The Effects of Trade Liberalization on Fertility, Infant Mortality and Sex Ratios: Evidence from Rural India*

S Anukriti†
Todd Kumler‡

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Abstract

Recent literature on India's trade liberalization finds that poverty declined at a relatively slower rate in rural districts that were more exposed to tariff reform. Moreover, schooling decreased relatively in districts with employment concentrated in industries losing tariff protection, especially for girls. In this paper, we examine whether trade reform in India also influenced fertility, infant mortality and sex ratios at birth. Using district-level measures of tariff protection combined with retrospective birth histories, we find that women in rural districts experiencing relatively larger declines in tariff protection were (relatively) more likely to give birth and these births were more likely to be female. In addition, infant mortality declined relatively slowly in districts more exposed to tariff reform.

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†Department of Economics, Columbia University. Email: as3232@columbia.edu.
‡Department of Economics, Columbia University. Email: tjk2110@columbia.edu.

1 Introduction

Several developing countries, including India, have increasingly become more open to international trade since the mid-1980s. Trade theory predicts that although free trade can enhance welfare overall, trade liberalization can also result in short and medium term adjustment costs. In particular, workers in formerly protected industries may face lower wages or reduced employment opportunities as the economy reallocates across regions and sectors in response to liberalization. For example, the decline in tariff protection due to trade liberalization in India in 1991 has been shown to cause slower reduction in poverty in affected rural districts (Topalova 2010). These districts also experienced slower improvements in children's schooling and smaller declines in child labor, as a result (Edmonds, Pavcnik, and Topalova 2010). Our study examines whether changes in trade policy also have implications for fertility behavior and investment in children's health.

India's trade liberalization in the early 1990s provides a good context for such an exercise. The policy reform was externally imposed by the International Monetary Fund (IMF) in response to a severe balance of payments crisis, which we argue was an exogenous shock to industry-level tariffs in India (more on this in Section II). Moreover, the resulting changes in tariff- and non-tariff barriers (NTBs) were quite large in magnitude. In the manufacturing sector, average tariff declined from 117 percent to 39 percent and the share of imports covered by NTBs fell from 82 percent to 17 percent between 1990-91 and 1999-2000 (Gupta and Kumar 2008). These tariff reductions were much more drastic in comparison to the experience of countries such as Indonesia, Brazil, Colombia, Argentina and Mexico. Following an identification strategy used by Topalova (2010) and others, we exploit heterogeneity in pre-reform industrial composition of Indian districts, combined with differences in tariff reductions by industry, to identify districts that were more or less exposed to trade liberalization. We, then, estimate the effect of this differential exposure on our outcomes of interest.

Using retrospective birth histories, we find that women are more likely to give birth in a given year in districts that are relatively more exposed to trade liberalization. Moreover, these births are more likely to be female. They are also more likely to die within one, six and twelve months of birth. The magnitudes of these effects are substantial. Relative to districts with no change in tariff protection, women in districts experiencing the average decline in tariff protection of 7 percentage points were 1.2 percentage points more likely to give birth, and these births were 0.7 percentage points more likely to be a female. In addition, infant mortality (within 12 months of birth) increased, relatively, by 0.44 percentage points in these districts.

There are several potential mechanisms linking tariff protection to our estimated fertility outcomes. One obvious channel is that trade liberalization induces a negative income shock for districts more exposed to the liberalization due to short- and medium-run adjustment costs. This is exactly the case in Topalova (2010), which finds that trade liberalization in India led to a relative decline in wages in impacted industries and caused a relative increase in poverty for districts more exposed to the liberalization[1]. To the extent that negative income shocks and poverty are linked to investments in children's health in developing countries countries (see, for example, Strauss and Thomas (1998), Strauss and Thomas (2008), Case (2001), Case (2004) for South Africa, Paxson and Schady (2005) for Peru) and parents' decisions about the number and sex-composition of their children (see, for instance, Edlund and Lee (2009) and Chung and Gupta (2007)), we may expect that the short-run adjustment costs associated with trade liberalization may influence fertility decisions and outcomes. Secondly, more open trade may influence relative commodity prices in an economy and hence, consumption levels (Porto 2007). Changes in the amount and type of food

[1]Although, using state-level data, Hasan, Mitra, and Ural (2007) conclude that greater exposure to trade openness is not associated with slower reduction in poverty in rural India. For a more detailed discussion, refer to Topalova (2010).

(nutrients) consumed by the mother and her children due to differences in dietary preferences across districts could affect child health outcomes, in general, and infant mortality, in particular (Cutler, Deaton, and Lleras-Muney 2006). Additionally, structural adjustments resulting from trade liberalization might change the relative demand for female labor (Katz and Murphy (1992), Kucera (2001), and Kucera and Milberg (2000)) or the gender wage gap (Wood (1991) and Black and Brainerd (2004)) and thus, influence fertility through the female labor force participation channel. Similarly, if parents' decisions to have female versus male children are influenced by their relative economic values, any effect of trade liberalization on female labor could also influence the observed sex ratio at birth (Qian 2008).

Our paper contributes to a large empirical literature that examines the costs and benefits of freer trade and a smaller one that focuses on the Indian experience. There is substantial evidence that globalization is contemporaneously linked with a rise in inequality in developing countries, but causality has been more difficult to establish. Despite methodological shortcomings, existing literature suggests that trade openness has not unambiguously benefited the poor. Using household consumption expenditure data from India, Topalova (2010) finds that the negative effect on relative poverty reduction was most pronounced among the least geographically mobile, at the bottom of the income distribution, and in Indian states where inflexible labor laws impeded factor reallocation across sectors. It is important to examine the implications of these changes for parents' fertility decisions to develop a broader understanding of the effects of more open trade. Moreover, it can shed light on the channels underlying investments in children's health and desired gender composition of children in a developing country like India, with a marked son preference.[2]

[2]Since beginning work on this paper, we have become aware of another study, Chakraborty (2012), analyzing the impact of the Indian trade liberalization on sex ratios in India. Contrary to our results, Chakraborty (2012) finds that Hindu households in relatively more open districts in India are *more* likely to have a male birth. She also finds that these districts experienced a significant increase in real dowry payments among Hindu marriages. Our paper differs from hers in a number of ways. First, she uses birth histories from the 1999 National Family Health Survey of India (NFHS), a much smaller dataset than ours, the 2002-2004 District-Level Household Survey of India (DLHS). Second, while her measure of trade exposure is similar

The rest of the paper proceeds as follows. In Section II, we provide a brief summary of the Indian trade reform. In Section III, we outline the empirical methodology and describe the data. Section IV discusses the empirical estimates of the relationship between tariffs and various outcomes of interest. Section V presents some robustness checks and Section VI concludes.

2 India's Trade Liberalization

We analyze the effect of trade reform on household fertility decisions in the context of the 1991 trade liberalization in India. Faced with a balance of payments crisis in August 1991, the Indian government embarked on several major economic reforms as conditions of an International Monetary Fund (IMF) bailout. Included among these reforms was a unilateral trade liberalization requiring the reduction in the overall level and the dispersion of import tariffs as well as the removal of import licensing and non-tariff barriers.

