i>0.00</i>	<i>0.82</i>	<i>1.00</i>	<i>0.20</i>	<i>0.00</i>	<i>0.00</i>	<i>0.80</i>	<i>1.00</i>
7-10	14,646	340	659	4,111	19,756	18,832	384	97	3,255	22,568
	<i>0.74</i>	<i>0.02</i>	<i>0.03</i>	<i>0.21</i>	<i>1.00</i>	<i>0.83</i>	<i>0.02</i>	<i>0.00</i>	<i>0.14</i>	<i>1.00</i>
11-14	11,678	1,071	2,419	1,258	16,426	16,063	1,634	155	1,319	19,171
	<i>0.71</i>	<i>0.07</i>	<i>0.15</i>	<i>0.08</i>	<i>1.00</i>	<i>0.84</i>	<i>0.09</i>	<i>0.01</i>	<i>0.07</i>	<i>1.00</i>

PANEL 2: 2000

Age	Girls					Boys				
	Schooling	Market Work	Domestic Work	Idle	Total	Schooling	Market Work	Domestic Work	Idle	Total
0-6	5,677	8	25	21,811	27,521	6,648	7	29	22,876	29,560
	<i>0.21</i>	<i>0.00</i>	<i>0.00</i>	<i>0.79</i>	<i>1.00</i>	<i>0.22</i>	<i>0.00</i>	<i>0.00</i>	<i>0.77</i>	<i>1.00</i>
7-10	15,931	178	350	3,701	20,160	19,397	220	78	2,914	22,609
	<i>0.79</i>	<i>0.01</i>	<i>0.02</i>	<i>0.18</i>	<i>1.00</i>	<i>0.86</i>	<i>0.01</i>	<i>0.00</i>	<i>0.13</i>	<i>1.00</i>
11-14	13,646	954	2,045	1,755	18,400	17,179	1,424	151	1,756	20,510
	<i>0.74</i>	<i>0.05</i>	<i>0.11</i>	<i>0.10</i>	<i>1.00</i>	<i>0.84</i>	<i>0.07</i>	<i>0.01</i>	<i>0.09</i>	<i>1.00</i>

Notes: Schooling category includes children who reported schooling as their principal activity (code 91). Market work category corresponds to the following activities: worked in household enterprise as paid or unpaid worker, worked as regular wage/salaried employee, worked as casual wage labor in public works or in other types of work, worked as beggar, etc. (codes 11-51 and 96). Domestic work category corresponds to the following activities: attended domestic duties and engaged in free collection of good, sewing, tailoring, weaving, etc. for household use (code 92-93). Numbers in italics represent the proportion of children within an age/gender group engaged in the specified activity.

Table 2: Household Characteristics and Labor Market Activity of Parents

Year	Number of Children		Average Per Capita Expenditure (log)		Parental Education			
	Urban	Rural	Urban	Rural	Urban		Rural	
					Mothers	Fathers	Mothers	Fathers
1988	2.396 (1.277)	2.517 (1.301)	5.292 (0.794)	4.917 (0.728)	0.581 (0.493)	0.805 (0.396)	0.241 (0.428)	0.527 (0.499)
1993	2.259 (1.172)	2.408 (1.235)	5.525 (0.583)	5.118 (0.488)	0.637 (0.481)	0.824 (0.381)	0.307 (0.461)	0.578 (0.494)
2000	2.183 (1.184)	2.441 (1.278)	5.528 (0.556)	5.068 (0.450)	0.671 (0.470)	0.830 (0.375)	0.344 (0.475)	0.595 (0.491)
Year	Participation in Market Work				Labor Supply in Market Work (days/week)			
	Urban		Rural		Urban		Rural	
	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers
1988	0.118 (0.323)	0.587 (0.492)	0.261 (0.439)	0.410 (0.492)	0.534 (1.729)	3.395 (3.080)	0.765 (2.029)	2.253 (3.015)
1993	0.139 (0.346)	0.626 (0.484)	0.299 (0.458)	0.477 (0.499)	0.638 (1.919)	3.772 (3.315)	0.830 (2.079)	2.525 (3.133)
2000	0.140 (0.347)	0.587 (0.492)	0.325 (0.468)	0.467 (0.500)	0.606 (1.862)	3.572 (3.254)	0.870 (2.082)	2.560 (3.084)

