EFFECTS OF TRADE LIBERALIZATION ON GENDER INEQUALITY: EMPIRICAL EVIDENCE FROM INDIA

A Dissertation

Presented to

The Faculty of the Department

of Economics

University of Houston

In Partial Fulfillment

Of the Requirements for the Degree of

Doctor of Philosophy

By

Ashmita Gupta

May 2015

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Abstract

This dissertation is composed of two essays. In the first essay, using a panel of establishments from the Annual Survey of Industries (ASI), I study the impact of the 1991 trade liberalization episode in India on the employment share of women. Contrary to the predictions of a taste-based discrimination model, I find that establishments exposed to larger output tariff reductions and import competition reduced the share of female workers. I also find that input tariff reductions neither raised nor reduced female employment share. The negative association between output tariff reductions and female employment appears to be driven by two factors. First, establishments facing larger output tariff declines engaged in more skill-upgrading which worked against women (who are less skilled in terms of measured education). Second, establishments facing larger tariff declines increased the number of shifts per worker. Since women in India are prohibited by law from working long hours and night shifts, this hours-constraint appears to have reduced relative employment of women. I find this effect to be particularly large among "big and private" establishments.

In the second essay, using household data from The Indian Human Development Survey (IHDS), 2005, I look at the effect of trade liberalization on education attainment in India. I find that there is an increase in education inequality which is mainly driven by females. Young cohorts in districts which had more employment in industries losing tariff protection experienced lesser increase in primary school and college education. However, I find an increase in secondary level of education for males who completed earlier levels. I also find trade liberalization alters the quality of education.

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Chapter 1

Introduction

In the past few decades trade liberalization has been advanced as a policy prescription for development in developing countries, especially by international organizations such as the International Monetary Fund (IMF) and the World Bank, and is implemented through structural adjustment programs. Beginning in the 1970s many developing countries in Latin America, east and south Asia and Africa have adopted trade liberalization policies to spur growth with not always desirable distributional outcomes. These countries have often experienced high growth of gross domestic product (GDP) on one hand and increased skill premium, income inequality and poverty on the other. One important issue that needs to be addressed is whether trade liberalization policies directly put at odds the twin goals of growth and equality. There are lots of discussions in the trade literature about modeling the role of trade on inequality.

Trade liberalization has occurred in different countries under different circumstances. For example, some countries had bilateral trade liberalization such as US and Mexico under NAFTA, while others had unilateral liberalization vis a vis many countries such

as India. Different countries have different set of institutions which might play a crucial role in determining the effects of liberalization. However, this also provides us with a variety of situations to study the effects of trade liberalization. Thus different countries pose different challenges and provide a variety of evidence. A number of studies have shown that trade liberalization has led to higher growth rates among developing countries. At the same time, many countries have experienced increase in skill premium and income inequality (see survey by Goldberg and Pavnick, 2007). In this dissertation I focus on the Indian context. It has been shown by Topalova (2010) that in India trade liberalization is associated with increase in poverty and income inequality.

One particular aspect of inequality which has gotten relatively little attention in the trade literature is gender inequality. The widespread prevalence of gender inequality had been first pointed out by Nobel laureate Amartya Sen (2001) who wrote: "Gender Inequality exists in most parts of the world, from Japan to Morocco, from Uzbekistan to United States. Yet inequality between men and women is not everywhere the same. It can take many different forms." Together with this, it has also been well established in the literature that economic development and empowerment of women are closely related (see survey by Duflo 2003). Advancing gender equality was recognized by policy makers as one of the eight stated goals in the U.N. Millennium Development Goals Report (UN, 2009).

There are several ways in which gender inequality has been studied in the literature. Some of these include life expectancy of women, mortality, natality, health and nutrition indicators, literacy rates and education, job opportunity and wages, age at marriage, bargaining power within the household, domestic violence, hereditary rights and several others. There is now growing evidence that empowering women promotes education, health

and better outcomes for children and hence may have long-term impacts. In this dissertation I focus on labor market opportunity and education attainment for females in the Indian context.

The importance of education on the development of an individual and society as a whole cannot be understated. H.G.Wells perfectly expressed this in his famous quote: "History is a race between education and catastrophe." It is universally accepted that education is an important component of human development which is a key measure of the development of a country. United Nations (U.N) regularly publishes Human Development Report with the objective of evaluating the rate of human capital formation in all nations. In the above context education of women is particularly important for their upward movement in the social and economic ladder. Thus understanding the effect of trade liberalization on women's education is vital.

The other focus of this dissertation is on the effect of trade liberalization in the organized manufacturing sector. Increase in job opportunities for women leads to their financial independence which leads to increase in bargaining power in the households which in turn has positive effects on the health, education and overall development of children and family. Increased job opportunities for women and increased education of women form a virtuous cycle. If trade liberalization leads to a reduction in gender inequality in the labor market, we would expect that to positively affect education of children and particularly increase investments in girls education. This in turn would enable these girls to avail better job opportunities. Thus labor market opportunities and education attainment are two sides of the same coin and it is important to look at both these facets.

India is an interesting country to study as it has a lot of diversity along various dimensions such as geography, demography and industrial composition. Moreover, it is home to 15% of the world population. It also has very rich set of data available at the household and establishment level. India implemented unilateral trade liberalization in 1991. The study of gender inequality is especially relevant for India and many other countries of Southeast Asia, Middle-East, Latin America and Africa where gender biases is present in extreme forms.

The Indian case provides an ideal setting to study the effect of trade liberalization because the tariff reductions were unexpected, large, and quickly implemented in an attempt to meet the conditions for an IMF rescue package. Not only were there drastic reductions in the level of tariffs, the variance of tariff changes was also large across sectors as those sectors with the highest initial tariffs underwent the largest reductions. The amount of industry-level tariff reductions were not correlated with initial industry characteristics and thus could be treated as plausibly exogenous. I use this variation in tariff reductions as a measure to study the impact of trade liberalization on female hiring by establishments and education attainment by households.

In Chapter 2, I look at the effect of the industry level variation of tariff reduction on the ratio of female to total employment in the manufacturing sector. In Chapter 3, I use district level variation in exposure to trade, as measured by Topalova (2010), to look at the effect on education attainment and quality of education. I use both household level data as well as establishment level data for my analysis. I mainly use ordinary least square (OLS) and difference in differences as my empirical strategy.

My findings suggest that there is an increase in gender inequality in the labor market

and education attainment due to trade liberalization in India. This is broadly consistent with the findings of Topalova (2010) and Edmonds et al (2010) who find that regions more exposed to reforms had slower reductions in poverty and child labor in India. Moreover, I find that the inequality results in the labor market and education are driven by output tariff reductions. This is also similar to the the above mentioned papers which find increase in inequality in districts more exposed to output tariff reductions.

I propose that the results could be driven by several possible channels. Skill upgrading and increase in hours of operations are some of the channels driving the inequality results in the labor market. On the other hand income, costs and returns to education are some of the possible factors leading to education inequality.

My results are counter to some recent papers in the context of other countries such as Mexico, Columbia and the United States. For example, Juhn et al (2014) find that trade liberalization leads to reduction in gender inequality in Mexico. However, the context of trade liberalization was different in these countries.

Chapter 2

Effect of Trade Liberalization on Gender Inequality:The Case of India

2.1 Introduction

In this paper I examine the link between trade liberalization and gender inequality. Understanding this link is important since gender inequality is prevalent all over the world, and it manifests itself in many faces such as mortality, natality, basic facility, special opportunity, professional, household and ownership inequality (Sen (2001)). Accordingly, advancing gender equality was recognized by policy makers as one of the eight stated goals in the U.N. Millenium Development Goals Report (UN, 2009).

Beginning in the 1970s, many developing countries in Latin America, east and south Asia and Africa have adopted trade liberalization policies to spur growth, not always with desirable distributional outcomes. Indeed, trade liberalization policies have in many cases increased skill premiums, raised income inequality and poverty (see Goldberg and Pavcnik

(2007) for a comprehensive survey).[1] In this context, another important question which is relatively under-studied is whether trade liberalization also increases gender inequality, thus directly putting at odds the twin goals of growth and gender equity.

Empirical evidence on the link between trade and gender is relatively scant. In one of the earlier papers, Black and Brainerd (2004) find that U.S. industries subject to greater import competition experienced larger reductions in the gender wage gap, a finding which they attribute to reductions in discrimination. A recent paper by Ederington et al. (2010) find similar results for Colombia. Aguayo et al. (2013) find that the signing of the North American Free Trade Agreement (NAFTA) increased demand for female labor both within and between industries in Mexico. Juhn et al. (2014) link the within-sector shift towards female labor due to U.S. tariff reductions on Mexican goods. Export tariff reductions raised exports and investments in technology which increased the relative productivity of women in blue-collar work.

In this study, I use the 1991 Indian tariff reforms to study the impact of trade liberalization on relative labor market outcomes of women. The Indian case provides an ideal setting as the tariff reductions were unexpected, large, and quickly implemented in an attempt to meet the conditions for an IMF rescue package. Not only were there drastic reductions in the level of tariffs, the variance of tariff changes was also large across sectors as those sectors with the highest initial tariffs underwent the largest reductions. Topalova (2010) finds that the amount of industry-level tariff reductions were not correlated with initial industry characteristics and thus could be treated as plausibly exogenous.[2] I use

[1] Revenga (1997), Hanson and Harrison (1999), Feliciano (2001), Currie and Harrison (1997) show evidence of this from a wide range of countries such as Mexico, Morocco, Chile, Argentina and Columbia.

[2] In the context of this study, I find that the output tariff change is also uncorrelated with the log female to male share in man-days in 1989, the log skill ratio in 1989 and log male intensity in 1989 at the industry

this variation in tariff reductions as the exogenous shock that impacted female hiring by establishments.

There are studies that have examined the impact of Indian tariff reforms on various outcomes. Topalova (2010) finds that regions with higher initial exposure to industries that underwent large tariff reductions experienced slower reductions in poverty. Khandelwal and Topalova (2011), Goldberg et al. (2010b) find that tariff reductions raised productivity of extant establishments, mainly by lowering the cost of imported inputs. However, the effect of Indian trade reform on the labor market has been relatively less studied. Sharma (2012) finds a change in skill composition mainly due to the increased use of imported intermediate inputs. This paper, to the best of my knowledge, is the first to use establishment level data to look at the change in gender composition of the workforce in the Indian labor market due to the introduction of trade reforms.

I use establishment level data from Annual Survey of Industries (ASI) prepared by the Department of Commerce in India. The ASI is a survey of all registered establishments in the manufacturing sector.[3] The ASI is a census of big establishments and a sample of smaller establishments [4]. I use unique establishments level identifiers to construct a panel and examine within-establishments changes between 1989 (the "before" period) and 1998 (the "after" period). I complement my panel analysis with analysis of cross-sections of establishments in 1989 and in 1998 to take account of entry and exit of establishments.

level (the results are presented in table 2.15).

[3] See Data Section below for more details

[4] All establishments with 100 workers or above were surveyed in 1989 and all establishments with 200 workers or above were surveyed in 1998

I find that larger reductions in tariffs on final goods (output tariffs) reduced relative employment of women. This appears to be the case for all establishments but it is especially true for "big and private" establishments in our panel data. This result is directly counter to what we would expect if tariff reductions led to increased competition and reduced taste-based discrimination practiced by employers, a channel suggested by Becker's model of taste-based discriminationBecker (1957). I also find very limited role for tariff reductions to have shifted gender composition through the imported inputs channel. Reductions in input tariffs appear to have neither positively nor negatively impacted women in our data.

What are the channels which potentially account for these findings? I examine two factors that could distinguish female and male labor for employers. The first factor is skill level. Female workers may be less skilled than male workers. I find evidence that sectors which experienced the largest tariff reductions and thus were subject to more import competition also had more rapid skill-upgrading, measured as the ratio of white collar to blue collar workers. Using household survey data, I also document that women who work in blue-collar manufacturing jobs have on average 5 years less formal education than their male counter-parts. If skill-upgrading occurred within blue-collar jobs, as it did across blue-collar and white-collar occupations, this suggests that female workers may have been hurt by trade liberalization through the skill channel.