The period after the IMF bailout, therefore, marks a sharp break in Indian trade policy. The maximum tariff fell immediately from 400 percent to 150 percent, with later revisions bringing the maximum tariff to approximately 45 percent by 1997 (Hasan, Mitra, and Ural 2007). Meanwhile, the average tariff fell from 80 percent in 1990 to 37 percent in 1996 and the standard deviation of tariffs declined by 50 percent (Topalova 2010). Non-tariff barriers also declined, with the proportion of goods subject to quantitative restrictions falling from 87 percent in 1987 to 45 percent by 1994 (Topalova 2010).

In addition to the sharp decline in trade protection, the 1991 Indian trade liberalization possesses several important features that are valuable for our analysis. Since the policy reform was imposed as part of the IMF bailout, the decline in tariffs was largely unanticipated

to ours, she only includes tariffs in the manufacturing sector; we include tariffs in all traded industries, including agriculture, the main sector of employment for rural India. Finally, our empirical strategies differ significantly; we believe our empirical specifications and larger sample size allow us to better isolate the causal effect of trade liberalization on fertility outcomes.

by firms and households in India. As other commentators have observed, the removal of trade barriers was implemented swiftly as a form of shock-therapy and was not part of any pre-existing development plan (Bhagwati (1993), Goyal (1996)). Households, therefore, were unlikely to have adjusted their fertility behavior prior to the implementation of these reforms.

The quick initiation of the liberalization episode also reduces concerns that industries with greater political influence or higher productivity shaped the structure of the tariff reforms in a way that would undermine our empirical strategy (described in detail in the following section). Topalova (2007) finds that industry-level tariff changes are uncorrelated with several proxies of an industry's political influence prior to the Indian reform, such as the number of employees, proportion of skilled workers, or industrial concentration. Previous studies also find no correlation between an industry's future tariffs and its productivity before 1991 or productivity growth in the period from 1989 to 1996 (Topalova 2004). Finally, tariff changes through 1997 were spelled out in India's Eighth Five Year plan (1992-1997), suggesting little room for manipulation of tariffs based on political economy concerns during this time period.

3 Data and Empirical Methodology

3.1 An Employment-based Measure of Trade Exposure

The impact of trade liberalization on a developing economy such as India can be felt through many channels. The availability of cheaper imported final goods can be welfare-improving for consumers while the reduction in tariffs on intermediate inputs can increase firm productivity. On the other hand, an increase in cheaper, imported products that compete with domestic goods can reduce employment and wages at domestic firms. Our measure of tariff protection emphasizes the latter effect of trade liberalization on employment. While a reduction in consumer prices could certainly influence household fertility behavior, this effect will be common across all households in India. Depending on their employment composition at the time of reform, some Indian districts experienced relatively larger reductions in tariffs than others. Our identification strategy relies on this comparison to estimate the causal effect of trade liberalization.

Different industries in India were subject to varying degrees of trade protection over our sample period. Moreover, there is substantial heterogeneity in the industrial composition of Indian districts prior to 1991. Following Topalova (2010), we combine these two facts to construct our measure of trade exposure for each district as:

$$tariff_{dt} = \frac{\sum_i employment_{id,1991} \times tariff_{it}}{employment_d} \tag{1}$$

As this formula makes clear, we interact the national nominal tariff faced by industry i in year t with the share of employment in industry i and in district d in 1991. Since our employment weights are based on a district's industrial composition before the initiation of trade liberalization, our tariff measure will be free of any endogenous changes in employment composition as a result of tariff reductions.

The measure discussed above assigns a zero tariff to all non-traded industries for the entire time period. As originally pointed out by Hasan, Mitra, and Ural (2007), districts with higher levels of employment in the non-traded sector will, therefore, mechanically have lower measures of tariff protection. This is problematic since a large proportion of non-traded employment is in the cereal and oilseeds sectors, and workers in these industries tend to be poor rural farmers. Districts with a greater share of employment in non-traded production sectors are likely to be impoverished, and will also record a lower decrease in tariffs, since the initial $tariff_{dt}$ measure is low. This would confound our estimation strategy.

Previous studies address this concern by constructing a second measure of tariff protection that only depends on employment in traded industries (Hasan, Mitra, and Ural (2007), Topalova (2010)). We follow the literature and create this measure as follows:

$$tradedtariff_{dt} = \frac{\sum_{i \in traded} employment_{id} \times tariff_{it}}{\sum_{i \in traded} employment_{id}} \tag{2}$$

The only difference between the two measures of tariff protection shown in (1) and (2) is that the latter only weights industry-level tariffs by employment in traded industries, dropping employment in non-traded industries. The traded tariff measure is, therefore, independent of the proportion of workers in the non-traded sector and uncorrelated with initial poverty levels within a district.

3.2 Empirical Framework

The question of interest in this paper is how the removal of tariff barriers influences household fertility and child health outcomes. In particular, we investigate whether reductions in tariff protection faced by a household (based on its district of residence) impact the probability of birth in a given year, the rate of infant mortality as well as observed sex ratios at birth. Our regression framework is similar to Edmonds, Pavcnik, and Topalova (2010) and Topalova (2010) and compares births in districts that were more or less exposed to tariff reductions. We start by estimating the following OLS equation using the retrospective panel of births:

$$y_{imdt} = \beta_0 + \beta_1 tariff_{dt} + \beta_2 X_{imdt} + \tau_t + \gamma_d + \epsilon_{imdt} \tag{3}$$

where i indexes a child born to mother m, in district d, and year t. In regressions looking at infant mortality, the outcome y_{imdt} is an indicator variable for whether a child dies within X months of birth, where we allow X to equal one, six, or twelve months; for the sex ratio regressions, the outcome y_{imdt} is an indicator variable equal to one if the child is male. For fertility regressions, we reshape the birth data to create a woman-year panel and estimate the following base specification:

$$birth_{mdt} = \beta_0 + \beta_1 tariff_{dt} + \beta_2 X_{mdt} + \tau_t + \gamma_d + \epsilon_{mdt} \tag{4}$$

where $birth_{mdt}$ is a dummy variable that equals one if woman m in district d gave birth in year t, and zero otherwise. The main regressor of interest, $tariff_{dt}$, represents the level of tariff protection assigned to households based on their district of residence. Although the variation in $tariff_{dt}$ occurs at the district level, we also control for a vector of individual covariates, X_{imdt} (or X_{mdt}), that may impact the outcome variables, e.g. indicators for the child's birth order, mother's age at birth, and household's caste and religion. Inclusion of district fixed-effects, γ_d, controls for time-invariant differences across districts while time effects, τ_t, control for any India-wide shocks that may influence our outcomes. Including the time fixed-effects also highlights that our empirical strategy does not address the overall effect of trade reform on fertility, infant mortality or sex ratios, since any economy wide impact on consumer prices or productivity will be captured by the time effects.

Since our data consists of births spanning all years between 1987 and 1997, we can also include linear state-specific time trends in our regressions as a robustness check. Furthermore, a large majority (89%) of women in our sample report giving birth to more than one child during this period, which allows us to run a second specification:

$$y_{imdt} = \beta_0 + \beta_1 tariff_{dt} + \beta_2 X_{imdt} + \tau_t + \gamma_m + \epsilon_{imdt} \tag{5}$$

where γ_m represents a mother fixed-effect. This specification controls for all unobserved, time-invariant heterogeneity across women that could influence fertility decisions. By including mother fixed-effects, we are essentially comparing the birth outcomes for a given woman under different levels of tariff protection within her district. A similar specification is estimated for the birth dummy, $birth_{mdt}$.