Notes: Per capita expenditure variable is corrected for inflation. Parental education is an indicator variable that takes the value of one if the parent had any schooling. Labor market variables are based on market work only. Following categories are included as market work: worked as regular wage/salaried employee, worked as casual wage labor in public works or in other types of work (codes 21-51). Standard errors are presented in parenthesis.

Table 3: Tariffs Rates by Years

	Agriculture	Mining	Manufacturing
1988	116.235 (36.530)	117.464 (22.923)	152.440 (22.846)
1993	72.488 (14.697)	85.000 (0.000)	84.787 (8.943)
2000	35.935 (7.817)	18.384 (7.612)	38.312 (7.854)

Notes: Tariff data obtained from Asian Development Bank and aggregated over 1 digit NIC 1987. In the rest of the analysis 2-digit classification is used. Standard errors are presented in parentheses.

Table 4: Schooling and Parental Labor Supply - Simple OLS Results

	(1)	(2)	(3)	(4)	(5)	(6)
Maternal Labor Supply	0.0054*** (0.0018)	0.0048*** (0.0018)	0.0031** (0.0014)			
Paternal Labor Supply	-0.0026 (0.0017)	-0.0027 (0.0017)		0.0003 (0.0013)		
MPLS=I(MLS-PLS>1)					0.0447*** (0.0134)	0.0389*** (0.0133)
Number of Children		-0.0330*** (0.0029)	-0.0330*** (0.0029)	-0.0332*** (0.0029)		-0.0330*** (0.0029)
<i>Household Characteristics</i>						
Per-Cap Expenditure (log)	0.0768*** (0.0077)	0.0579*** (0.0075)	0.0586*** (0.0075)	0.0573*** (0.0075)	0.0762*** (0.0076)	0.0576*** (0.0075)
Land Owned (log)	0.0087*** (0.0027)	0.0102*** (0.0027)	0.0111*** (0.0026)	0.0094*** (0.0026)	0.0074*** (0.0024)	0.0093*** (0.0024)
Rural	-0.1046*** (0.0140)	-0.1073*** (0.0141)	-0.1071*** (0.0141)	-0.1075*** (0.0141)	-0.1044*** (0.0140)	-0.1072*** (0.0140)
<i>Child Characteristics</i>						
Boy	0.1462*** (0.0065)	0.1406*** (0.0065)	0.1407*** (0.0065)	0.1403*** (0.0065)	0.1462*** (0.0065)	0.1405*** (0.0065)
Age	0.0564 (0.0519)	0.0752 (0.0521)	0.0772 (0.0521)	0.0821 (0.0522)	0.0617 (0.052)	0.081 (0.0521)
Age-Squared	-0.0021 (0.0030)	-0.0033 (0.0030)	-0.0034 (0.0030)	-0.0037 (0.0030)	-0.0024 (0.0030)	-0.0036 (0.0030)
<i>Parental Characteristics</i>						
Mother Age	-0.0120*** (0.0012)	-0.0116*** (0.0012)	-0.0116*** (0.0012)	-0.0116*** (0.0012)	-0.0119*** (0.0012)	-0.0115*** (0.0012)
Father Age	0.0085*** (0.0011)	0.0076*** (0.0011)	0.0076*** (0.0011)	0.0076*** (0.0011)	0.0084*** (0.0011)	0.0075*** (0.0011)
Mother Attended School	0.1617*** (0.0087)	0.1536*** (0.0088)	0.1533*** (0.0088)	0.1530*** (0.0088)	0.1615*** (0.0087)	0.1534*** (0.0088)
Father Attended School	0.1823*** (0.0077)	0.1830*** (0.0076)	0.1835*** (0.0076)	0.1827*** (0.0076)	0.1811*** (0.0076)	0.1821*** (0.0076)
Number of Observations	29,886	29,886	29,900	29,924	29,941	29,941
R-squared	0.23	0.24	0.24	0.24	0.23	0.24