The second factor which distinguishes male and female in the Indian context is hours restrictions imposed by federal and state legislation. All registered manufacturing units have to follow the guidelines of the Factories Act of 1948. Section 66 of this Act limits the working hours of women and prohibits them from working night shifts. I find evidence that establishments which experienced the largest tariff reductions responded by increasing

work intensity, or the number of shifts per worker. To the extent that women were barred from extended hours and night shifts, this would have lowered hours worked by women relative to hours worked by men. In support of this hypothesis, I find that the negative impact of tariff declines on female share was most pronounced among establishments with higher initial shifts per worker measure in 1989. Hence, this paper adds to the literature which assess the possible impact of labor laws in the labor market empirically. Recently, there is a lot of interest among academics, media and policy makers about the impact of labor laws on industry and how these laws have been hampering in reaping the benefits of liberalization in India. In the press there is a lot of discussion on this issue and we get to hear that a lot of the existing laws are going to be scrapped (including Section 66 of the factories act). Although, the policy makers believe that these laws are harmful for development, there is no concrete empirical evidence in this regard. This paper is possibly the first to show empirical evidence supporting this claim.

My results suggest that the Indian episode of trade liberalization adversely impacted women in terms of their employment rates. Since there is now growing evidence that empowering women promotes education, health and better outcomes for children Thomas (1990), Duflo (2003), Qian (2008), Duflo (2012) this may also have had long-term adverse impacts. One has to keep in mind, however, that my examination of trade's impact is restricted to a context narrower than what perhaps is ideal. I examine only the organized manufacturing sector. I also study only production workers due to data limitations. In my analysis, I do not look at the change in relative wages, as I do not have information for wages for the "pre" period[5]. I ignore the impact of outsourcing and other footprints of

[5]Figure 2.2 shows that the correlation between log ratio of female to total share man-days and log ratio of female to total share in wage bill for 1998 is 0.95.

globalization. For example, the rapidly growing IT industry may have positively impacted women as recently suggested by Millett and Oster (2013). These questions are left for future investigations. However, this study is an important starting point exploring the relationship between trade liberalization and gender inequality in the Indian labor market.

The paper is organized as follows. Section 2 lays out the conceptual framework. Section 3 discusses the trade liberalization episode and related literature. Section 4 describes the data. Section 5 describes the empirical specifications. Section 6 reports the main results. Section 7 discusses and evaluates alternative channels. Section 8 discusses the robustness of main results. Finally, Section 9 presents the main conclusions of the study.

2.2 Conceptual Framework

In this paper, I use plausibly exogenous changes in tariff rates across industries to study the impact of trade liberalization on the hiring of men and women at the establishment level. What are some possible channels that link these changes? One possible channel is through reductions in discrimination. As suggested by Becker (1957), employers may practice taste-based discrimination and not hire women even when men and women are equally productive. Trade liberalization and reductions in tariffs may increase competition from imports and drive discriminating employers out of the market, thereby raising relative share of women employment and their wage levels. Empirically, this channel has been validated in a variety of settings. Black and Brainerd (2004) test the Becker model for the U.S. and find that industries subject to greater import competition experienced larger reductions in the gender wage gap. Ederington et al. (2010) find similar results for

Colombia.

Tariff reductions which increase import competition may cause the less productive establishments to lose market share or drive them out of business. Surviving establishments may respond by raising productivity. Khandelwal and Topalova (2011) find that tariff reductions raised productivity of incumbent establishments through two channels. First, reductions in tariffs on final goods (output tariffs) raised productivity by increasing competition. Even more importantly, they find reductions in tariffs on imported inputs (input tariffs) had even larger impact on establishment productivity by increasing the quality and variety of goods produced and the scale of production. Increases in productivity may be accompanied by investments in new technology and the hiring of skilled workers who complement the upgraded technology. How would men and women be differentially impacted in this case? If men and women differ in terms of their underlying productivity and in particular, if women are less skilled than men, then women's employment and wage prospects may worsen. In other words, skill upgrading by the establishment may manifest itself in falling share of women employment.

Juhn et al. (2014) provide a different model which differentiates men and women. They propose that women have less "brawn-intensive" skills compared to men. Trade induced technology upgrading increases the relative productivity of women in blue-collar work. They find that tariff reductions in Mexico associated with the North American Free Trade Agreement (NAFTA) encouraged exports, technology upgrading, and the hiring of female labor.

Yet another channel which may be relevant in the Indian context is hours constraints faced by women. Tariff reductions and the onset of competition may change production

decisions for establishments in ways that disadvantage women even when men and women have similar underlying productive capacities. If establishments increase hours of operation and number of shifts, this may disadvantage women who are constrained by family obligations or explicit government regulations that limit their hours. These constraints are similar in spirit to those in developed economies where hours requirements and inflexible schedules in certain occupations limit the advancement of women (Goldin and Katz (2011), Bertrand et al. (2010)). In India, women are prohibited from working night shifts. If the optimal hours of plant operations increases to night shifts, men are likely to expand hours of operation relative to women in such plants.

2.3 Background

2.3.1 Indian Tariff Reforms

Since independence in 1947, India followed a policy of import substitution. As a result huge import tariffs were imposed on various industries. Apart from tariffs there were also other kinds of restrictions in the form of non-tariff barriers such as import quotas. Partial liberalization began in 1980. However, in 1991 India ran into an acute balance of payment crisis for which it had to seek help from International Monetary Fund (IMF).[6]

As part of IMF conditions India implemented economy wide reforms in 1991 including drastic reductions in tariffs in all industries. Average output tariffs declined from 150 percent in 1988 to 38 percent in 1997. Similarly, average input tariffs declined from 147

[6]The crisis in turn was triggered due to various incidences such as rise in oil prices, the Gulf War, fall in remittances, political uncertainty and assassination of Rajiv Gandhi which led to a fall in investor confidence.

percent in 1988 to 38 percent in 1997. As Figure 2.1b and Figure 2.1a illustrate, not only were there reductions in the levels of tariffs but the dispersion of tariffs fell as well with the largest declines occurring in industries with the largest initial tariffs. [7]Topalova (2010) documents that the original round of tariff reductions were broadly based and unanticipated. The tariff reductions continued even after 1998 but Khandelwal and Topalova (2011) find that later reforms were more correlated with industry characteristics. Hence, I isolate my analysis to the tariff reductions which occurred over the 1989-1998 period.

2.3.2 Related Literature

The impact of trade liberalization on employment has been studied in a number of countries. One of the channels through which trade could affect employment is through skill biased technological change, and this has been widely studied. Skill biased technological change leads to an increase in the share of skilled workers within industries as well as compositional changes and "quality" upgrading of product, plant and workers.[8]

Trade liberalization could lead to skill biased technological change through the export channel. Bustos (2011b) and Bustos (2011a) find evidence of technology and skill-upgrading as a result of change in export status due to trade liberalization. Establishments subject to competition may also invest in newer technology and increasingly hire skilled workers who complement the upgraded technology. Apart from exports, other measures are used in various studies to show the effect of trade liberalization on different outcomes.

[7]The change in tariffs are in percentage points.

[8] Acemoglu (2003); Attanasio et al. (2004); Tybout (2003) provide for a survey; Helpman et al. (2011); Ahn et al. (2010); Amiti and Davis (2012); Amiti and Khandelwal (2013).

Verhoogen (2008) uses exchange rate shocks as a measure of variation. Import competition and use of imported intermediate inputs is another measure of trade liberalization which has got the attention of various scholars. It is associated with improvement in quality upgrading of products and increase in wages and skill premium. [9] However, we do have some conflicting evidences.[10]

Skill biased technological change is likely to impact gender inequality [11]. Juhn et al. (2014) link the above two and put forward a model in which men and women embody different "brain" and "brawn" skills and test them empirically in Mexico. They conclude that changes in production technology towards "brain" intensive work should provide women with a comparative advantage which lead to a decline in gender inequality.

The previous studies linking trade liberalization and gender inequality have mainly used household data and focused on separating out within versus between industry changes in wage inequality [12]. They find that most of the effects of trade liberalization are within industry.

The exogenous trade liberalization in India had an effect on the Indian Industry along various dimensions. Khandelwal and Topalova (2011) show that these reforms have led to an increase in productivity due to increase in import competition and use of imported intermediate inputs. They establish that the latter has a stronger effect than the former. Goldberg et al. (2010b) find changes in product composition within establishments in terms of both input and output as a result of trade liberalization. They show that there

[9] Amiti and Khandelwal (2013), Amiti et al. (2007), Csillag and Koren (2011)

[10] Autor et al. (2013), Amiti et al. (2012)

[11] (Galor and Weil (1996); Blau and Kahn (1997); Weinberg (2000); Autor et al. (2003) and Rendall (2010))

[12] See Ozler (2000); Ederington et al. (2010), Paul and Paul (2012); Aguayo et al. (2013)

were a variety of new products that were produced as well as variety of inputs thats were used to produce them. Sharma (2012) finds evidence of a shift in workforce composition favoring skilled labor mainly due to the use of imported intermediate inputs. However, she does not look into the gender composition of workers.

However, there are several complexities which needs to be kept in mind while analyzing the Indian labor market. Bollard and Sharma (2013) do not find any associations between any major reforms and productivity growth. The reforms that they look into are industrial de-licensing, tariff reductions, FDI liberalizations and lifting of small-scale industry reservations. Menon et al. (2013) look at technical change due to trade and attribute it to agglomeration and differences in regional productivity. Menon and Rodgers (2008) show that trade liberalization has led to an increase in concentration among industries which happened to be biased against women leading to increased gender inequality.

Aghion et al. (2005) emphasize the role of domestic institutions, labor market restrictions in particular, and their interactions with technology adoption for the distributional effects of trade policy in India. They find that productivity and profits increased more in industries that were close to the Indian productivity frontier and in states that had more flexible labor market institutions.

There is a body of literature which shows that labor laws and differences in them across states play an important role in determining the effect of trade liberalization on industry. Hasan et al. (2007) show that trade liberalization has led to higher labor demand elasticities and these were stronger in states with flexible labor laws. Ahsan et al. (2012) find that the unemployment has decreased in urban areas with flexible labor markets and in net exporter industries. Ahsan (2013) shows that rapid contract enforcement is necessary in order to

maximize the productivity benefits from input tariff liberalization. Ahsan and Mitra (2014) find that labor share of total revenue increased in small labor intensive establishments but decreased in large capital intensive establishments. Ahsan et al. (2014) analyze the role of trade unions while looking at the effect of trade on employment. They find that in the net importer industries which experienced larger tariff cuts experienced larger increase in union wages. However, the total wage income losses from de-unionized workers exceed the total gains of unionized workers.

The economic reforms of 1991 have also influenced various socio-economic aspects. In districts with greater exposure to tariff reductions, there is an increase in poverty and inequality Topalova (2010), a decline in school attendance Edmonds et al. (2010), fertility increases for low status women and decreases for high status women Anukriti and Kumler (2013). Hence, looking at the effect of reforms on the Indian industry on one hand and its effect on social outcomes on the other prompts us to directly explore the effect of trade liberalization on women in the labor market.

Tariff change impact studies have mainly focused on changes in technology, productivity and employment, etcetera, but not on gender inequality. This paper is an attempt to fill that research gap. Since the gender inequality in employment has obvious welfare implications, the present study is also an addition to the small body of literature on welfare impacts of tariff liberalization.

2.4 Data

2.4.1 Tariff Data

The tariff data is available at the 3-digit National Industrial Classification (NIC) which resembles international classifications commonly used in other countries.[13] These classifications were revised between 1989 and 1998. I converted all industry classifications to the 1998 NIC codes using concordance tables provided by Ministry of Statistics and Program Implementation (MOSPI). These data were then merged with the establishment level data using the 3-digit NIC codes, resulting in 90 industries.[14]

2.4.2 Establishment Level Data

I use establishment level data from Annual Survey of Industries (ASI) made available by the Department of Commerce in India. The unit of observation is an establishment or a plant. For convenience, however, I will use the terms "firm" and "establishment" interchangeably in the paper. ASI covers all registered establishments in the manufacturing sector.[15] All establishments with 100 workers or above were surveyed in 1989 and all establishments with 200 workers or above were surveyed in 1998. For establishments below these size cut-offs, a stratified sampling procedure was used where the stratification was done at the state and-4 digit industrial classification level. The sample scheme surveyed

[13] I am grateful to Reshad Ahsan and Debashish Mitra for sharing their tariff data.

[14] Input tariffs were constructed by Ahsan and Mitra (2014) using the formula used by Amiti et al. (2012). Consider industry j that uses inputs from industry k. In this case Input Tariff$_{jt} = \sum_k s_{jk} *$ Output Tariff$_{kt}$, where s_{jk} is the share of input k used in producing output j. The share of inputs are obtained from the relevant input output tables.