The coefficient β_1 is identified under the assumption that changes in our tariff measures are uncorrelated with district-specific, unobserved, time-varying shocks (or mother-specific unobserved time-varying shocks in (5)) that influence fertility, infant mortality or sex ratios. Since we interact a district's pre-reform industrial composition with national changes in industry tariffs to construct the relevant tariff variables, any source of bias would have to be correlated with both pre-reform industrial composition and national tariff changes by industry. We assume that this not the case. We test the validity of this assumption by checking the robustness of our results to the inclusion of other district-specific, unobserved, time-varying shocks, such as rainfall shocks (in Section V).

One concern, previously discussed, is that the tariff protection measure given by equation (1) may be correlated with a district's initial level of poverty. If this is the case, OLS estimates in specifications (3)-(5) will be biased. We deal with this issue by using traded tariff, $tradedtariff_{dt}$ as an instrument for $tariff_{dt}$. $tradedtariff_{dt}$ is significantly correlated with $tariff_{dt}$ (estimates presented later). Moreover, it is independent of the proportion of workers in the non-traded sector and therefore, uncorrelated with initial poverty levels within a district. This validates the use of traded tariff as an instrument.

3.3 Data

The data used in this paper comes from the second round of the District Level Household Survey (DLHS-2) of India. The DLHS-2 surveyed over 500,000 currently-married women between the ages of 15 and 44 during March 2002 - October 2004. This survey includes a complete retrospective birth history for every women interviewed, which contains information on month and year of the child's birth, birth order, age of the mother at birth, and the age at which the child died, if the child is deceased.

DLHS-2 includes district of residence identifiers at the time of survey. In order to match each child to the mother's district of residence at the time of birth, we assume that mothers do not migrate to a different district after initiating child-bearing. In practice, this seems like a reasonable assumption. Internal migration in India generally consists of women relocating as a result of marriage. Using National Sample Survey (NSS) data, Topalova (2010) shows that only three to five percent of women moved across districts within the last ten years. We would expect this number to be even lower for women who have already given birth to their first child. In addition, this assumption is problematic only if the measurement error induced by it varies, systematically, with our measures of district-level tariff protection.

From the retrospective birth data, we select all births during 1987-1997. We choose this sample period for two reasons. First, 1987 is the earliest year for which we have tariff data. In addition, the tariff changes during 1992-1997 were spelled out in India's Eighth Five Year Plan, so they are unlikely to be influenced by political economy decisions. After 1997, however, industry-level tariffs are negatively correlated with that industry's current productivity (Topalova 2004), suggesting that these latter changes may be endogenous to industry performance. For this reason, we only focus on years up to 1997.

We impose three additional sample-selection criteria. First, we only include births for which mother's age at birth was between 13 and 40. Second, we exclude birth parities of 11 or higher. We use these restrictions mainly due to the small number of births to women outside of 13-40 age range and the small number of births with parity above 10. However, our results do not appear to be affected by the exclusion of these observations. We also exclude women who are not permanent residents of the household.

To each birth, we assign the district-level measures of tariff protection based on the year and the district of child's birth. For our sex ratio regressions, we use the year of conception (and district of birth), instead. Since induced abortions generally occur within the first or second trimester of birth, tariff protection during the year of conception is the more relevant variable. We assume no premature births and define the year of conception as the year nine months prior to the month of birth. The district-level tariff protection data comes directly from Topalova (2010). Industry- and district-wise employment data come from the 1991 Indian Census of Population while tariff data at the six-digit level were collected by hand by Topalova from the Indian Ministry of Finance publications.

We focus our analysis on rural areas within Indian districts. Topalova (2010) finds an insignificant relationship between tariff protection and poverty in urban areas of Indian districts, which she attributes to pre-existing trends in poverty and the presence of other reforms in addition to trade liberalization that impacted urban areas. Due to concerns of simultaneous reforms and pre-existing trends in urban areas, we focus on rural areas only.

The rainfall data used in Section V comes from the annual district-level precipitation time series created by Ram Fishman using Indian Meteorological Department data.

Figures 1 and 2 and Table 1 present the average tariff and traded tariff, by year, over the period of analysis (1987-1997). Average district-level tariff shows a slightly downward trend during 1987-1991, after which there is a sharp decline throughout this period[3]. Table 2 provides summary statistics of the variables included in this paper for two pre- and post-years (1987 and 1997).

4 Results

4.1 Fertility

Table 3 provides results of regressions analyzing the impact of trade protection on fertility. The outcome y_{mdt} is an indicator variable equal to one if woman m gives birth to a child in district d in year t, and zero otherwise. Column (1) represents the baseline regression controlling for district effects, year effects, mother's age at birth effects, and fixed effects for the number of previous births. In Column (2) we add caste and religion indicators while in

[3]The only exception is an increase in the average tariff in 1993. Due to concerns of measurement error in the tariff variable for this year, we also run regressions excluding 1993; our results are robust to excluding this year. These results are available upon request.

Column (3) we add state-specific linear time trends. Finally, Column (4) controls for mother fixed effects.

The OLS results in Panel A indicate a positive and significant relationship between district-level tariff protection and the probability that a woman gives birth. While the estimated relationship between tariff protection and fertility becomes insignificant and small when we include state-specific linear time trends in Column (3), the results remain significant, and increase five-fold, when we include mother fixed effects (Column (4)). These positive coefficients suggests that districts more exposed to trade liberalization witnessed a relative decline in fertility.

For reasons previously described, however, changes in the tariff measure utilized in Panel A may be negatively correlated with a district's initial poverty level. If women in initially more impoverished districts also experience relatively smaller declines in fertility over our time period for reasons unrelated to trade liberalization, this will cause us to overestimate the causal effect of tariff protection on fertility. We, therefore, instrument for our tariff protection measure using traded tariff protection, which is uncorrelated with the size of the non-traded sector.

Panel B of Table 3 shows the first-stage regression of our district tariff measure on district traded tariff protection. In all specifications, traded tariff has a significant and strong first-stage impact on district tariff protection, indicating that traded tariff is a valid instrument for district tariff.

Using traded tariff as an instrument (Panels C and D of Table 3), district tariff protection now has a negative effect on the probability that a woman gives birth, although the coefficient is only significant in Columns (2) and (3). The fact that coefficient becomes negative when instrumenting for district tariff protection suggests that including non-traded industries in the tariff measure introduces a significant upward bias due to the correlation between initial poverty and changes in the tariff measure.

The IV coefficients indicate that the Indian trade reform had a meaningful effect on fertility – a woman living in a district that experienced the average decline in tariff protection of 7 percentage points was between 0.6 percentage points (Panel D, Column 1) and 1.2 percentage points (Panel D, Column 3) more likely to give birth in a given year.