Notes: Dependent variable child schooling is an indicator variable that is constructed based on principal activity of the child (activity code 91). Sample includes children between ages 7 and 10 whose parents are employed in traded industries. Labor supply is defined as days/week labor supplied in the following labor market activities: worked as regular salaried/wage employee, worked as casual wage labor in public works and in other types of works (activity codes 31-51). MPLS is an indicator variable that marks the households in which the difference between maternal labor supply and paternal labor supply is positive and larger than one work day a week. All standard errors are corrected for heteroscedasticity and clustered at household level. Additional controls include industry fixed effects for both maternal and paternal industries, states, year fixed effects, social group of the household (caste, tribe) and religion of the household. *** p<0.01, ** p<0.05, * p<0.1

Table 5: Schooling and Parental Labor Supply - IV Results

	(1)	(2)	(3)
Maternal Labor Supply	0.0666** (0.0340)	0.0455* (0.0269)	
Paternal Labor Supply	-0.0335 (0.0518)		0.0110 (0.0378)
Number of Children	-0.0305*** (0.0041)	-0.0299*** (0.0037)	-0.0328*** (0.0038)
<i>Household Characteristics</i>			
Per-Cap Expenditure (log)	0.0705*** (0.0244)	0.0791*** (0.0155)	0.0631*** (0.0228)
Land Owned (log)	0.0265 (0.0320)	0.0392** (0.0177)	0.018 (0.0298)
Rural	-0.1063*** (0.0154)	-0.1074*** (0.0148)	-0.1090*** (0.0145)
<i>Child Characteristics</i>			
Boy	0.1393*** (0.0068)	0.1393*** (0.0066)	0.1380*** (0.0066)
Age	0.0534 (0.0583)	0.0706 (0.0522)	0.0872 (0.0543)
Age-Squared	-0.0021 (0.0034)	-0.0030 (0.0031)	-0.0040 (0.0032)
<i>Parental Characteristics</i>			
Mother Age	-0.0105*** (0.0017)	-0.0103*** (0.0015)	-0.0112*** (0.0016)
Father Age	0.0066*** (0.0012)	0.0071*** (0.0012)	0.0076*** (0.0011)
Mother Attended School	0.1569*** (0.0102)	0.1543*** (0.0098)	0.1499*** (0.0089)
Father Attended School	0.1895*** (0.0169)	0.1957*** (0.0108)	0.1878*** (0.0156)
<i>First Stage :</i>			
Tariff in Maternal Industry (log)	-2.8790*** (0.5648)	-2.1933*** (0.3809)	
F-Statistics	17.42	33.15	
Tariff in Paternal Industry (log)	-1.1918*** (0.6407)		-1.5884*** (0.4273)
F-Statistics	7.18		13.81
Number of Observations	29,886	29,900	29,924
R-squared	0.24	0.24	0.24

Notes: Dependent variable child schooling is an indicator variable that is constructed based on principal activity of the child (activity code 91). Sample includes children between ages 7 and 10 whose parents are employed in traded industries. Labor supply is defined as days/week labor supplied in the following labor market activities: worked as regular salaried/wage employee, worked as casual wage labor in public works and in other types of works (activity codes 31-51). All standard errors are corrected for heteroscedasticity and clustered at household level. Additional controls include industry fixed effects for both maternal and paternal industries, states, year fixed effects, social group of the household (caste, tribe) and religion of the household. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Fertility and Household Characteristics by Gender Composition