[15] These are registered under the Factories Act of 1948. This includes all establishments using 10 or more workers if using power and 20 or more workers if not using power.

approximately one third of the establishments below the size cut-off every year, subject to the constraint that a sufficient number of establishments were sampled to assure representativeness at the state and industry level. An observation is a single plant for the fiscal year from April to March, with the exception that an owner of two or more establishments located in the same industry group and state is permitted to submit a joint statement.[16] The data for 1989 and 1998 are available as representative cross-sections. In a recent release of the ASI, establishment identifiers were included which allowed me to create a panel data set in which the same establishment is observed at two points in time, 1989-1998. The match rate and summary statistics are reported in Table 2.1 and Table 2.2b. I use this panel data for my main analysis and use the cross-sectional data to check the robustness of my results. Table 2.2a and 2.2b in the provides summary statistics of the cross-sectional data as well as the panel data. [17]

The ASI data contains detailed information on employment. It reports separately different categories such as directly employed, contract workers, supervisory and other workers. I have categorized direct and contract workers as "production workers" and supervisory and other workers as "non-production workers", following the standard used by the Bureau of Labor Statistics. Man-days (corresponding to an 8-hour shift) worked over the year by males and females are reported separately for directly employed (production) workers. Unfortunately there is no break-down by gender for supervisory and other (non-production) workers. In addition to man-days worked, I also have the daily average numbers of workers on payroll, averaged over a year, which I refer to as "number" of workers.

[16]While the ASI data is a representative data set for all registered factories, not all factories are registered under the Factories Act. However, they are still a significant share of plants in the manufacturing sector in India Allcott et al. (2014)

[17]Table 2.13 contains the summary statistics of the variables actually used in the regressions.

The ASI data also contain information on plant ownership (government or private), age and location of the plant. I also have information on the total value of imported inputs, gross sales, fixed capital and working capital.

The share of female man-days is calculated by taking the ratio of female man-days to total man-days among directly employed (production) workers. The log of this share is taken for each year and then the difference is calculated between 1989 and 1998. Similarly, I look at the share of females by dividing the number of female workers by the number of all workers.

Following the size cut-offs for being in the census of establishments or in the sample, I classify establishments with > 60000 man-days as "big" establishments.[18]This includes 1832 establishments. Around 43.40 percent of the big establishments in 1989 are matched and included in the panel data set. This is expected, given that Hsieh and Klenow (2014) find that the exit rate of large establishments is around 4 percent every year. The match rate among smaller establishments is even lower. Around 7 percent of the smaller establishments in the 1989 sample are matched and included in the panel data set.

[18]This definition of the census sector is taken according to 1998. However, only 5% of these establishments were not part of the census sector in 1989. Even if I drop these 5 % establishments, the results remian similar. Also, I do not find any correlation between change in tariff and the total size of establishments.

2.5 Empirical Specification

2.5.1 Panel Data Regressions

The central question in this paper is how tariff reductions impact the share of female workers at the establishment level. While it would be instructive to examine both production and non-production workers separately, ASI unfortunately has the gender break-down for production workers only in the establishment data. The results of this paper therefore apply to production workers. I estimate the following reduced-form equation using OLS.

$$\Delta F_{ji} = \beta_1 \Delta OutputTariff_i + \beta_x X_{ji,1989} + \delta_{i'} + \Delta\epsilon_{ji} \tag{2.1}$$

where, j refers to the establishment, i refers to 3-digit industry. ΔF_{ji} is the change in log female share. More specifically, it is the 1998 log female share less the 1989 log female share. [19] $\Delta OutputTariff_i$ is output tariff in 1998 at 3 digit NIC less output tariff in 1989. $\delta_{i'}$ refers to 2-digit industry controls. I am looking at within-establishment changes. However, the changes in log female share may vary with initial characteristics of the establishment, $X_{ji,1989}$. I include the ratio of fixed capital to sales and the ratio of working capital to sales, all measured in 1989.[20] My main coefficient of interest is β_1. A positive coefficient means that a decline in output tariffs (which is what occurred between 1989 and 1998) leads to a decrease in female share.

In addition to output tariffs, another important channel is input tariffs. The literature

[19] I also look at the change in ratio of female to total man-days (in levels) and find no difference in results.

[20] I also control for age of the establishment, state where the establishment is located, and dummy variable indicating whether the establishment has imported inputs.

indicates that reduction in input tariffs increased productivity among establishments importing inputs. In my second set of models, I include input tariff changes as well as output tariff changes as specified in the following equation:

$$\Delta F_{ji} = \beta_1 \Delta OutputTariff_i + \beta_2 \Delta InputTariff_i + \beta_x X_{ji,1989} + \delta_{i'} + \Delta\epsilon_{ji} \qquad (2.2)$$

Here, I run a "horse-race" between output and input tariffs by comparing β_1 and β_2. Since input tariffs also declined from 1989 to 1998, a positive coefficient means that a decline in input tariffs leads to a decrease in female share.

Since the ASI data is a census of larger establishments and a sample of smaller establishments, the larger entities are more likely to be in my constructed panel data set. I do not have panel weights and therefore do not assign weights to observations in my panel. Therefore, it is likely that the smaller establishments in my panel are less likely to representative of all establishments in this category. In addition, larger establishments are more likely to survive, leading to smaller survival bias in my estimates. For these reasons, I examine results separately for "big" establishments which are more likely to be representative of the establishments in this category. I also examine separately "private" establishments. Since the government-owned establishments might have equity concerns apart from maximizing profits, I examine private establishments separately where I expect markets forces to have the larger impact. In 1989, around 10 percent of the establishments were publicly owned.

2.5.2 Industry-Level Regressions

Within-establishment changes in female share are not subject to changes in the composition of establishments which may confound my analysis. On the other hand, the results based on the balanced panel may not be representative of industry-level changes which include births and deaths of establishments. I, therefore, also run following regressions on industry-level data based on representative cross-sections of establishments in 1989 and 1998.

$$\Delta F_i = \beta' \Delta OutputTariff_i + \Delta \epsilon_i \tag{2.3}$$

$$\Delta F_i = \beta_1' \Delta OutputTariff_i + \beta_2' \Delta InputTariff_i + \Delta \epsilon_i \tag{2.4}$$

2.6 Results

2.6.1 The Effect of Output Tariffs on Female Share

Table 2.3 gives the results from estimating Equation 2.1. Each column represents a separate regression. Columns (1)-(4) do not include initial establishment characteristics while I include these initial characteristics in columns (5)-(8). Columns (4) and (8) include establishments which are privately owned and have $>$ 60000 man-days of operation in a given year and hence are categorized as "big". In all specifications, the coefficient is positive which means that greater tariff reductions led to declines in female share. Among

"all" establishments, the estimate is 0.030 but not statistically significant at conventional levels. While the standard errors are large, the coefficients for "big and private" establishments are large and statistically significant at the 10 and 5 percent levels in columns 4 and 8 respectively.[21] The point estimate of 0.725 implies that a "big and private" establishment in an industry experiencing 10 percentage point reduction in output tariffs would reduce female share by 7 percent. An establishment in an industry experiencing the average output tariff decline (115 percent) would reduce female share by approximately 40 percent (from a base of 10 percentage points) relative to a establishment facing minimum tariff change (60 percent). These results are counter to what we expect from declining discrimination due to increased competition as laid out by the Becker model. In contrast to the theoretical prediction, I find that output tariff reductions led to declines in the relative share of female employment.

2.6.2 The Effect of Input Tariffs on Female Share

Table 2.4 presents the results from estimating Equation 2.2 where I include input tariff changes. Here again, the columns have similar representation as Table 2.3. None of the coefficients on input tariff changes is statistically significant. Thus the change in input tariffs does not have any effect on female share. The coefficients of output tariff changes remain positive and significant for "big" and "private" establishments, and insignificant for the other samples, as in the main results.[22]

[21] I cluster standard errors at the 3-digit industry level.

[22] I have also interacted the importer dummy with input tariff changes to check for differential effects and found none of the interactions to be statistically significant.

2.6.3 Industry Level Regressions

I report the results of industry level regressions in Table 2.5. Table 2.5 presents results from estimating Equations 2.3 and 2.4 when I aggregate female man-hours and total man-hours up to the 3-digit NIC level. I do the same for columns (4), (5) and (6) of Table 2.5, except that I aggregate over establishments in the "big and private" category only. Since the cross-sections of establishments in 1989 and 1998 are representative of all establishments in the economy, these regressions give me an idea of how results differ if I take account of all establishments including those newly born and those that do not survive.

As shown in Table 2.5, when all establishments are included, I obtain a coefficient on output tariff change of 0.400 which is significant at the 10 percent level (column (1)). When both output and input tariffs are included, output tariff change still has a positive effect while input tariff change now has a negative effect, although neither coefficient is significant. In columns (4), (5) and (6) of Table 2.5, I focus on establishments which are "big and private." The coefficient on output tariff change alone is now no longer significant. When both tariff changes are included, the coefficient on output tariff change becomes large, positive and significant while the coefficient on input tariff change are negative and insignificant. This is similar to the pattern found in the panel level regressions in Table 2.4.

Overall, I find that the industry level regression results are broadly consistent with the results from panel data, especially for output tariff change. I find that coefficients on output tariff changes, while not always significant, are consistently positive, implying a negative association between tariff reductions and female employment share. In the case of "all

establishments" which includes smaller establishments, the industry level regression may be more representative of the population of establishments. The coefficient I obtain for "all establishments," 0.400, is similar in size to the coefficient from the panel data regression.[23]

2.6.4 Extensive and Intensive Margin

Among the establishments in the panel data, 63 percent did not hire any female workers in 1989.[24] Changes in female share can occur through the extensive margin (more establishments hiring at least one female worker) or through the intensive margin (establishments which hire female workers expanding the share of female labor). In this section, I examine the relative importance of these margins. Columns (1)- (4) of Table 2.6 present the results from estimating changes in female share at the extensive margin. I define a categorical variable which takes the value 1 if the establishment hires females and 0 otherwise for 1989 and 1998. I define a switch variable which is the difference in this categorical variable across the two years. I then estimate Equation 2.2 using this switch variable as my dependent variable. I multiply the variable by 100 for convenience of presentation. Columns (5)- (8) explore the effect of tariff changes at the intensive margin. I begin with a sample of establishments which hired female workers. I use the change in (log) female share as the dependent variable. At the extensive margin, I find that the effect of output tariff change is positive and significant in " big and private" establishments. The coefficient of 0.034 implies that a "big and private" establishment in an industry which experienced the average output tariff decline of 115 percentage points would be approximately 2 percentage points less likely to hire at least one female worker relative to an establishment

[23] Figure 2.3 shows that the correlation between output and input tariff is 0.61.

[24] The correlation between output tariff reduction and firms which hire women in 1989 is 0.06.

that experienced minimum tariff change (60 percent). Since about 40 percent of establishments in this category hire any female workers, this amounts to about a 5 percent decline. Among "big and private" establishments, the share which hired at least one female worker increased from 0.415 to 0.439 suggesting that gender segregation declined.[25] Output tariff declines, however, are associated with slower decline in gender segregation across establishments, again counter to the Becker model. I also find a positive coefficient on output tariff on the intensive margin, suggesting that there was a decline in the female share even at the intensive margin. However, the coefficients are not significant at conventional levels.

2.7 Mechanisms

In the previous section I established that output tariff decline led to a decline in female employment share. In this section, I explore the mechanisms through which output tariff reductions adversely impact female employment.

2.7.1 Skill Upgrading

If women are less skilled than men and trade liberalization brings about skill biased technological change, I would expect trade liberalization to increase gender inequality. In this section, I examine whether output or input tariff changes indeed leads to skill upgrading. I estimate the following equation:

$$\Delta S_{ji} = \gamma_1 \Delta OutputTariff_i + \gamma_2 \Delta InputTariff_i + \beta_x X_{ji,1989} + \delta_{i'} + \Delta\epsilon_{ji} \qquad (2.5)$$

[25] See 2.2a.

where ΔS_{ji} now refers to the skill ratio in establishment j in industry i. The independent variables and the controls are the same as the previous specifications. The skill ratio is defined as the ratio of non-production to production workers. Non-production workers include supervisors and clerical workers. Production workers on the other hand include directly employed and contract workers. I look at the change in skill ratio in terms of man-days. If tariff reductions lead to skill-biased technology change, I would expect the coefficients γ_1 and γ_2 to be negative. I should find a stronger effect for input tariff reduction as it leads to the use of imported intermediate inputs which require greater skills to operate.