Relative declines in tariff protection across districts could increase the probability a woman gives birth for several reasons. If trade liberalization reduces the returns to female employment relative to the returns to male employment, this could increase fertility due to a reduction in female bargaining power and/or a decline in the opportunity cost of having a child (Chiappori, Fortin, and Lacroix (2002), Rosenzweig and Wolpin (1980)). Another possible mechanism linking tariff protection and fertility is poverty. As previously shown in Topalova (2010), districts more exposed to trade liberalization witnessed a relative increase in poverty. Households that suffer a negative income shock due to a decline in tariff protection may be less able to afford modern birth control methods and sex-selective abortions. In addition, the supply of free or subsidized contraception may decline if government finances decline as a result of trade liberalization. Moreover, if poverty impacts the probability that a child survives to adulthood or the likelihood that a child is male, households may choose to increase fertility. In the next two sections, we explore some of these questions. Specifically, we analyze the impact of trade liberalization on infant mortality and the probability that a birth is male.

4.2 Infant Mortality

Table 4 presents results from OLS (Panel A) and IV regressions (Panels B, C, and D) of an indicator for whether a child dies within 12 months of birth on district-level tariff protection. Column (1) presents results for specifications that include district fixed effects, year of birth fixed effects, mother's age at birth effects, and fixed effects for the number of previous births. The coefficient estimates in Column (1) are negative and significant, indicating that a larger decline in tariff protection within a district is associated with a relative increase in infant mortality. Moreover, the estimated coefficient is economically meaningful. For example, our coefficient estimate of -0.058 in Column (1), Panel A of Table 4 indicates that, relative to other districts, a district that experienced the average decline in tariff protection of 7 percentage points witnessed an increase in infant mortality within 12 months of birth of 0.41 percentage points. When we instrument for the district tariff variable using traded tariff, the coefficient increases, suggesting that our OLS estimate is biased downward. Based on the IV results in Column (1), Panel D of Table 4, a district experiencing the average decline in tariff protection had a relative increase in infant mortality within 12 months of birth of 0.44 percentage points. In comparison, the average rural district in India experienced a decline in infant mortality within 12 months of birth of approximately 2 percentage points from 1987 to 1997.

Adding controls such as religion and caste fixed effects as in Column (2) causes our results to increase slightly. Adding state-specific linear time trends to our regressions as in Column (3) reduces our coefficients by approximately two-thirds. While the coefficients on our district level tariff measures remain negative, they are no longer significant. Since initial industry composition is highly correlated across districts within states and our tariff measure exhibits a generally linear downward trend, it does not seem possible to separately identify the impact of the district-level tariff measures from the state-specific linear time trends. In Column (4), we add mother fixed-effects, which control for any unobserved time-invariant mother characteristics. The coefficients remain significant, although the OLS estimate in Panel A becomes insignificant.

Tables 5 and 6 show regressions using indicators for whether a child dies within six months of birth and within one month of birth, respectively. Comparing Tables 5 and 6 to Table 4, the coefficient estimates increase as we change our mortality outcomes from mortality within one month of birth to mortality within six months or twelve months of birth. The fact that we find significant results on mortality within the first month of birth for some specifications suggests that trade liberalization influences households' ability to invest in the health of a child while in-utero [4]. However, the growth in the coefficients as we look at mortality within six months and twelve months implies that trade liberalization prevents families from making the necessary investments in a child's health to prevent infant death even after birth.

4.3 Sex Ratio

Next, we investigate whether tariff reductions due to trade liberalization affect the probability of a male birth in rural India. Sex ratio at birth (SRB) deviates from the natural SRB if female fetuses are terminated more frequently than male fetuses due to less care or sex-selective abortions. In India, pre-natal sex-determination (PNSD) is illegal, but widely prevalent, leading to a large number of female fetuses being aborted (Arnold, Kishor, and Roy 2002). Sex-determination can be effectively performed through ultrasound around 12 weeks of gestation or much earlier, through *amniocentesis*, around 8-9 weeks of gestation. So, if a mother has an induced abortion, it is likely to take place during the 1st or 2nd trimester of pregnancy. Trade liberalization can affect the SRB by (a) changing the demand for sex-selective abortions due to changes in the relative demand for sons, (b) changing the demand for sex-selective abortions due to changes in parents' ability to afford PNSD and abortion resulting from changes in income, (c) through income shocks which impact the fetal environment, affecting fetal viability differentially based on the sex of the fetus (Trivers and Willard 1973) [5], or (d) through greater access to PNSD technology *via* imports of ultrasound

[4] Investments in health while in-utero are also likely to be affected by the tariff in the year of conception. In order to examine this channel, we also run regressions using tariff in the year nine months prior to the year of birth as the explanatory variable. These results, for mortality within 12 months, are presented in Table 12 in Appendix Tables. The IV estimates don't show any significant effect of tariff protection in the year of conception on mortality. This suggests that post-birth investments in health are more likely to influence infant mortality. Results for mortality within 1 and 6 months are available upon request.

[5] The Trivers-Willard hypothesis suggests that male births decline in response to negative shocks to the fetal environment

machines, for example.[6] The relevant tariff variable for each birth, then, is not the tariff at the time of birth, but the tariff during the first two trimesters of pregnancy. Thus, we use tariff in the district of birth in the year of conception as the explanatory variable for all sex ratio regressions.

Using the retrospective panel of births, Table 7 presents the results from OLS and IV regressions of a male birth dummy on district-level tariff during the year of conception. Each cell indicates a separate regression. Regressions in Column (1), which include district and year fixed-effects, show that a child born in a district with a relative decline in tariff protection during the year of conception is more likely to be a girl. The coefficient estimate in Panel A, column (1) in Table 7 implies that a district with the average decline in tariff protection of 7 percentage points experienced a 5.6 percentage point increase in the probability that a baby born is female. The coefficient remains remarkably stable and significant as we include parity of birth fixed-effects, mother's age at birth fixed-effects, religion and caste dummies and state-specific linear time trends (columns (2) - (3)). For the mother fixed-effects specification in column (4), the tariff coefficient is still positive, but of a lower magnitude and not significant at the conventional levels.

Panels B, C, D present IV regression estimates. The first stage coefficients of traded tariff are positive and highly significant throughout. The IV coefficients of district tariff in the year of conception are always positive, and have a higher magnitude in comparison to OLS estimates, but we lose significance in column (3). For a district with the average decline in tariffs of 7 percentage points, column (1) on Panel B suggests that the likelihood of a female birth increases by 0.77 percentage points. Thus, the reduction in trade protection seems to have caused relative improvements in the probability of a female birth in rural Indian districts more exposed to tariff declines.

[6] Changes in PNSD technology, however, are likely to impact the entire country similarly, so it could not explain results using our measure of tariff protection, which varies at the district level.