Gender composition of first two children	Number of Households	Average number of children within each household	Per Cap Expenditure (log)	Maternal Education	Paternal Education
Same Gender =1	5563	2.664 (0.0156)	5.260 (0.009)	0.153 (0.005)	0.393 (0.006)
Same Gender =0	5527	2.542 (0.0149)	5.279 (0.009)	0.167 (0.005)	0.412 (0.007)
Difference		0.122*** (0.021)	-0.019 (0.013)	-0.014** (0.007)	-0.027*** (0.009)
Two Girls=1	2681	2.674 (0.024)	5.262 (0.014)	0.164 (0.007)	0.394 (0.009)
Two Girls=0	8409	2.580 (0.012)	5.271 (0.007)	0.159 (0.004)	0.410 (0.005)
Difference		0.094*** (0.025)	-0.009 (0.015)	0.006 (0.008)	-0.015 (0.010)
Two Boys=1	2846	2.655 (0.020)	5.257 (0.013)	0.142 (0.006)	0.391 (0.005)
Two Boys=0	8244	2.585 (0.013)	5.273 (0.008)	0.167 (0.004)	0.411 (0.005)
Difference		0.070*** (0.025)	-0.015 (0.015)	-0.024*** (0.008)	-0.019** (0.011)

Notes: Standard errors are presented in parenthesis. Maternal and paternal education is measured as an indicator variable that takes the value of 1 if they had any schooling. The difference between group averages is tested against the t-distribution where stars significance at 10 percent, 5 percent and 1 percent, respectively.

Table 7: Child Schooling and Parental Labor Supply - IV Results

	(1)	(2)	(3)	(4)
Maternal Labor Supply	0.0042** (0.0020)	0.0062*** (0.0020)		
Paternal Labor Supply	-0.0029* (0.0017)	-0.0024 (0.0018)		
MPLS=I(MLS-PLS>1)			0.0317* (0.0163)	0.0536*** (0.0158)
Number of Children	-0.0738 (0.0512)	0.0492 (0.0435)	0.0512 (0.0436)	0.0512 (0.0436)
Household Characteristics				
Per-Cap Expenditure (log)	0.0346 (0.0301)	0.1049*** (0.0259)	0.0343 (0.0302)	0.1051*** (0.0256)
Land Owned (log)	0.0119*** (0.0035)	0.0066* (0.0034)	0.0116*** (0.0038)	0.0045 (0.0035)
Rural	-0.1107*** (0.0151)	-0.1005*** (0.0146)	-0.1107*** (0.0151)	-0.1001*** (0.0146)
Child Characteristics				
Boy	0.1336*** (0.0108)	0.1546*** (0.0093)	0.1335*** (0.0110)	0.1549*** (0.0093)
Age	0.0985 (0.0613)	0.0283 (0.0592)	0.1050* (0.0619)	0.0319 (0.0595)
Age-Squared	-0.0048 (0.0036)	-0.0004 (0.0035)	-0.0051 (0.0037)	-0.0006 (0.0035)
Parental Characteristics				
Mother Age	-0.0111*** (0.0013)	-0.0126*** (0.0013)	-0.0110*** (0.0013)	-0.0125*** (0.0013)
Father Age	0.0064*** (0.0018)	0.0099*** (0.0016)	0.0063*** (0.0018)	0.0099*** (0.0016)
Mother Attended School	0.1435*** (0.0155)	0.1738*** (0.0141)	0.1432*** (0.0157)	0.1741*** (0.0141)
Father Attended School	0.1838*** (0.0078)	0.1813*** (0.0080)	0.1832*** (0.0079)	0.1797*** (0.0080)
First Stage Results:				
Same Gender	0.1357*** (0.0034)		0.1302*** (0.0034)	
F-Statistics	38.33		37.03	
Two Girls		0.2103*** (0.0044)		0.2108*** (0.0044)
F-Statistics		55.38		56.02
Number of Observations	29,886	29,886	29,941	29,941
R-squared	0.24	0.23	0.23	0.19

Notes: Dependent variable child schooling is an indicator variable that is constructed based on principal activity of the child (activity code 91). Sample includes children between ages 7 and 10 whose parents are employed in traded industries. Labor supply is defined as days/week labor supplied in the following labor market activities: worked as regular salaried/wage employee, worked as casual wage labor in public works and in other types of works (activity codes 31-51). MPLS is an indicator variable that marks the households in which the difference between maternal labor supply and paternal labor supply is positive and larger than one work day a week. Regressions with two boys instrument are not reported due to the weakness of the instrument (first stage F statistics is 0.10). All standard errors are corrected for heteroscedasticity and clustered at household level. Additional controls include industry fixed effects for both maternal and paternal industries, states, year fixed effects, social group of the household (caste, tribe) and religion of the household. *** p<0.01, ** p<0.05, * p<0.1.