Table 2.7 reports the results. Columns (1) to (4) present results in terms of man-days. I find that the coefficients on output tariff changes are negative in all columns suggesting that larger tariff declines are associated with skill upgrading. The effect of output tariff changes on the skill ratio appears to be stronger at the smaller establishments since I find a large negative coefficient (-0.187 and -0.193) among all establishments and private establishments (columns (1) and (2)).[26]

Are women less skilled than men in the manufacturing sector? While education levels of workers are not reported in the establishment survey, one can utilize household surveys to address this question. Table 2.8 shows average years of education among males and female in the manufacturing sector. The source of this data is the Human Development Survey, which was conducted in the year 2005. I restrict the sample to those aged 24 to 66 years in order to include individuals who would have finished their education and potentially be working 10 years ago. The values are weighted by sampling weights in

[26]In Tables 2.14 and 2.16 I look at the change in log ratio of plant and machinery to man-days and the change in log ratio of fixed capital to sales as alternative measures of skill upgrading. However I do not observe significant changes.

order to be representative of the population. I find that females are less educated than males in all industries leading me to believe that there are skill differences among males and females which would have partly contributed to the gender inequality. To the extent that skill upgrading occurred within production workers, as it apparently did across non-production and production workers, this would have led to a reduction in the hiring of female workers.

2.7.2 Plant Operations and Shifts per Worker

In India, women are restricted from working extended hours and night shifts in the manufacturing sector. All registered manufacturing units have to follow the guidelines of the Factories Act of 1948. Section 66 of this Act limits the working hours of women and prohibits them from doing night shifts (Begum (2013)).[27] One possibility is that with tariff reductions and import competition, establishments increased the number of shifts worked. Since women are constrained in terms of the maximum number of hours they can work, both because of the legal constraints described above, and also possibly because of family obligations, this change in plant operations would reduce the relative employment of women. In this section, I investigate whether this could be a possible channel through which tariff reductions negatively impacted female employment.

To begin, I examine whether tariff reductions have similar negative impact on female hiring when I define female share based on number of workers. The establishments report

[27]The IT sector is not subject to these restrictions. Begum (2013) studies the effect of night shifts on the health of women in the IT sector. Recent newspaper articles reported that states are actively considering repealing this section of the Act. The state governments have been given authority to make amendments to the law.

"man-days" which is defined as the number of 8-hour shifts worked over the year. I have so far focused on this measure of employment. But establishments also report daily average number of workers, which I call "number of workers." An alternative measure of female share is the ratio of "average number of female workers" to "average number of all workers." I use this alternative measure of female share as our dependent variable and report the results in Table 2.9. Unlike the conclusions using man-days, I find no clear evidence that output tariff reductions adversely impacted female employment share based on this alternative measure. For example, the coefficient for "big and private" establishments is 0.111 which is not statistically significant. This leads me to hypothesize that the negative impact of tariff reductions is operating through work intensity or shifts per worker.

Table 2.10 examines (yearly) shifts per worker among males. I divide the number of man-days by the average number of workers. The table shows the results from regressing this variable on output and input tariff changes. The table shows that shifts per worker increased faster in establishments facing larger declines in output tariffs. Among "big and private" establishments, the coefficient is -0.124 (column (4)) which suggests that the average tariff decline of 115 percentage points led to a 7 percent increase in shifts per worker compared to an establishment with minimum tariff decline (60 percent). Since the average in 1989 was approximately 317, this amounts to 22 extra 8-hour shifts per worker compared to an establishment which experienced minimum tariff decline and 44 extra 8-hour shifts per worker compared to an establishment with no output tariff decline.

Table 2.11 examines how the effect of output tariffs varies with establishment's work intensity or number of shifts per worker. I examine only the "big and private" establishments in this exercise. I run separate regressions for establishments with initial male shift

per worker in 1989 below the median value and for establishments with initial male shift per worker above the median value. Table 2.11 shows that the negative impact of output tariff declines on female share is driven by establishments with high initial shift per worker.

The rise in work intensity associated with output tariff declines are likely to be disadvantageous for female workers. As discussed above, women are explicitly barred from working long hours and night shifts. In addition, women may have household obligations which limit their ability to work long hours. Among the subset of establishments which are "big and private," these types of hours constraints appear to have worked particularly against female workers.

2.8 Robustness of the Main Results

In the sections above, I find that the decline in output tariff leads to a decline in female share in jobs in the organized manufacturing sector. I attribute skill biased technological change and hours constraint faced by females as the main reasons for that. In this section I discuss several threats to the identification strategy. I consider possible alternate channels and ways to rule them out.

2.8.1 How do we ensure causality?

I argue in Section 2.3 that the tariff changes were not correlated with industrial characteristics as shown by Topalova (2010) and several others thereafter. This ensures that the reforms were exogenous. In the context of this study, I find that the output tariff change

is also uncorrelated with the log female to male share in man-days in 1989, the log skill ratio in 1989 and log male intensity in 1989 at the industry level (the results are presented in Table 2.15). Hence, this enables us to establish causal interpretation.

2.8.2 Could establishment level characteristics matter?

It can be argued that tariff reductions and share of females are correlated with establishment level characteristics. Export and import status of the establishment could be one example. In this work I use a balanced panel of establishments and hence look at the same establishment before and after. Additionally I control for establishment level characteristics for the initial year. [28] Thus, I argue that I am able to control for establishment level characteristics.

2.8.3 Could sampling problems lead to selection bias?

One might argue that there could be selection bias due to sampling techniques. In my main result I look at 'big and private' establishments separately, which is a census of establishments in this category and hence are not subject to sampling biases. I also aggregate the establishment level data up to the industry level using the relevant multipliers and find similar results at the industry level as well (see Section 2.6.3).

[28] I take controls for import status of the establishment in the initial year. As mentioned earlier, I do not have information on the export status of establishments. In order to take care of this issue, I take the share of fixed capital to sales and working capital to sales and use them as a proxy for exports.

2.8.4 Could there be changes in industrial composition?

One can argue that sectors which employed more women grew much less than those which employed more men. This could be one of the factors driving our results at the establishment and industry level. In my main specification, [29], I take an additional control of ratio of man-days worked by females to males for 1989 (which is the "pre" year) at 3 digit industry level (results are presented in Table 2.12). I find that the results remain very similar. Additionally I do not find an effect of output and input tariff on overall man-days worked as seen in Table 2.17. Also there does not seem to be a significant change in log sales especially for big and big and private establishments as a result of the change in output and input tariffs as seen in Table 2.19. [30] So, as such we do not find any significant change in industrial composition as a result of change in tariff.

2.8.5 Could there be a shift from direct to contract workers?

One can argue that the decline in female to total workers might be due to employers hiring more contract workers. My data does not have the gender decomposition of contract workers and thus I cannot comment on the gender ratio of the contract workers. But I look at the change in share of contract to total workers (in man-days) and do not find any significant changes with respect to changes in tariffs (see Table 2.21). Moreover, I look at establishment level data and there is no reason to believe that the shift from direct to contract workers would be proportionally larger for females.

[29] Equations 2.1 and 2.2

[30] In Table 2.20, I look at the I look at the change in log ratio of total sales to man-days and find that there is a decline overall with respect to a decline in output as well as input tariffs.

2.8.6 What are the effects from the supply side?

I look at the period between 1989 and 1998. This coincides with the emergence of the IT industry in India. Millett and Oster (2013) mention how the increase in IT jobs increased the relative hiring and education of girls. In this context one can argue that females are probably shifting from formal manufacturing to the IT sector. In my main specification, I take state level controls. Further, I take control for each district and find that the results remain broadly similar (see Table 2.18). The district is a much smaller geographical location and thus if employment opportunities arose in certain districts in the non-manufacturing sector, taking district level controls would ensure that we look at changes within a district.

I argue that the change in tariff has a significant effect on the change in female share and I also argue that one of the main channel is increase in the hours of works. I however cannot fully disentangle these between demand and supply side effects.

2.9 Conclusion

The larger question addressed in this paper is how trade liberalization policies in India impacted gender inequality. While this is the larger question at hand, in practice, my empirical work addresses the narrower question of how tariff reductions impacted the relative hiring of women by employers in the manufacturing sector. How the initial trade shocks feed through the economy through input-output linkages to impact other sectors is left for future research. It would be ideal to be able to examine the impact on both production and non-production workers. Unfortunately, the establishment data gives the breakdown

of female and male employment only for production workers. Thus, my study is confined to examining how tariff reductions impacted the female share of employment among production workers.

My findings suggest that larger tariff declines reduced the relative hiring of women. This appears to be the case for all establishments, but it is especially true for "big and private" establishments in our panel data. This result is directly counter to what I would expect if tariff reductions led to increased competition and reduced taste-based discrimination practiced by employers. I also find tariff reductions had little role in changing gender composition through the imported inputs channel, as suggested by a number of papers Goldberg et al. (2010b), Goldberg et al. (2010a), Goldberg et al. (2009), Khandelwal and Topalova (2011). Reductions in input tariffs appear to have neither positively nor negatively impacted women in my data.

What are the possible channels for my finding? I identify two possible channels that are consistent with my empirical analysis. First, I find that establishments facing larger tariff reductions undertook more skill-upgrading, which I define as the increase in the ratio of white-collar to blue-collar workers. Using household data, I establish that blue-collar female workers in manufacturing have lower levels of education (by nearly 5 years) compared to male workers in manufacturing. To the extent that establishments subject to trade liberalization and import competition engaged in skill-upgrading even within production work, this would have negatively impacted the hiring of women. I also identify another channel which appears to be especially important for "big and private" establishments. While I am not able to precisely identify the cause, I find that work intensity, or shifts per worker, rose more rapidly among establishments facing steep tariff reductions in their

sector. Since women are explicitly barred from working extended hours and night shifts by law and constrained from long hours of work due possibly to family obligations, I hypothesize that this development would also have deterred the hiring of women. Consistent with this hypothesis, I find that tariff reductions negatively impacted women among establishments which had high initial levels of work intensity in 1989.

My analysis suggests that women did not benefit from trade liberalization policies and in fact these policies may have increased, rather than decreased, gender inequality. This is broadly consistent with the conclusions of Topalova (2010) and Edmonds et al. (2010) who find that regions with exposure to trade liberalization policies had relatively slower reductions in poverty and child labor. On the other hand, my results are counter to some recent papers which examine the impact of trade liberalization on gender inequality in the Mexican case. Since my findings here appear to be at odds, some further elaboration is warranted. An important distinction between Indian tariff reforms and the North American Free Trade Agreement signed by Mexico is that in the Indian case, the tariff reductions were unilateral while in the Mexican case they were bilateral. Juhn et al. (2014) find that reductions in U.S. tariff rates imposed on Mexican exports led to increases in the number of exporting Mexican establishments and that these establishments in turn upgraded technology. The upgraded technology appears to have benefited female blue-collar workers who previously had been disadvantaged in terms of "brawn-intensive" skills. There was no such reduction in export tariffs in the Indian case. It is also worth noting that expansion of trade, defined broadly to include outsourcing (the re-location of services across countries) may have helped Indian women. Millett and Oster (2013) documents how the increase in IT jobs increased the relative hiring and education of girls.

Table 2.1: Panel Match Rate Table

	>60000	30000-60000	<30000
Cross Section 1989	4221	2980	27038
Cross Section 1998	3991	1446	13322
Panel	1832	389	1893
Match Rate $\%$	43.40	13.05	7.00

Notes: >60000 represents all establishments which reported >60000 total man-days worked in a year. $30000-60000$ represents all establishments which reported $30000-60000$ total man-days worked in a year. <30000 represents establishments which reported <30000 total man-days in a year.