4.4 Heterogeneous Effects

We next turn to analyzing whether trade liberalization has heterogenous impacts on infant mortality. For example, previous economics research on the Trivers-Willard Hypothesis indicates that male children are less likely to survive relative to females in harsher environments (Almond and Edlund 2007). If a decline in tariff protection increases poverty and decreases health investments for pregnant women or for newborn children, we might expect trade liberalization to have a greater effect on mortality for male children. Our IV results in Table 8, however, suggest that a decline in tariff reduction has a large effect on infant mortality within 12 months of births for females but a muted effect on males[7]. Using the estimates from our basic specification in Column (1), females in districts which witnessed the average decline in tariff protection experienced a relative increase in mortality within 12 months of birth of 0.76 percentage points while males in the same district would have experienced only a 0.25 percentage point increase in mortality within 12 months of birth, a difference that is statistically significant. Our results are robust to including controls as in Column (2). When we add state-specific linear time trends to our regressions in Column (3), the main effect on females declines by approximately half; however, the estimates remain significant.

Table 9 checks if the effect on mortality varies by child's parity of birth. As earlier, the outcome variable is mortality within 12 months of birth[8]. Births of parity higher than 5 comprise the omitted group. The interaction terms are mostly negative; however, all of them are insignificant at the conventional levels. Although we might expect higher parities to be more risky pregnancies and more prone to complications following birth, it does not appear that trade liberalization had a significantly heterogeneous effect by birth parity.

In Table 10, we examine if the effects vary by mother's age-group at birth. Women in

[7] For brevity, we only report here IV results from regressions using an indicator for death within 12 months of birth as the outcome variable. OLS results and results on mortality within one and six months of birth are similar and are available on request.

[8] OLS results and results on mortality within one and six months of birth are similar and are available on request.

the age-group 13-20 are the omitted category. Like parity of birth, we expect older mothers to have more risky pregnancies and to be more prone to complications following birth. The main effect of tariff in the year of birth is positive but insignificant, suggesting no effect on mortality outcomes for children born to young mothers. The interaction terms are always negative, mostly significant and the magnitude of these coefficients is larger for older mothers. This suggests that children born to older mothers are more likely to experience relatively higher mortality post-birth in response to larger tariff reductions.

In future drafts, we plan to test if the effects on fertility and sex ratio also vary by parity of birth, mother's age at birth and mother's educational attainment.

5 Robustness Checks

An important concern with our identification strategy is the presence of other time-varying district-specific omitted variables. Since our tariff exposure index varies at the district-year level, we cannot include district-year fixed effects to prevent omitted variable bias. We check the robustness of results presented in the previous sections by controlling for district-level annual rainfall shocks. Annual fluctuations in rainfall are an important determinant of economic outcomes in agriculture-dependent developing countries, such as India[9]. We reestimate our main specifications by including a dummy variable that is equal to one if the district experienced a rainfall shock in a given year, and zero otherwise. We define a rainfall shock as a deviation of more than 30% from historic annual mean precipitation in the district. The IV estimates for mortality regressions are presented in Table 11, while Table 12 reports the estimates for sex ratio and fertility regressions. It is reassuring that even after controlling for rainfall shocks, the point estimates on tariff measures in all specifications are consistent with our previous results (with similar signs, magnitudes and significance).

[9]Paxson (1992), Rosenzweig and Wolpin (1993), Townsend (1994), Jayachandran (2006)

6 Conclusions

This paper analyzes whether India's trade liberalization, beginning in 1991, impacted fertility, infant mortality and observed sex ratios at birth. To identify the impact of trade policy reform, we compare rural districts more exposed to tariff reductions to rural districts less exposed to tariff reductions. Previous research using a similar empirical strategy finds that districts subject to greater reductions in tariffs experience slower declines in poverty as well as slower increases in school enrollment ((Topalova (2010), Edmonds, Pavcnik, and Topalova (2010)). We find that women in districts with a higher relative trade reform exposure were more likely to give birth and these births were more likely to be female. In addition, districts experiencing a relative decline in tariff protection witnessed a relative increase in infant mortality (within one, six and twelve months of birth).

It is important to note that these results do not suggest that trade liberalization overall increases fertility and infant mortality or reduces sex ratios. Decreasing tariff barriers can lead to lower prices for consumer goods, improving the livelihood for many individuals in India. In addition, trade liberalization can increase productive efficiency, ultimately creating jobs in comparative advantage sectors. Indeed, the general trend over the period of trade liberalization is one of decreasing fertility and infant mortality as well as increasing sex ratios. Our results do confirm, however, that trade reform has important distributional consequences. Individuals who are more exposed to trade liberalization through employment opportunities do seem to suffer negative consequences on outcomes such as infant mortality that have meaningful, long-term effects on household well-being. On the other hand, girls are more likely to be born, either because they are more "wanted" or due to parents' reduced ability to afford sex-selection.

References

Almond, D., and L. Edlund (2007): "Trivers–Willard at Birth and One Year: Evidence from US Natality Data 1983–2001," *Proceedings of the Royal Society B*, 274(1624), 2491–2496.

Arnold, F., S. Kishor, and T. Roy (2002): "Sex-selective Abortions in India," *Population and Development Review*, 28(4), 759–785.

Bhagwati, J. (1993): *India in Transition: Freeing the Economy.* Oxford: Oxford University Press.

Black, S. E., and E. Brainerd (2004): "Importing Equality? The Impact of Globalization on Gender Discrimination," *Industrial and Labor Relations Review*, 57(4), 540–559.

Case, A. (2001): "Health, Income, and Economic Development," *Annual World Bank Conference on Development Economics*, pp. 221–241.

——— (2004): *Does Money Protect Health Status? Evidence from South African Pensions*vol. Perspectives on the Economics of Aging, chap. 8, pp. 287–312. University of Chicago Press, 1 edn.

Chakraborty, T. (2012): "Impact of Industrialization on Relative Female Survival: Evidence from Trade Policies," *Unpublished manuscript.*

Chiappori, P.-A., B. Fortin, and G. Lacroix (2002): "Marriage Market, Divorce Legislation, and Household Labor Supply," *Journal of Political Economy*, 110, 37–72.

Chung, W., and M. D. Gupta (2007): "The Decline of Son Preference in South Korea: The Roles of Development and Public Policy," *Population and Development Review*, 33(4), 757–783.

CUTLER, D., A. DEATON, AND A. LLERAS-MUNEY (2006): "The Determinants of Mortality," *Journal of Economic Perspectives*, 20(3), 97–120.

EDLUND, L., AND C. LEE (2009): "Son Preference, Sex Selection and Economic Development: Theory and Evidence from South Korea," *Columbia University Department of Economics Discussion Paper*, (0910-04).

EDMONDS, E. V., N. PAVCNIK, AND P. TOPALOVA (2010): "Trade Adjustment and Human Capital Investments: Evidence from Indian Tariff Reform," *American Economic Journal: Applied Economics*, 2(4), 42–75.

GOYAL, S. K. (1996): "Political Economy of India's Economic Reforms," *Institute for Studies in Indus- trial Development (ISID) Working Paper*, (WP1996/04).

GUPTA, P., AND U. KUMAR (2008): "Trade Liberalization and Wage Inequality: Evidence From India," *Review of Development Economics*, 12(2), 291–311.

HASAN, R., D. MITRA, AND B. P. URAL (2007): "Trade Liberalization, Labor-Market Institutions, and Poverty Reduction: Evidence from Indian States," *Indian Policy Forum*, 3, 71–122.

JAYACHANDRAN, S. (2006): "Selling Labor Low: Wage Responses to Productivity Shocks in Developing Countries," *Journal of Political Economy*, 114(3).