Table 8: Schooling, Parental Labor Supply, Trade and Number of Children

	(1)	(2)	(3)
Maternal Labor Supply	0.0706** (0.0349)	0.0489* (0.0270)	
Paternal Labor Supply	-0.0355 (0.0530)		0.0125 (0.0388)
Number of Children	0.0376 (0.0463)	0.0336 (0.0438)	0.0533 (0.0456)
<i>Household Characteristics</i>			
Per-Cap Expenditure (log)	0.1094*** (0.0300)	0.1162*** (0.0272)	0.1120*** (0.0288)
Land Owned (log)	0.0237 (0.0332)	0.0378** (0.0183)	0.0143 (0.0315)
Rural	-0.1006*** (0.0158)	-0.1022*** (0.0152)	-0.1015*** (0.0150)
<i>Child Characteristics</i>			
Boy	0.1511*** (0.0104)	0.1502*** (0.0096)	0.1528*** (0.0101)
Age	0.0135 (0.0679)	0.0341 (0.0588)	0.0387 (0.0641)
Age-Squared	0.0004 (0.004)	-0.0008 (0.0035)	-0.0009 (0.0038)
<i>Parental Characteristics</i>			
Mother Age	-0.0113*** (0.0019)	-0.0110*** (0.0017)	-0.0123*** (0.0019)
Father Age	0.0085*** (0.0018)	0.0089*** (0.0018)	0.0101*** (0.0017)
Mother Attended School	0.1735*** (0.0157)	0.1698*** (0.0144)	0.1704*** (0.0147)
Father Attended School	0.1882*** (0.0175)	0.1952*** (0.0111)	0.1861*** (0.0165)
<i>First Stage :</i>			
Tariff in Maternal Industry (log)	-2.8899*** (0.5654)	-2.1997*** (0.3823)	
F-Statistics	12.17	17.85	
Tariff in Paternal Industry (log)	-1.1833*** (0.6398)		-1.5866*** (0.4278)
F-Statistics	5.29		7.79
Two Girls	0.2123*** (0.0287)	0.2137*** (0.0285)	0.2128*** (0.0286)
F Statistics	18.37	28.06	27.66
Number of Observations	29,257	29,450	29,368
R-squared	0.14	0.16	0.19

Notes: Dependent variable child schooling is an indicator variable that is constructed based on principal activity of the child (activity code 91). Sample includes children between ages 7 and 10 whose parents are employed in traded industries. Labor supply is defined as days/week labor supplied in the following labor market activities: worked as regular salaried/wage employee, worked as casual wage labor in public works and in other types of works (activity codes 31-51). All standard errors are corrected for heteroscedasticity and clustered at household level. Additional controls include industry fixed effects for both maternal and paternal industries, states, year fixed effects, social group of the household (caste, tribe) and religion of the household. *** p<0.01, ** p<0.05, * p<0.1.