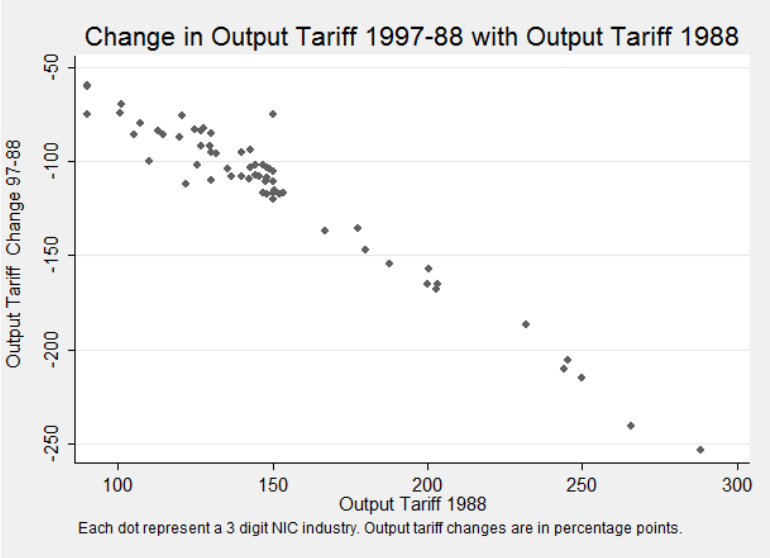

Figure 2.1a: Change in output tariff and initial output tariff in 1988

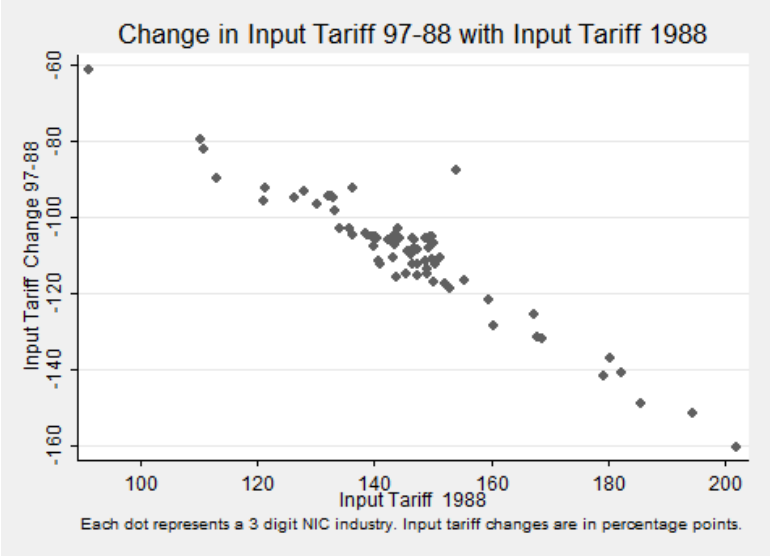

Figure 2.1b: Change in input tariff and initial input tariff in 1988

Table 2.2a: Summary Statistics: Cross Section

	1989		1998	
	All	Big& Pvt	All	Big& Pvt
Female Man-days/Total Man-days	0.156	0.126	0.195	0.195
	(0.293)	(0.265)	(0.330)	(0.331)
Female Number/Total Number	0.193	0.131	0.260	0.200
	(0.282)	(0.262)	(0.312)	(0.228)
Male Man-days/ Male Number	176.55	315.30	251.37	314.43
	(126.75)	(110.18)	(106)	(123.44)
Skilled Man-days/Unskilled Man-days	0.297	0.323	0.387	0.333
	(0.280)	(0.279)	(0.376)	(0.335)
Working Capital/Sales	0.178	0.108	0.340	0.247
	(0.263)	(0.183)	(0.369)	(0.301)
Fixed Capital/Sales	0.200	0.176	0.416	0.417
	(0.288)	(0.248)	(0.382)	(0.348)
Import Dummy	0.06	0.234	0.056	0.459
	(0.236)	(0.424)	(0.230)	(0.498)
Female Dummy	0.294	0.410	0.335	0.466
	(0.456)	(0.492)	(0.472)	(0.498)
Observations	34239	3056	18759	3164

Table 2.2b: Summary Statistics: Panel

	1989		1998	
	All	Big& Pvt	All	Big& Pvt
Female Man-days/Total Man-days	0.128	0.102	0.141	0.102
	(0.263)	(0.234)	(0.282)	(0.232)
Female Numbers/Total Numbers	0.152	0.106	0.183	0.105
	(0.259)	(0.233)	(0.277)	(0.231)
Male Man-days/Male Number	246.73	317.97	275.98	321.56
	(121.29)	(111.96)	(88.14)	(52.63)
Skill Man-days/Unskill Man-days	0.310	0.351	0.387	0.393
	(0.275)	(0.406)	(0.366)	(0.691)
Working Capital/Sales‡	0.136	0.100	0.297	0.214
	(0.211)	(0.163)	(0.346)	(0.270)
Fixed Capital/Sales‡	0.181	0.184	0.372	0.371
	(0.259)	(0.247)	(0.359)	(0.315)
Import Dummy‡	0.113	0.228	0.149	0.442
	(0.317)	(0.419)	(0.356)	(0.496)
Female Dummy	0.367	0.415	0.374	0.439
	(0.482)	(0.492)	(0.483)	(0.496)
Observations	4114	1289	4114	1289

The table mean coefficients. Standard deviations are in parentheses. Female Dummy is 1 if a firm hires at least 1 female and 0 otherwise. Likewise Import Dummy is 1 if the firm imports and 0 otherwise.

‡ indicates these variables are used as controls. The summary statistics for these variables are winsorized at 1%.

Table 2.3: Female Share and Output Tariffs

Dependent Variable: Change in Log of Female to Total Ratio in Man-days								
	All (1)	Pvt (2)	Big (3)	Big & Pvt (4)	All (5)	Pvt (6)	Big (7)	Big & Pvt (8)
ΔOutput Tariff	0.320	0.274	0.441	0.712*	0.337	0.311	0.445	0.725**
	(0.406)	(0.334)	(0.618)	(0.395)	(0.393)	(0.330)	(0.582)	(0.354)
WorkCap/Sales					-8.152	-11.58***	-31.60***	-31.28***
					(5.050)	(3.698)	(2.829)	(1.497)
FixedCap/Sales					4.452	2.467	19.98***	19.18***
					(2.880)	(2.400)	(2.215)	(1.518)
Observations	4114	3429	1832	1289	4114	3429	1832	1289
R^2	0.028	0.024	0.052	0.063	0.030	0.025	0.057	0.071

Notes: Same as in Table:2.4

Table 2.4: Female Share and Output and Input Tariffs

Dependent Variable: Change in Log of Female to Total Ratio in Man-days								
	All (1)	Pvt (2)	Big (3)	Big & Pvt (4)	All (5)	Pvt (6)	Big (7)	Big &Pvt (8)
ΔOutput Tariff	0.252	0.283	0.317	0.781*	0.250	0.311	0.291	0.765***
	(0.311)	(0.222)	(0.801)	(0.412)	(0.308)	(0.233)	(0.708)	(0.284)
ΔInput Tariff	0.388	-0.061	0.635	-0.376	0.504	0.001	0.784	-0.214
	(1.227)	(1.124)	(2.019)	(1.166)	(1.161)	(1.093)	(1.851)	(1.021)
WorkCap/Sales					-8.561	-11.81***	-31.76***	-31.23***
					(5.190)	(3.777)	(2.792)	(1.543)
FixedCap/Sales					4.692	2.665	20.19***	19.11***
					(2.965)	(2.490)	(2.136)	(1.475)
Observations	4114	3429	1832	1289	4114	3429	1832	1289
R^2	0.028	0.024	0.052	0.063	0.030	0.025	0.057	0.071

Notes: Standard errors clustered at 3 digit industry level in parentheses. Dependent variable is the (log(female man-days in 1998/total man-days in 1998) - log(female man-days in 1989/total man-days in 1989)) *100. Columns (1) & (5) represent all establishments in the panel. Columns (2) & (6) include establishments which have completely private ownership. Columns (3) & (7) include establishments that have $>$ 60000 man-days of operation and hence categorized as big establishments. Δ Output Tariff represents (output tariff in 1998 - output tariff in 1988). Δ Input Tariff represents (input tariff in 1998 - input tariff in 1988). WorkCap/Sales is the ratio of working capital to sales in 1989. FixedCap/Sales is the ratio of fixed capital to sales in 1989. All regressions include controls for imported inputs, age of the establishment, 2 digit industry and states. The control for imported inputs is a dummy which takes the value 1 if the establishment imports1989. Age is a dummy which has a value 1 if the establishment is less than 15 years old and 0 otherwise. ***, **, * denote significance at 1%, 5%, 10% levels respectively.

Table 2.5: Female Share and Output Tariff - Industry level

Dependent Variable: Change in Log of Female to Total Ratio in Man-days						
	All			Big & Pvt		
	(1)	(2)	(3)	(4)	(5)	(6)
ΔOutput tariff	0.400*		0.467	0.916		2.04**
	(0.237)		(0.323)	(0.745)		(1.01)
ΔInput Tariff		0.562	-0.256		-0.641	-4.20
		(0.621)	(0.838)		(1.92)	(2.59)
Observations	89	89	89	86	86	86
R^2	0.031	0.010	0.033	0.017	0.002	0.049

Notes: Standard errors in parentheses. Dependent variable is the (log(total female man-days in the industry in 1998/total man-days in the industry in 1998) - log(female man-days in the industry in 1989/total man-days in the industry in 1989)) *100. I aggregated the cross section of establishments up to the 3 digit NIC industry level in columns (1), (2) and (3). In columns (4), (5) and (6), I aggregated "big" (establishments with $>$ 60000 man-days) and private establishments from the cross-section of establishments. Δ Output Tariff represents (output tariff in 1998 - output tariff in 1988). Δ Input Tariff represents (input tariff in 1998 - input tariff in 1988). ***, **, * denote significance at 1%, 5%, 10% levels respectively.

Table 2.6: Female Share and Tariffs- Extensive and Intensive Margin

	Dependent Variable:							
	Change in dummy variable for hiring female				Change in Log of Female to Total Ratio in Man-days in female hiring firms			
	Extensive Margin				Intensive Margin			
	All (1)	Pvt (2)	Big (3)	Big & Pvt (4)	All (5)	Pvt (6)	Big (7)	Big & Pvt (8)
ΔOutput Tariff	0.0160	0.0199	0.00638	0.0340**	0.987	1.112	-0.488	2.598
	(0.0168)	(0.0150)	(0.0331)	(0.0152)	(1.545)	(1.972)	(2.594)	(1.680)
ΔInput Tariff	0.0336	-0.0114	0.0682	-0.0154	1.228	-1.228	2.925	-4.139
	(0.0578)	(0.0609)	(0.0875)	(0.0517)	(3.244)	(3.654)	(5.712)	(3.931)
WorkCap/Sales	-0.563	-0.767***	-2.050***	-2.064***	-29.10***	-29.52***	-35.43***	-30.28***
	(0.353)	(0.262)	(0.170)	(0.102)	(4.708)	(6.529)	(5.712)	(2.995)
FixedCap/Sales	0.312	0.192	1.322***	1.305***	16.50***	17.40**	23.62***	19.00***
	(0.202)	(0.176)	(0.126)	(0.0979)	(2.753)	(7.731)	(7.242)	(4.057)
Observations	4114	3429	1832	1289	1824	1472	916	630
R^2	0.034	0.029	0.059	0.076	0.075	0.072	0.113	0.140

Notes: Standard errors clustered at 3 digit industry level in parentheses. Dependent variable for columns (1) to (4) is the (Female98 -Female89)*100. Female89 and Female98 categorical variable which takes the value 1 if the establishment hires females and 0 otherwise for 1989 and 1998 respectively. The dependent variable for columns (5) to (8) is the same as Table 2.3 and 2.4. In col. (5) to (8) I take the sample of establishments which hire at least one female. Columns (1) & (5) represent all establishments in the panel. Columns (2) & (6) include establishments which have completely private ownership. Columns (3) & (7) include establishments that have $>$ 60000 man-days of operation and hence categorized as big establishments. Columns (4) & (8) include all establishments that are big as defined above and privately owned. Δ Output Tariff represents (output tariff in 1998 - output tariff in 1988). Δ Input Tariff represents (input tariff in 1998 - input tariff in 1988). WorkCap/Sales is the ratio of working capital to sales in 1989. FixedCap/Sales is the ratio of fixed capital to sales in 1989. All regressions include controls for imported inputs, age, 2 digit industry and states. The control for imported inputs is a dummy which takes the value 1 if the establishment imports. Age is a dummy which has a value 1 if the establishment is less than 15 years old and 0 otherwise. ***, **, * denote significance at 1%, 5%, 10% levels respectively.