KATZ, L. F., AND K. M. MURPHY (1992): "Changes in Relative Wages 1963 - 1987: Supply and Demand Factors," *Quarterly Journal of Economics*, 107(1), 35–78.

KUCERA, D. (2001): "Foreign Trade of Manufactures and Men and Women's Employment and Earnings in Germany and Japan," *International Review of Applied Economics*, 15(2), 129–149.

Kucera, D., and W. Milberg (2000): "Gender Segregation and Gender Bias in Manufacturing Trade Expansion: Revisiting the 'Wood Asymmetry'," *World Development*, 28(7), 1191–1210.

Paxson, C. (1992): "Using Weather Variability to Estimate the Response of Savings to Transitory Income in Thailand," *The American Economic Review*, 82(1).

Paxson, C. H., and N. Schady (2005): "Child Health and Economic Crisis in Peru," *The World Bank Economic Review*, 19(2), 203–223.

Porto, G. G. (2007): "Estimating Household Responses to Trade Reforms: Net Consumers and Net Producers in Rural Mexico," *World Bank Policy Research Working Paper*, (3695).

Qian, N. (2008): "Missing Women and the Price of Tea in China: The Effect of Sex-Specific Income on Sex Imbalance," *The Quarterly Journal of Economics*, 123(3), 1251–1285.

Rosenzweig, M., and K. Wolpin (1980): "Life-Cycle Labor Supply and Fertility: Causal Inferences from Household Models," *Journal of Political Economy*, 88(2).

——— (1993): "Credit Market Constraints, Consumption Smoothing, and the Accumulation of Durable Production Assets in Low-Income Countries: Investments in Bullocks in India," *Journal of Political Economy*, 101(2).

Strauss, J. A., and D. Thomas (1998): "Health, Nutrition, and Economic Development," *Journal of Economic Literature*, 36(2), 766–817.

——— (2008): *Health over the Life Course*vol. 4 of *Handbook of Development Economics*, chap. 54, pp. 3375–3474. Elsevier.

Topalova, P. (2004): "Trade Liberalization on Productivity: The Case of India," *International Monetary Fund Working Paper*, (04/28).

——— (2007): *Trade Liberalization, Poverty, and Inequality: Evidence from Indian Districts*vol. Globalization and Poverty, chap. 7. University of Chicago Press.

——— (2010): "Factor Immobility and Regional Impacts of Trade Liberalization: Evidence on Poverty from India," *American Economic Journal: Applied Economics*, 2(4), 1–41.

Townsend, R. (1994): "Risk and Insurance in Village India," *Econometrica*, 62(3).

Trivers, R., and D. Willard (1973): "Natural Selection of Parental Ability to Vary the Sex Ratio of Offspring," *Science*, 179, 90–92.

Wood, A. (1991): "North-South Trade and Female Labour in Manufacturing: An Asymmetry," *Journal of Development Studies*, 27(2), 168–189.

Figures

Figure 1: Average Tariff, by Year

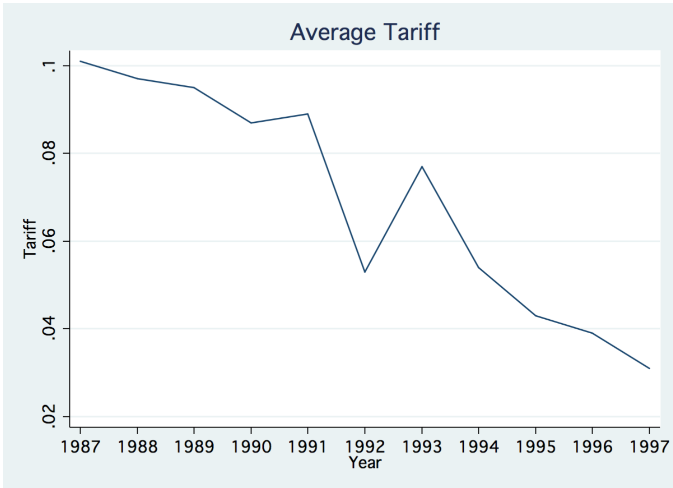
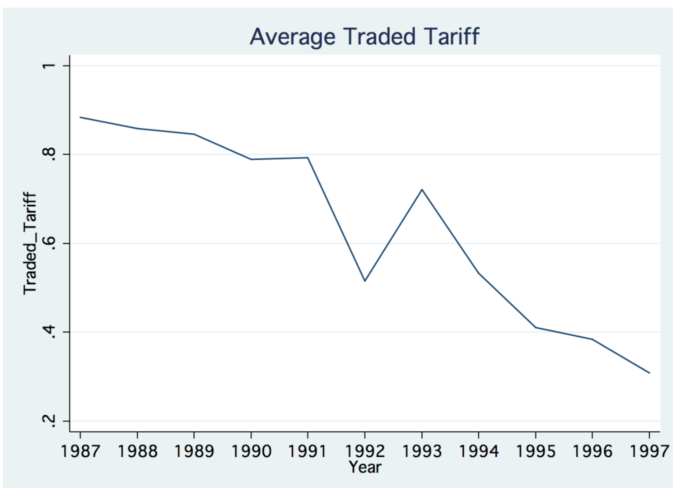


Figure 2: Average Traded Tariff, by Year



Tables

Table 1: Average Tariff and Traded Tariff, by Year

Year	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Tariff	0.101	0.097	0.095	0.087	0.089	0.053	0.077	0.054	0.043	0.039	0.031
Traded Tariff	0.884	0.859	0.846	0.789	0.793	0.515	0.721	0.533	0.411	0.384	0.309

Table 2: Summary Statistics

	1987	1997
Male	0.52	0.52
Parity	2.34	2.92
Mother's age at birth	21.03	23.18
Hindu	0.78	0.77
Muslim	0.09	0.10
Sikh	0.03	0.02
Christian	0.07	0.08
Scheduled Caste	0.18	0.19
Scheduled Tribe	0.19	0.21
Other Backward Caste	0.38	0.38
Died w/i 1 month	0.06	0.05
Died w/i 6 months	0.08	0.06
Died w/i 12 months	0.09	0.07
Low HH Wealth Index	0.60	0.66
Medium HH Wealth Index	0.30	0.26
High HH Wealth Index	0.10	0.08
N(births)	31,897	50,834
N(districts)	408	408

Table 3: The Effect of Tariff Reduction on Probability of Birth

	(1)	(2)	(3)	(4)
A. OLS				
Tariff	0.133***	0.107***	0.013	0.572***
	[0.021]	[0.021]	[0.023]	[0.106]
B. First Stage				
Traded Tariff in YOB	0.218***	0.218***	0.204***	0.214***
	[0.012]	[0.012]	[0.011]	[0.030]
C. Reduced form				
Traded Tariff	-0.017**	-0.025***	-0.034***	-0.028
	[0.009]	[0.008]	[0.009]	[0.025]
D. IV				
Tariff in YOB	-0.079**	-0.117***	-0.174***	-0.133
	[0.040]	[0.040]	[0.044]	[0.119]
F-stat (First Stage)	343.38	343.60	352.08	50.13
N	1,858,906	1,858,906	1,858,906	1,845,523
District FE	X	X	X	
Year FE	X	X	X	X
Covariates		X	X	X
State-specific linear time trends			X	
Mother FE				X
Clustered by District-Year	X	X	X	
Clustered by District				X

Notes: Each cell constitutes a separate regression. All regressions include indicators for mother's age at birth and number of previous births. (2) and (3) also include household's religion and caste dummies. ***Significant at 1%, **Significant at 5%, *Significant at 10%.