APPENDIX

Table A1: Description of the main variables

<p><u><i>Child Schooling:</i></u></p> <p>An indicator variable that takes the value of 1 if the child's principal activity reported as 'schooling', which is code 91 in the NSS data. We generated a second schooling variable based on the question about the 'current attendance to educational institution' which specifies the type of school the person is registered. This variable 98 percent matched to the schooling variable generated by principal activity. However, this is not our preferred schooling definition as it takes the value of one when the child is registered to school, but not necessarily pursuing a continuous education.</p>
<p><u><i>Parental Labor Supply:</i></u></p> <p>Labor supply in the following market activities: worked as regular salaried/wage employee, worked as casual wage labor in public works and in other types of works, which are activity codes 31-51 in the NSS data. The variable includes non-participation. Labor supplied in market activities is included even when it is not their principal activity.</p>
<p><u><i>Tariffs:</i></u></p> <p>Tariff variable is based on Indian Input-Output table for 1991 and aggregated over 2-digit NIC-87 categories to match the industry definition used in the NSS data.</p>
<p><u><i>Number of Children:</i></u></p> <p>Number of all children in the household, including the children that are younger than 7 and older than 10 years of age.</p>
<p><u><i>Monthly Per Capita Expenditure:</i></u></p> <p>This variable is recorded in the survey as it is. We correct the expenditure for inflation using the Current Price Index obtained from the Reserve Bank of India.</p>
<p><u><i>Land Ownership:</i></u></p> <p>Land owned as of the date of survey in hectares.</p>
<p><u><i>School Attendance of Parents:</i></u></p> <p>This variable is constructed from 'educational status' question in the survey which records the highest education attained by the members of the household. The individuals who are literate through NFEC, AEC, TLC and other government programs, literate but below primary, primary, secondary, higher secondary and graduate degrees are considered to have received schooling. Individuals who cannot read and write a simple message in any language are considered illiterate and they are assigned a value of zero.</p>

Table A2: Schooling and Parental Labor Supply: Results for children between the ages of 11 and 14

	(1)	(2)	(3)	(4)
Maternal Labor Supply	-0.0012 (0.0022)	-0.0022 (0.0022)	-0.0028 (0.0017)	
Paternal Labor Supply	-0.0010 (0.0021)	-0.0010 (-0.0020)		-0.0023 (0.0016)
MPLS=I(MLS-PLS>1)				
Number of Children		-0.0387*** (0.0031)	-0.0388*** (0.0031)	-0.0387*** (0.0031)
<i>Household Characteristics</i>				
Per-Cap Expenditure (log)	0.0896*** (0.0084)	0.0642*** (0.0082)	0.0640*** (0.0082)	0.0642*** (0.0082)
Land Owned (log)	0.0047 (0.0031)	0.0059* (0.0031)	0.0062** (0.0030)	0.0061** (0.0030)
Rural	-0.0466*** (0.0160)	-0.0509*** (0.0160)	-0.0507*** (0.0160)	-0.0512*** -0.016
<i>Child Characteristics</i>				
Boy	0.2458*** (0.0076)	0.2367*** (0.0076)	0.2365*** (0.0076)	0.2369*** (0.0076)
Age	-0.3231*** (0.0906)	-0.3588*** (0.0897)	-0.3601*** (0.0898)	-0.3556*** (0.0896)
Age-Squared	0.0105*** (0.0036)	0.0119*** (0.0036)	0.0119*** (0.0036)	0.0118*** (0.0036)
<i>Parental Characteristics</i>				
Mother Age	-0.0029** (0.0013)	-0.0037*** (0.0013)	-0.0037*** (0.0013)	-0.0036*** (0.0013)
Father Age	0.0017 (0.0012)	0.0001 (0.0012)	0.0001 (0.0012)	0.0000 (0.0012)
Mother Attended School	0.1615*** (0.0105)	0.1543*** (0.0105)	0.1541*** (0.0105)	0.1538*** (0.0105)
Father Attended School	0.1835*** (0.0088)	0.1814*** (0.0087)	0.1815*** (0.0087)	0.1820*** (0.0086)
Number of Observations	23,435	23,435	23,443	23,447
R-squared	0.20	0.21	0.21	0.21

Notes: Dependent variable child schooling is an indicator variable that is constructed based on principal activity of the child (activity code 91). Labor supply is defined as days/week labor supplied in the following labor market activities: worked as regular salaried/wage employee, worked as casual wage labor in public works and in other types of works (activity codes 31-51). All standard errors are corrected for heteroscedasticity and clustered at household level. Additional controls include industry fixed effects for both maternal and paternal industries, states, year fixed effects, social group of the household (caste, tribe) and religion of the household. *** p<0.01, ** p<0.05, * p<0.1