Table 2.7: Skill Ratio and Output and Input Tariffs

Dependent Variable: Change in Log Skill Ratio Man-days				
	All (1)	Pvt (2)	Big (3)	Big & Pvt (4)
ΔOutput Tariff	-0.187**	-0.193**	-0.0516	-0.0291
	(0.0869)	(0.0966)	(0.0375)	(0.0442)
ΔInput Tariff	0.173	0.235	0.213*	0.125
	(0.322)	(0.369)	(0.117)	(0.147)
WorkCap/Sale	0.153	-0.490	0.770	0.827**
	(1.556)	(1.600)	(0.552)	(0.414)
FixedCap/Sales	-0.119	-0.458	-0.649	-0.567
	(0.913)	(1.355)	(0.506)	(0.423)
Observations	4114	3429	1832	1289
R^2	0.021	0.023	0.034	0.041

Notes: Standard errors clustered at 3 digit industry level in parentheses. Dependent variable is the (log skill ratio in man-days in 1998 - log skill ratio in man-days in 1989)*100. Skill ratio is the ratio of non-production to production workers. Non-production workers include supervisory and other workers. Production workers include direct and contract workers. Columns (1) represent all establishments in the panel. Columns (2) include establishments which have completely private ownership. Columns (3) include establishments that have $>$ 60000 man-days of operation and hence categorized as big establishments. Columns (4) include all establishments that are big as defined above and privately owned. Δ Output Tariff represents (output tariff in 1998 - output tariff in 1988). Δ Input Tariff represents (input tariff in 1998 - input tariff in 1988). WorkCap/Sales is the ratio of working capital to sales in 1989. FixedCap/Sales is the ratio of fixed capital to sales in 1989. All regressions include controls for imported inputs, age, 2 digit industry and states. The control for imported inputs is a dummy which takes the value 1 if the establishment imports. Age is a dummy which has a value 1 if the establishment is less than 15 years old and 0 otherwise. ***, **, * denote significance at 1%, 5%, 10% levels respectively.

Table 2.8: Education Among Males and Females in Manufacturing Industries

	Male		Female	
Coal Mining	6.05	(4.43)	1.12	(2.03)
Iron Mining	4.97	(4.77)	0.81	(1.67)
Other Metal Mining	3.99	(4.43)	3.11	(3.71)
Non Metal Mining	3.27	(3.86)	0.53	(1.49)
Mining Services	4.03	(4.77)	1.11	(2.54)
Food Products	5.75	(4.33)	2.49	(3.46)
Beverage and Tobacco	4.29	(4.55)	1.65	(2.82)
Manf Cotton Textiles	6.28	(4.27)	2.37	(3.95)
Manufacture of Wool, Silk Etc	5.80	(3.99)	2.30	(3.57)
Manufacture of Jute	7.91	(5.37)	3.96	(3.13)
Manufacture of Apparel	5.20	(3.82)	4.72	(4.48)
Manf Wood/Furniture	5.48	(4.01)	1.95	(3.72)
Manf of paper/publish	8.65	(3.49)	7.16	(3.77)
Manf of Leather	6.44	(4.38)	7.04	(5.79)
Manf of Chemicals	9.68	(3.46)	5.22	(5.28)
Rubber and Plastic	7.86	(3.77)	3.48	(3.79)
Manufacture Minerals	4.09	(4.98)	0.37	(1.24)
Manufacture Basic Metals	7.78	(4.04)	3.11	(4.01)
Manf of Metal products	7.15	(4.31)	2.34	(3.23)
Manufacture Machinery	9.38	(3.55)	2.70	(4.97)
Manf Other	7.67	(4.55)	2.76	(3.31)
All Blue Collar	7.73	(4.25)	2.93	(3.99)

Standard deviations in parentheses. Source: Human Development Survey, 2005. Table shows the average education level among males and female blue collared workers in manufacturing. I restrict the sample to the age 24 to 66 years. The values are weighted by sampling weights in order to be representative of the population.

Table 2.9: Change In Female Share In Number of Employees

Dependent Variable: Change in Log of Female to Total Ratio in Number of Employees				
	All (1)	Pvt (2)	Big (3)	Big & Pvt (4)
ΔOutput Tariff	-0.0213	-0.0613	0.133	0.111
	(0.0667)	(0.0713)	(0.113)	(0.0974)
ΔInput Tariff	-0.193	-0.0820	-0.156	0.0679
	(0.274)	(0.271)	(0.314)	(0.297)
Observations	4113	3429	1831	1289
R^2	0.041	0.051	0.054	0.053

Standard errors clustered at 3 digit industry level in parentheses. Dependent variable for is (log of ratio of female number to total number in 1998 - log of ratio of female number to total number in 1998)*100. Columns (1) represent all establishments in the panel. Columns (2) include establishments which have completely private ownership. Columns (3) include establishments that have $>$ 60000 man-days of operation and hence categorized as big establishments. Columns (4) include all establishments that are big as defined above and privately owned. Δ Output Tariff represents (output tariff in 1998 - output tariff in 1988). Δ Input Tariff represents (input tariff in 1998 - input tariff in 1988). WorkCap/Sales is the ratio of working capital to sales in 1989. FixedCap/Sales is the ratio of fixed capital to sales in 1989. All regressions include controls for imported inputs, age, 2 digit industry and states. The control for imported inputs is a dummy which takes the value 1 if the establishment imports. Age is a dummy which has a value 1 if the establishment is less than 15 years old and 0 otherwise. ***, **, * denote significance at 1%, 5%, 10% levels respectively.

Table 2.10: Total Male Employment Intensity and Output and Input Tariff

Dependent Variable: Change in Log of ratio of male man-day to numbers of male employees								
	All (1)	Pvt (2)	Big (3)	Big & Pvt (4)	All (5)	Pvt (6)	Big (7)	Big & Pvt (8)
ΔOutput Tariff	-0.0839*	-0.0993*	-0.0947**	-0.124**	-0.0746	-0.0847	-0.108***	-0.133***
	(0.0491)	(0.0563)	(0.0456)	(0.0558)	(0.0490)	(0.0551)	(0.0311)	(0.0379)
ΔInput Tariff					-0.0535	-0.0892	0.0687	0.0468
					(0.177)	(0.197)	(0.138)	(0.174)
WorkCap/Sales	-1.143	-0.873	-4.408***	-4.918***	-1.137	-0.867	-4.423***	-4.931***
	(1.010)	(0.949)	(0.661)	(0.310)	(1.004)	(0.941)	(0.663)	(0.291)
FixedCap/Sales	0.657	0.848	4.234***	4.698***	0.654	0.840	4.252***	4.713***
	(0.587)	(0.749)	(0.670)	(0.348)	(0.583)	(0.741)	(0.667)	(0.322)
Observations	4113	3429	1831	1289	4113	3429	1831	1289
R^2	0.065	0.064	0.043	0.051	0.065	0.064	0.043	0.051

Notes: Standard errors clustered at 3 digit industry level in parentheses. Dependent variable is (log of male intensity in 1998 - log of male intensity in 1989)*100. The LHS is multiplied by 100 due to convenience of presentation. Male intensity is measured as a ratio of male man-days by average number of male workers. Columns (1) & (5) represent all establishments in the panel. Columns (2) & (6) include establishments which have completely private ownership. Columns (3) & (7) include establishments that have $>$ 60000 man-days of operation and hence categorized as big establishments. Columns (4) & (8) include all establishments that are big as defined above and privately owned. Δ Output Tariff represents (output tariff in 1998 - output tariff in 1988). Δ Input Tariff represents (input tariff in 1998 - input tariff in 1988). WorkCap/Sales is the ratio of working capital to sales in 1989. FixedCap/Sales is the ratio of fixed capital to sales in 1989. All regressions include controls for imported inputs, age of the establishment, 2 digit industry and states. The control for imported inputs is a dummy which takes the value 1 if the establishment imports. Age is a dummy which has a value 1 if the establishment is less than 15 years old and 0 otherwise. ***, **, * denote significance at 1%, 5%, 10% levels respectively.

Table 2.11: Effect of Female Share on Output Tariff by Initial Male Intensity Distribution

Dependent Variable: Change in Log of Female to Total Ratio in Man-days		
	Above Median	Below Median
ΔOutput Tariff 98-89	1.187***	0.255
	(0.378)	(0.622)
Observations	654	635
R^2	0.093	0.101

Notes: Standard errors clustered at 3 digit industry level in parentheses. Dependent variable is the (log(female man-days in 1998/total man-days in 1998) - log(female man-days in 1989/total man-days in 1989)) *100. Columns (1) & (5) represent all establishments in the panel. Δ Output Tariff represents (output tariff in 1998 - output tariff in 1988). The median value of male intensity in 1989 is 310, 8- hour shifts per male worker. All regressions include controls for imported inputs, age, 2 digit industry and states. The control for imported inputs is a dummy which takes the value 1 if the establishment imports. Age is a dummy which has a value 1 if the establishment is less than 15 years old and 0 otherwise. ***, **, * denote significance at 1%, 5%, 10% levels respectively.

Table 2.12: Female Share and Tariff with the Female Share in 1989 at 3 digit NIC as a Control

Dependent Variable: Change in Log of Female to Total Ratio in Man-days								
	All (1)	Pvt (2)	Big (3)	Big & Pvt (4)	All (5)	Pvt (6)	Big (7)	Big & Pvt (8)
ΔOutput Tariff	0.326	0.296	0.420	0.697**	0.246	0.300	0.291	0.754***
	(0.389)	(0.325)	(0.578)	(0.348)	(0.303)	(0.228)	(0.698)	(0.273)
ΔInput Tariff					0.457	-0.0292	0.661	-0.306
					(1.184)	(1.095)	(1.891)	(1.043)
Observations	4114	3429	1832	1289	4114	3429	1832	1289
R^2	0.030	0.026	0.057	0.071	0.030	0.026	0.057	0.071

Notes: All regressions include controls of ratio of female to male man days worked in 1989 by 3 digit NIC. All other things are the same as columns (4) to (8) of Tables 2.3 and 2.4. ***, **, * denote significance at 1%, 5%, 10% levels respectively.

2.10 Appendix Tables to Chapter 2

Table 2.13: Summary Statistics: Variables Used in Regressions

	1989		1998		Change	
	All	Big& Pvt	All	Big& Pvt	Δ All	Δ Big & Pvt
Female Dummy	0.367	0.415	0.374	0.439	0.006	0.02
	(0.482)	(0.492)	(0.483)	(0.496)	(0.38)	(0.350)
$\text{Ln}\left(\frac{\text{Female Man-days}}{\text{Total Man-days}}\right)$	-2.93	-2.78	-2.601	-2.34	0.333	0.445
	(8.959)	(10.16)	(8.817)	(10.26)	(6.73)	(6.89)
$\text{Ln}\left(\frac{\text{Female Numbers}}{\text{Total Numbers}}\right)$	-4.27	-4.273	-4.27	-4.271	0.314	0.002
	(2.03)	(2.031)	(2.01)	(2.011)	(1.20)	(1.11)
$\text{Ln}\left(\frac{\text{Male Man-days}}{\text{Male Number}}\right)$	5.26	5.67	5.40	5.70	0.137	0.03
	(1.01)	(0.63)	(1.12)	(0.60)	(1.13)	(0.67)
$\text{Ln}\left(\frac{\text{Skill Man-days}}{\text{Unskill Man-days}}\right)$	-1.77	-1.58	-1.51	-1.48	0.267	0.005
	(1.70)	(1.26)	(1.75)	(1.23)	(1.86)	(0.82)
Output tariff	150.68	154.08	38.34	38.42	-112.25	-115.30
	(38.04)	(40.55)	(7.53)	(7.43)	(38.90)	(40.91)
Input tariff	147.06	148.81	38.40	38.88	-108.62	-109.88
	(14.56)	(14.89)	(6.30)	(6.14)	(13.89)	(14.64)
Observations	4114	1289	4114	1289	4114	1289

Notes: The table mean coefficients. Standard deviations are in parentheses. Female Dummy is 1 if a firm hires at least 1 female and 0 otherwise. These variables are used in the regressions.