Table 4: The Effect of Tariff Reduction in YOB on Mortality within 12 months of birth

Mortality w/i 12 months	(1)	(2)	(3)	(4)
A. OLS				
Tariff in YOB	-0.058***	-0.067***	-0.021	-0.047
	[0.014]	[0.014]	[0.017]	[0.042]
B. First Stage				
Traded Tariff in YOB	0.206***	0.206***	0.194***	0.186***
	[0.011]	[0.011]	[0.010]	[0.028]
C. Reduced form				
Traded Tariff in YOB	-0.013**	-0.015***	-0.004	-0.025*
	[0.005]	[0.005]	[0.006]	[0.013]
D. IV				
Tariff in YOB	-0.063**	-0.075***	-0.022	-0.136**
	[0.026]	[0.027]	[0.031]	[0.058]
F-stat (First Stage)	340.34	340.57	351.13	44.22
N	486,335	486,335	486,335	431,459
District FE	X	X	X	
YOB FE	X	X	X	X
Covariates		X	X	X
State-specific linear time trends			X	
Mother FE				X
Clustered by District-YOB	X	X	X	
Clustered by District				X

Notes: YOB stands for year of birth. Each cell constitutes a separate regression. All regressions include indicators for mother's age at birth and number of previous births. (2) and (3) also include household's religion and caste dummies. ***Significant at 1%, **Significant at 5%, *Significant at 10%.

Table 5: The Effect of Tariff Reduction in YOB on Mortality within 6 months of birth

Mortality w/i 6 months	(1)	(2)	(3)	(4)
A. OLS				
Tariff in YOB	-0.051***	-0.059***	-0.019	-0.041
	[0.013]	[0.013]	[0.015]	[0.039]
B. First Stage				
Traded Tariff in YOB	0.206***	0.206***	0.194***	0.186***
	[0.011]	[0.011]	[0.010]	[0.028]
C. Reduced form				
Traded Tariff in YOB	-0.012**	-0.014***	-0.004	-0.025**
	[0.005]	[0.005]	[0.006]	[0.012]
D. IV				
Tariff in YOB	-0.056**	-0.067***	-0.021	-0.132**
	[0.025]	[0.025]	[0.030]	[0.056]
F-stat (First Stage)	340.34	340.57	351.13	44.22
N	486,335	486,335	486,335	431,459
District FE	X	X	X	
YOB FE	X	X	X	X
Covariates		X	X	X
State-specific linear time trends			X	
Mother FE				X
Clustered by District-YOB	X	X	X	
Clustered by District				X

Notes: YOB stands for year of birth. Each cell constitutes a separate regression. All regressions include indicators for mother's age at birth and number of previous births. (2) and (3) also include household's religion and caste dummies. ***Significant at 1%, **Significant at 5%, *Significant at 10%.

Table 6: The Effect of Tariff Reduction in YOB on Mortality within 1 month of birth

Mortality w/i 1 month	(1)	(2)	(3)	(4)
A. OLS				
Tariff in YOB	-0.035***	-0.039***	-0.011	-0.017
	[0.011]	[0.011]	[0.014]	[0.037]
B. First Stage				
Traded Tariff in YOB	0.206***	0.206***	0.194***	0.186***
	[0.011]	[0.011]	[0.010]	[0.028]
C. Reduced form				
Traded Tariff in YOB	-0.009*	-0.010**	-0.003	-0.017
	[0.005]	[0.005]	[0.005]	[0.011]
D. IV				
Tariff in YOB	-0.042*	-0.050**	-0.014	-0.092*
	[0.022]	[0.022]	[0.026]	[0.048]
F-stat (First Stage)	340.34	340.57	351.13	44.22
N	486,335	486,335	486,335	431,459
District FE	X	X	X	
YOB FE	X	X	X	X
Covariates		X	X	X
State-specific linear time trends			X	
Mother FE				X
Clustered by District-YOB	X	X	X	
Clustered by District				X

Notes: YOB stands for year of birth. Each cell constitutes a separate regression. All regressions include indicators for mother's age at birth and number of previous births. (2) and (3) also include household's religion and caste dummies. ***Significant at 1%, **Significant at 5%, *Significant at 10%.

Table 7: The Effect of Tariff Reduction on Probability of a Male Birth

Male birth	(1)	(2)	(3)	(4)
A. OLS				
Tariff in YOC	0.081***	0.083***	0.089**	0.030
	[0.031]	[0.031]	[0.038]	[0.090]
B. First Stage				
Traded Tariff in YOC	0.200***	0.200***	0.187***	0.182***
	[0.011]	[0.011]	[0.010]	[0.028]
C. Reduced form				
Traded Tariff in YOC	0.022*	0.022*	0.020	0.057**
	[0.012]	[0.012]	[0.013]	[0.022]
D. IV				
Tariff in YOC	0.110*	0.112*	0.105	0.313***
	[0.057]	[0.057]	[0.070]	[0.106]
F-stat (First Stage)	341.69	341.90	332.77	42.90
N	461,545	461,545	461,545	404,817
District FE	X	X	X	
YOC FE	X	X	X	X
Covariates		X	X	X
State-specific linear time trends			X	
Mother FE				X
Clustered by District-YOC	X	X	X	
Clustered by District				X

Notes: YOC stands for year of conception. Each cell constitutes a separate regression. All regressions include indicators for mother's age at birth and number of previous births. (2) and (3) also include household's religion and caste dummies. ***Significant at 1%, **Significant at 5%, *Significant at 10%.

Table 8: IV Estimates for the Effect of Tariff Reduction: By Child's Gender

Mortality w/i 12 months	(1)	(2)	(3)
Tariff in YOB * Boy	0.073*	0.071*	0.072*
	[0.039]	[0.039]	[0.039]
Tariff in YOB	-0.109***	-0.118***	-0.065*
	[0.033]	[0.033]	[0.037]
Boy	0.003	0.003	0.003
	[0.002]	[0.002]	[0.002]
N	473,747	473,747	473,747
District FE	X	X	X
Year FE	X	X	X
Covariates		X	X
State-specific linear time trends			X
Clustered by District - YOB	X	X	X

Notes: YOB stands for year of birth. Each column constitutes a separate regression. All regressions include indicators for mother's age at birth and number of previous births. ***Significant at 1%, **Significant at 5%, *Significant at 10%.

Table 9: IV Estimates for the Effect of Tariff Reduction: By Birth Parity

Mortality w/i 12 months	(1)	(2)	(3)
Tariff in YOB * Parity1	-0.098	0.006	0.080
	[0.121]	[0.123]	[0.123]
Tariff in YOB * Parity2	-0.115	0.003	0.074
	[0.118]	[0.120]	[0.120]
Tariff in YOB * Parity3	-0.160	-0.038	0.023
	[0.121]	[0.122]	[0.122]
Tariff in YOB * Parity4	-0.133	-0.032	0.012
	[0.128]	[0.129]	[0.129]
Tariff in YOB * Parity5	-0.114	-0.053	-0.027
	[0.142]	[0.142]	[0.142]
Tariff in YOB	0.042	-0.072	-0.083
	[0.117]	[0.118]	[0.119]
Parity1	0.002	-0.054***	-0.057***
	[0.005]	[0.005]	[0.005]
Parity2	-0.018***	-0.056***	-0.059***
	[0.004]	[0.005]	[0.005]
Parity3	-0.021***	-0.047***	-0.050***
	[0.005]	[0.005]	[0.005]
Parity4	-0.014***	-0.031***	-0.033***
	[0.005]	[0.005]	[0.005]
Parity5	-0.012**	-0.021***	-0.022***
	[0.005]	[0.005]	[0.005]
N	473,750	473,750	473,750
District FE	X	X	X
Year FE	X	X	X
Covariates		X	X
State-specific linear time trends			X
Clustered by District - YOB	X	X	X

Notes: YOB stands for year of birth. Each column constitutes a separate regression. All regressions include indicators for mother's age at birth. ***Significant at 1%, **Significant at 5%, *Significant at 10%.

Table 10: IV Estimates for the Effect of Tariff Reduction: By Mother's Age at Birth

Mortality w/i 12 months	(1)	(2)	(3)
Tariff in YOB * Age 21-25	-0.084*	-0.078	-0.062
	[0.049]	[0.049]	[0.049]
Tariff in YOB * Age 26-30	-0.344***	-0.305***	-0.290***
	[0.061]	[0.062]	[0.062]
Tariff in YOB * Age 31-35	-0.641***	-0.549***	-0.519***
	[0.154]	[0.155]	[0.156]
Tariff in YOB * Age 36-40	-0.858	-0.634	-0.323
	[1.298]	[1.302]	[1.299]
Tariff in YOB	0.032	0.016	0.059
	[0.039]	[0.040]	[0.043]
Age 21-25	-0.024***	-0.026***	-0.027***
	[0.002]	[0.002]	[0.002]
Age 26-30	-0.015***	-0.030***	-0.030***
	[0.003]	[0.003]	[0.003]
Age 31-35	-0.009*	-0.037***	-0.039***
	[0.005]	[0.005]	[0.005]
Age 36-40	-0.003	-0.043*	-0.050*
	[0.025]	[0.025]	[0.025]
N	473,750	473,750	473,750
District FE	X	X	X
Year FE	X	X	X
Covariates		X	X
State-specific linear time trends			X
Clustered by District YOB	X	X	X

Notes: YOB stands for year of birth. Each column constitutes a separate regression. All regressions include indicators for number of previous births. ***Significant at 1%, **Significant at 5%, *Significant at 10%.

Table 11: IV Estimates for the Effect of Tariff Reduction on Mortality, controlling for Rainfall Shocks

	(1)	(2)	(3)	(4)
A. Mortality w/i 1 month				
Tariff in YOB	-0.054**	-0.059**	-0.021	-0.106**
	[0.025]	[0.025]	[0.029]	[0.053]
B. Mortality w/i 6 months				
Tariff in YOB	-0.069**	-0.076***	-0.027	-0.145**
	[0.028]	[0.029]	[0.033]	[0.062]
C. Mortality w/i 12 months				
Tariff in YOB	-0.074**	-0.083***	-0.026	-0.143**
	[0.029]	[0.029]	[0.034]	[0.064]
D. First Stage				
Traded Tariff in YOB	0.193***	0.193***	0.182***	0.175***
	[0.012]	[0.012]	[0.011]	[0.030]
F-stat (First Stage)	272.50	273.44	290.83	34.59
N	432,311	432,311	432,311	384,023
District FE	X	X	X	
YOB FE	X	X	X	X
Covariates		X	X	X
State-specific linear time trends			X	
Mother FE				X
Clustered by District-YOB	X	X	X	
Clustered by District				X

Notes: YOB stands for year of birth. Each cell constitutes a separate regression. All regressions include indicators for mother's age at birth and number of previous births. (2) and (3) also include household's religion and caste dummies. ***Significant at 1%, **Significant at 5%, *Significant at 10%.

Table 12: IV Estimates for the Effect of Tariff Reduction on Sex Ratio and Fertility, controlling for Rainfall Shocks

Male dummy	(1)	(2)	(3)	(4)
IV				
Tariff in YOC	0.105*	0.107*	0.104	0.320***
	[0.064]	[0.064]	[0.078]	[0.116]
First Stage				
Traded Tariff in YOC	0.188***	0.188***	0.176***	0.171***
	[0.011]	[0.011]	[0.011]	[0.030]
F-stat (First Stage)	277.15	277.25	277.15	33.54
N	410,252	410,252	360,347	360,347
Birth dummy	(1)	(2)	(3)	(4)
IV				
Tariff	-0.084*	-0.122***	-0.180***	-0.153
	[0.046]	[0.045]	[0.050]	[0.135]
First Stage				
Traded Tariff	0.202***	0.202***	0.189***	0.198***
	[0.012]	[0.012]	[0.011]	[0.032]
F-stat (First Stage)	272.66	273.42	298.57	38.81
N	1,644,676	1,644,676	1,644,676	1,632,872
District FE	X	X	X	
YOB FE	X	X	X	X
Covariates		X	X	X
State-specific linear time trends			X	
Mother FE				X
Clustered by District-YOB	X	X	X	
Clustered by District				X

Notes: YOC stands for year of conception. Each cell constitutes a separate regression. All regressions include indicators for mother's age at birth and number of previous births. (2) and (3) also include household's religion and caste dummies. ***Significant at 1%, **Significant at 5%, *Significant at 10%.

Table 13: The Effect of Tariff Reduction in YOC on Mortality within 12 months of birth

Mortality w/i 12 months	(1)	(2)	(3)	(4)
A. OLS				
Tariff in YOC	-0.041***	-0.051***	-0.008	-0.036
	[0.013]	[0.013]	[0.016]	[0.042]
B. First Stage				
Traded Tariff in YOC	0.201***	0.201***	0.187***	0.183***
	[0.011]	[0.011]	[0.010]	[0.028]
C. Reduced form				
Traded Tariff in YOC	-0.003	-0.005	0.008	-0.013
	[0.005]	[0.005]	[0.006]	[0.013]
D. IV				
Tariff in YOC	-0.025	-0.034	0.034	-0.073
	[0.026]	[0.027]	[0.032]	[0.055]
F-stat (First Stage)	339.47	339.67	327.64	42.61
N	449,366	449,366	449,366	395,291
District FE	X	X	X	
YOC FE	X	X	X	X
Covariates		X	X	X
State-specific linear time trends			X	
Mother FE				X
Clustered by District-YOC	X	X	X	
Clustered by District				X

Notes: YOC stands for year of conception. Each cell constitutes a separate regression. All regressions include indicators for mother's age at birth and number of previous births. (2) and (3) also include household's religion and caste dummies. ***Significant at 1%, **Significant at 5%, *Significant at 10%.