Table 2.14: Change in Log Plant and Machinery/Man-days and Output and Input Tariff

Dependent Variable: Change in Log of Plant and Machinery to Sales								
	All (1)	Pvt (2)	Big (3)	Big & Pvt (4)	All (5)	Pvt (6)	Big (7)	Big & Pvt (8)
ΔOutput Tariff	0.00448	0.0741	-0.131	0.0339	-0.0467	0.0591	-0.101	0.165**
	(0.110)	(0.124)	(0.112)	(0.123)	(0.0936)	(0.110)	(0.0956)	(0.0800)
ΔInput Tariff					0.299	0.0940	-0.152	-0.703**
					(0.474)	(0.471)	(0.325)	(0.274)
Observations	3864	3190	1801	1265	3864	3190	1801	1265
R^2	0.063	0.081	0.112	0.099	0.063	0.081	0.112	0.101

Notes: Standard errors in parentheses clustered at 3 digit industry level. Dependent variable is the change in Δ log ratio of plant and machinery to total man-days (1998-1989). The LHS is multiplied by 100 due to convenience of presentation. The LHS variables are in nominal values. Columns (1) & (5) represent all establishments in the panel. Columns (2) & (6) include establishments which have completely private ownership. Columns (3) & (7) include establishments that have $>$ 60000 man-days of operation and hence categorized as big establishments. Columns (4) & (8) include all establishments that are big as defined above and privately owned. Δ Output Tariff represents (output tariff in 1998 - output tariff in 1988). Δ Input Tariff represents (input tariff in 1998 - input tariff in 1988). All regressions include controls for imported inputs, age, 2 digit industry, states, working capital/sales and fixed capital/sales. The control for imported inputs is a dummy which takes the value 1 if the establishment imports. Age is a dummy which has a value 1 if the establishment is less than 15 years old and 0 otherwise. ***, **, * denote significance at 1%, 5%, 10% levels respectively.

Table 2.15: Exogeneity of Tariff Change

Dependent Variable: Change in Output Tariff			
	(1)	(2)	(3)
$\text{Ln}\left(\frac{\text{Female Man-days89}}{\text{Total Man-days89}}\right)$	0.794		
	(2.413)		
$\text{Ln}\left(\frac{\text{Non-Production89}}{\text{Production 89}}\right)$		-5.453	
		(8.768)	
$\text{Ln}\left(\frac{\text{Male Man-days89}}{\text{Male Number89}}\right)$			0.996
			(14.15)
Observations	92	92	92
R^2	0.001	0.004	0.000

Notes: Standard errors in parentheses. Dependent variable is change in output tariff between 1998 and 1989. All variables are at 3-digit NIC. ***, **, * denote significance at 1%, 5%, 10% levels respectively.

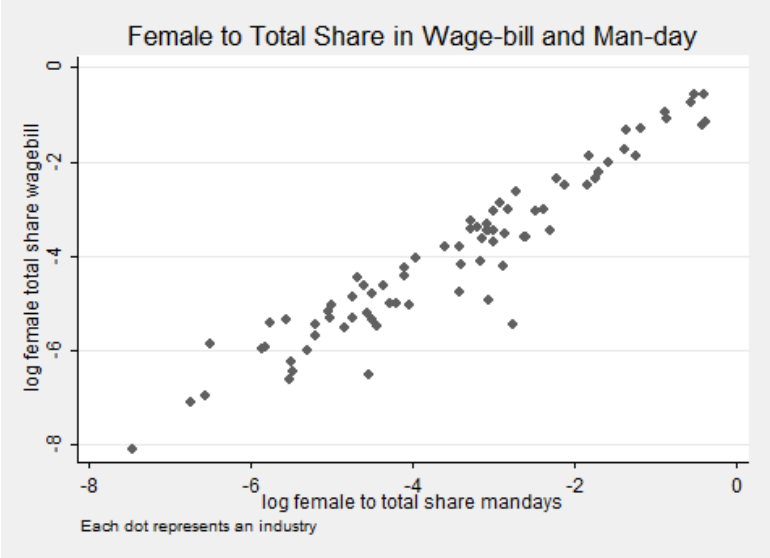

Figure 2.2: Relationship between Log Wage Bill Share and log Manday Share in 1998

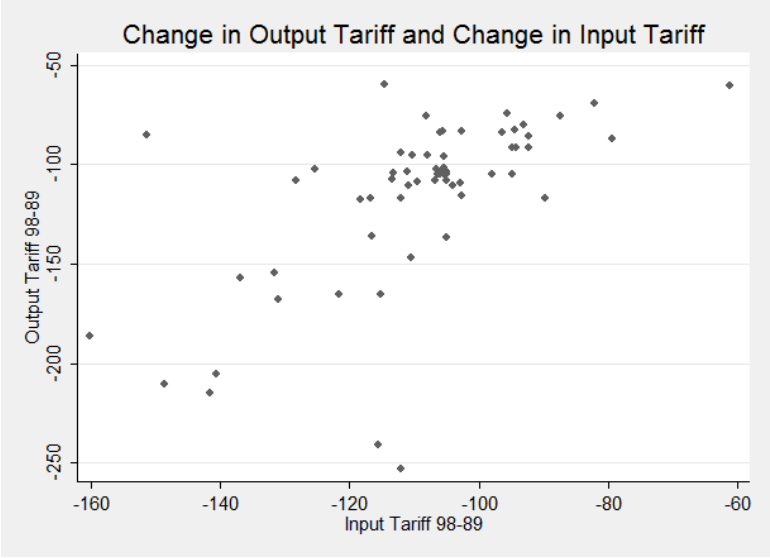

Figure 2.3: Relationship of output Tariff and Input Tariff Change

Table 2.16: Change in Log Fixed Capital/Sales and Output and Input Tariff

Dependent Variable: Change in log of Fixed Capital to Sales								
	All (1)	Pvt (2)	Big (3)	Big & Pvt (4)	All (5)	Pvt (6)	Big (7)	Big & Pvt (8)
ΔOutput Tariff 98-89	0.329**	0.331**	0.0597	0.00288	0.361**	0.368**	0.261	0.198
	(0.158)	(0.153)	(0.261)	(0.354)	(0.168)	(0.171)	(0.256)	(0.320)
ΔInput Tariff 98-89					-0.193	-0.230	-0.975	-0.933
					(0.596)	(0.650)	(1.039)	(1.271)
Observations	48884	46207	3911	3368	48884	46207	3911	3368
R^2	0.042	0.044	0.088	0.094	0.042	0.044	0.088	0.094

Notes: Standard errors in parentheses clustered at 3 digit industry level. Dependent variable is the change Δ log fixed capital by sales between 1989 and 1998. The LHS is multiplied by 100 due to convenience of presentation. The LHS variables are in nominal values. Columns (1) & (5) represent all establishments in the panel. Columns (2) & (6) include establishments which have completely private ownership. Columns (3) & (7) include establishments that have $>$ 60000 man-days of operation and hence categorized as big establishments. Columns (4) & (8) include all establishments that are big as defined above and privately owned. Δ Output Tariff represents (output tariff in 1998 - output tariff in 1988). Δ Input Tariff represents (input tariff in 1998 - input tariff in 1988). All regressions include controls for imported inputs, age, 2 digit industry, states, working capital/sales and fixed capital/sales. The control for imported inputs is a dummy which takes the value 1 if the establishment imports. Age is a dummy which has a value 1 if the establishment is less than 15 years old and 0 otherwise. ***, **, * denote significance at 1%, 5%, 10% levels respectively.

Table 2.17: Change In Log(Man-days)

Dependent Variable: Change in log of Man-days								
	All (1)	Pvt (2)	Big (3)	Big & Pvt (4)	All (5)	Pvt (6)	Big (7)	Big & Pvt (8)
ΔOutput Tariff	0.104**	0.128**	-0.0125	0.0245	0.0653	0.0830	0.00257	0.0354
	(0.0517)	(0.0537)	(0.0482)	(0.0412)	(0.0540)	(0.0531)	(0.0525)	(0.0480)
ΔInput Tariff					0.224	0.277*	-0.0768	-0.0581
					(0.158)	(0.149)	(0.179)	(0.153)
WorkCap/Sales	-1.556	-1.362	-5.379***	-5.517***	-1.580	-1.380	-5.363***	-5.501***
	(1.116)	(0.926)	(0.193)	(0.197)	(1.136)	(0.949)	(0.207)	(0.179)
FixedCap/Sales	0.883	0.921	4.989***	5.094***	0.898	0.948	4.969***	5.075***
	(0.648)	(0.831)	(0.174)	(0.203)	(0.660)	(0.844)	(0.188)	(0.177)
Observations	4114	3429	1832	1289	4114	3429	1832	1289
R^2	0.044	0.040	0.238	0.246	0.045	0.040	0.238	0.246

Notes: Standard errors clustered at 3 digit industry code in parentheses. The Dependent Variable is (log Man-days in 1998 - log Man-days in 1989)*100. Δ Output Tariff represents (output tariff in 1998 - output tariff in 1988). Δ Input Tariff represents (input tariff in 1998 - input tariff in 1988). All regressions include controls for imported inputs, age, 2 digit industry, states, working capital/sales and fixed capital/sales. The control for imported inputs is a dummy which takes the value 1 if the establishment imports. Age is a dummy which has a value 1 if the establishment is less than 15 years old and 0 otherwise. ***, **, * denote significance at 1%, 5%, 10% levels respectively.

Table 2.18: Female Share and Tariff with Initial Female Share and District as Control

Dependent Variable: Change in Log of Female to Total Ratio in Man-days								
	All (1)	Pvt (2)	Big (3)	Big & Pvt (4)	All (5)	Pvt (6)	Big (7)	Big & Pvt (8)
ΔOutput Tariff	0.134	0.289	-0.00343	0.302	0.196	0.417*	0.114	0.689*
	(0.351)	(0.327)	(0.626)	(0.521)	(0.270)	(0.226)	(0.688)	(0.377)
ΔInput Tariff					-0.365	-0.811	-0.609	-2.119
					(1.413)	(1.507)	(2.202)	(1.927)
Observations	4114	3429	1832	1289	4114	3429	1832	1289
R^2	0.152	0.155	0.250	0.262	0.152	0.155	0.250	0.263

*Notes:*All regressions include controls of ratio of female to male man days worked in 1989 by 3 digit NIC and controls for each district. All other things are same as columns (4) to (8) of tables 2.3 and 2.4. ***, **, * denote significance at 1%, 5%, 10% levels respectively.

Table 2.19: Change In Log (Sales)

Dependent Variable: Change in Log of Sales								
	All (1)	Pvt (2)	Big (3)	Big & Pvt (4)	All (5)	Pvt (6)	Big (7)	Big & Pvt (8)
ΔOutput Tariff	0.554**	0.678***	0.0912	0.230	0.529**	0.628**	0.108	0.294
	(0.253)	(0.241)	(0.206)	(0.190)	(0.239)	(0.244)	(0.206)	(0.217)
ΔInput Tariff					0.149	0.323	-0.0884	-0.350
					(0.681)	(0.609)	(0.559)	(0.557)
Observations	4114	3429	1832	1289	4114	3429	1832	1289
R^2	0.150	0.145	0.116	0.137	0.151	0.146	0.117	0.137

Notes: Standard errors clustered at 3 digit industry code in parentheses. The Dependent Variable is (log Sales in 1998 - log Sales in 1989)*100.Δ Output Tariff represents (output tariff in 1998 - output tariff in 1988). Δ Input Tariff represents (input tariff in 1998 - input tariff in 1988). All regressions include controls for imported inputs, age, 2 digit industry, states, working capital and fixed capital. The control for imported inputs is a dummy which takes the value 1 if the establishment imports. Age is a dummy which has a value 1 if the establishment is less than 15 years old and 0 otherwise. ***, **, * denote significance at 1%, 5%, 10% levels respectively.

Table 2.20: Change In Log(Total Sales/Man-days)

Dependent Variable: Change in Log of Total Sales to Man-days Ratio								
	All (1)	Pvt (2)	Big (3)	Big & Pvt (4)	All (5)	Pvt (6)	Big (7)	Big & Pvt (8)
ΔOutput Tariff	0.842**	1.017**	0.510	0.909*	0.541*	0.640**	0.292	0.626*
	(0.396)	(0.432)	(0.391)	(0.499)	(0.293)	(0.292)	(0.231)	(0.337)
ΔInput Tariff					1.726*	2.307**	1.126	1.514
					(0.892)	(1.006)	(1.200)	(1.614)
Observations	4114	3429	1832	1289	4114	3429	1832	1289
R^2	0.150	0.145	0.116	0.137	0.151	0.146	0.117	0.137

Notes: Standard errors clustered at 3 digit industry code in parentheses. The Dependent Variable is (log Sales/Man-days in 1998 - log Sales/Man-days in 1989)*100. Δ Output Tariff represents (output tariff in 1998 - output tariff in 1988). Δ Input Tariff represents (input tariff in 1998 - input tariff in 1988). All regressions include controls for imported inputs, age, 2 digit industry, states, working capital and fixed capital. The control for imported inputs is a dummy which takes the value 1 if the establishment imports. Age is a dummy which has a value 1 if the establishment is less than 15 years old and 0 otherwise. ***, **, * denote significance at 1%, 5%, 10% levels respectively.

Table 2.21: Share of Contrct to Total Workers in Mandays

Dependent Variable: Ratio of Contract to Total Workers in Man-days								
	All (1)	Pvt (2)	Big (3)	Big + Pvt (4)	All (5)	Pvt (6)	Big (7)	Big + Pvt (8)
Δ Output Tariff	-0.145	-0.116	-0.0164	0.0587	-0.235	-0.200	-0.123	0.00680
	(0.294)	(0.298)	(0.431)	(0.492)	(0.258)	(0.250)	(0.414)	(0.486)
Δ Input Tariff					0.519	0.517	0.543	0.278
					(1.046)	(1.227)	(1.308)	(1.837)
Observations	4255	3544	1862	1304	4255	3544	1862	1304
R^2	0.032	0.033	0.063	0.086	0.032	0.034	0.063	0.086

Notes: Same as Table 2.3. ***, **, * denote significance at 1%, 5%, 10% levels respectively.

Chapter 3

Trade and Education Attainment: Empirical Evidence from Indian Tariff Reforms

3.1 Introduction

This paper presents new insights into the linkages of trade and human capital development. It is widely believed that trade liberalization leads to an increase in economic growth. Hence, in the past few decades many developing countries in Asia, Africa and South America have been embracing trade liberalization with an expectation of achieving higher growth rates. At the same time, human capital is very important for development and more so for developing countries which are labor abundant. This is recognized by United Nations (U.N) which publishes Human Development Report with the objective of evaluating the rate of human capital formation in all nations. But the effect of trade liberalization on human capital is not fully understood. A body of empirical work has shown

that trade liberalization has been linked to higher economic growth on one hand but also increase in poverty and inequality on the other (see Goldberg and Pavcnik (2007) for a survey). Hence, one important question that needs to be examined is whether the dual goals of higher growth due to trade liberalization and development of human capital are at odds with each other.

In this paper I look at the effect of trade liberalization on education attainment. In the words of Amartya Sen "You need an educated, healthy workforce to sustain economic development." Thus understanding the effect of trade liberalization on education is not just for academic interest but is essential for the development of countries and human race at large. A number of papers have looked into the effect of trade liberalization on education in the context of developing countries. People have considered a number of outcomes to measure education. School attendance, education attainment, literacy rates are some of the examples. In this work my main focus is the effect of trade liberalization on female education attainment.

In the literature primarily three channels have been studied through which trade liberalization can affect education attainment. First is through changes in the standard of living of the people. For example, Topalova (2010) shows that trade liberalization in India has led to increase in poverty and Edmonds et al. (2010) argue that this has led to decline in school attendance and increase in child labor. The second channel, through which education can be affected, is due to an increase in returns to education. Cross country analysis has found evidence of trade liberalization leading to a change in production technology which consequently affects labor market outcomes. There have been evidences of increase in productivity which leads to increase in quality of products and skill of workers.

Skill biased technological change has been observed in a number of countries which leads to increase in skill premium.[1] In the Indian context Millett and Oster (2013) find that there is a massive increase in school enrollment due to the rising service sector. Kijima (2006) also finds evidence of increased returns to skills and Azam et al. (2013), Shastry (2012) show that there are increases in returns to English ability. The third channel could be through changes in opportunity costs of education. Atkin (2012) finds that the growth of export manufacturing jobs in Mexico affected the education distribution and led to higher number of school dropouts. These channels might work together or individually and affect education attainment. The effect could be positive or negative and could be different for different levels of education.

Recently there has been a number of studies that show trade liberalization can affect male and female differently. New evidences from Mexico show that trade affects women differently and in turn might have consequences for women empowerment and child health (Juhn et al. (2014)). In a parallel study, (Gupta (2015)) I find that trade liberalization adversely affects female blue collar workers in the Indian manufacturing sector. Edmonds et al. (2010) observes that trade liberalization in India affects male and female education differently. Again in the words of Amartya Sen "Empowering women is key to building a future we want." In this context, I expect each of these above channels to be different for males and females. I also expect that education attainment for males and females would be different as a result of trade liberalization. Hence, in this paper I specially focus on the effect of trade liberalization on female education in India. I look at education attainment

[1] Khandelwal and Topalova (2011), Goldberg et al. (2010b), Revenga (1997), Hanson and Harrison (1999), Feliciano (2001), Currie and Harrison (1997) show evidence of this from a wide range of countries such as India, Mexico, Morocco, Chile, Argentina and Columbia.

as well as the quality of education as outcome measures.

India is a developing country and is slowly emerging as a massive force in the world scenario. It also contains nearly 15% of the world population. This makes India a very important country to study. At the same time India is an interesting country to study as it has a lot of diversity along various dimensions such as geography, demography and industrial composition. As part of IMF conditions India implemented economy wide reforms in 1991 by drastic reductions in tariffs in all industries. The variation in industrial composition among districts led to the differential impact of tariff reduction among districts. Not only were there reductions in levels of tariff but also in the dispersion of tariff rates Topalova (2010). From the years 1991 to 1997 the tariff reforms were drastic and unanticipated (Topalova (2010); Edmonds et al. (2010)). This paper uses the identification strategy, first developed by Topalova (2005), which exploits the historical district level variation in industrial composition to generate an exogenous measure of trade liberalization.

In this paper I first look at the average years of education attainment. I look at 0 to 10 plus years of schooling, whcih is secondary school and above in India. I also take a closer look at education attainment of individuals separately at primary (0-5 years of schooling), middle (5-8 years of schooling), secondary (8-10 years of schooling), higher secondary (10-12 years of schooling) and college (12+ years of schooling) levels on condition that the individual has completed the previous level. I look at the outcomes separately for males and females. This enables me to check if the factors driving an individual to complete an additional year of schooling are different at different levels of education and for men and women.

I find that there is a decline in the average years of schooling which is mostly driven

by females. I find that the negative effect of liberalization on attainment are concentrated in the lower and higher end of the education distribution. Interestingly, I find that at the secondary level (8 to 10 years), there is an increase in attainment for males.

Hanushek (2012) emphasizes the importance of quality of education in developing skills of workers which in turn leads to higher growth and productivity. Hence, in this paper I look at various outcomes which help me to understand possible changes in the the quality of education due to trade liberalization. I look at the grades obtained at the secondary level, whether a person has ever repeated a class and English speaking ability as the outcome measures of quality. I also examine if there are any changes in the choice of subjects made at the secondary level. I separately look at each of these outcomes for males and for females.

I find that in India liberalization also affected quality of education. There is an improvement in the overall English ability of individuals. The improvement for females is large and significant. In terms of grades obtained at higher secondary level and in terms of repeating a grade, men perform significantly worse than before. These results could be due to more men finishing secondary school. I also find changes in the choice of subjects after the secondary level. Men choose more arts subjects than before and less commerce subjects. There are no significant changes in the choice of subjects for females.

I use Human Development Survey, which is an all India survey conducted in 2005. I define ”young” cohorts as those whose schooling or college decisions had been taken only after the reforms. The ”old” cohorts are defined as those who had finished schooling decisions much before the reforms and they serve as the ideal control group. I attempt to measure the level of exposure to the reforms by separating the treated group into those that

are fully exposed, little and very little exposed similar to Duflo (2001).

I carry out robustness checks by looking at groups of cohort that had no exposure to the reforms. I find that there was no effect on this group. Additionally, I run several specification checks using other reform controls which include industry licensing, foreign direct investment (FDI), banks per 1000, exports and number of primary schools per capita following Edmonds (2004). I find that my results are similar even after including these controls.

My results suggest that the Indian episode of trade liberalization led to a change in distribution of education attainment. More people seem to be dropping out of primary school and college. However, having finished primary and middle schools men are more likely to finish secondary school. The attainment rates for women are adverse at all levels. Since there is now growing evidence that empowering women promotes education, health and better outcomes for children Thomas (1990), Duflo (2003), Qian (2008),Duflo (2012) this may also have had long-term adverse impacts. One has to keep in mind, however, that my examination of trade's impact is restricted to a context narrower than what perhaps is ideal. My analysis is limited across cohorts in a single cross section. I ignore the impact of outsourcing and other footprints of globalization. These questions are left for future investigations.

The paper is organized as follows. Section 2 lays out the conceptual framework. Section 3 discusses the background of trade liberalization episode and related literature. Section 4 describes the data. Section 5 describes the empirical specifications. Section 6 reports the main results. Section 7 discusses the robustness of the main results. Finally, Section 8 presents the main conclusions of the study.

3.2 Conceptual Framework

An individual's decision to go to school would depend on various factors such as the household income, the cost of schooling and the returns to education. However, the way these factors influence an individual is different at different levels of education. Trade policy might influence some or all these factors and in turn the influence on individuals education decisions are different.

Trade reforms are expected to affect schooling decisions, such as attendance at different levels, English skills and subjects studied. Topalova (2010), shows that districts more exposed to reforms experienced lesser declines in poverty. Hence, kids in families which got poorer due to trade liberalization, might be forced to drop out of school. Edmonds et al. (2010) find that there is linkage between poverty and less school attendance in districts more exposed to reforms is driven by schooling costs.

However, kids in families who can still afford schooling, invest in skills that pay higher returns and have less opportunity costs. Hence, we would expect that the families would optimally invest in schooling decisions where overall the returns would be higher than the costs. Azam et al. (2013) show that there is an increase in returns to English ability. Hence, we expect changes in investment to English ability and choice of subjects in districts more exposed to reforms. We would also expect the outcomes to be different for males and females if the returns and costs for them are different.

3.3 Background

3.3.1 Indian Tariff Reforms

Since independence in 1947, India followed a policy of import substitution. As a result huge import tariffs were imposed on various industries. Apart from tariffs there were also other kinds of restrictions in the form of non-tariff barriers such as import quotas. Partial liberalization began in 1980, however in 1991 India ran into an acute balance of payment crisis for which it had to seek help from International Monetary Fund (IMF). [2]

As part of IMF conditions, India implemented economy wide reforms in 1991 by drastic reductions in tariffs in all industries. Not only were there reductions in levels of tariff but also in the dispersion of tariff ratesTopalova (2010). Average tariff declined from 83 percent in 1991 to 30 percent in 1997. Tariff reductions affected all broad sectors of the economy and were unanticipated as has been repeatedly shown by Topalova (2005), Topalova (2010) and several other scholars thereafter.[3]

In this paper, I make use of district level variation in exposure to the reforms, based on differences in pre-reform industrial composition, which was first used by Topalova (2010) and Edmonds et al. (2010).

[2]The crisis in turn was triggered due to various incidences such as rise in oil prices, Gulf War, fall in remittances, political uncertainty and assassination of Rajiv Gandhi which led to a fall in investor confidence.

[3] (Khandelwal and Topalova (2011); Hasan et al. (2007); Goldberg et al. (2009) (2007, 2008); Edmonds et al. (2010); Anukriti and Kumler (2013); Sharma (2012); Ahsan et al. (2012); Ahsan (2013); Ahsan and Mitra (2014)) .

3.3.2 Related Literature

As discussed in the conceptual framework above, investments in human capital depend on family income, returns to education and opportunity costs of education. Cross county evidence indicates that economic reforms alter all these above factors. Trade liberalization has led to an increase in income inequality Goldberg and Pavcnik (2007).

Topalova (2010) looks at rural districts in India and finds that the districts more exposed to the reforms experienced lesser decline in poverty and lower increase in consumption growth. Liberalization was more pronounced in least geographically mobile districts and affected people in the bottom of income distribution. Inflexible labor laws would also be a factor responsible for the increase in poverty. As a consequence Edmonds et al. (2010) show that the regions more exposed to trade experienced a smaller improvement in school enrollment and an increase in child labor.

There is an increase in skill premium noted by several academic studies. Kijima (2006) analyzes the increase in wage inequality in India. She finds that the wage inequality had been rising before 1991 and observes that there has been an increase in the returns to skills. The demand for skilled labor has increased due to the rise in skill biased technological change within industries. The paper predicts that the increase in skill premium is expected to stimulate human capital investments which might be biased towards the rich and educated.

Increase in skill premium is expected to lead to changes in returns to schooling. Millett and Oster (2013), show that introducing a new Information Technology Enabled Services center causes a 4 to 7 percent increase in the number of children enrolled in primary school

in India.

However, trade might also alter the opportunity costs of schooling and hence change the education attainment distribution as shown by Atkin (2012) for the case of Mexico. He finds that the growth of export manufacturing jobs during 1986-2000 affected the education distribution in Mexico. He shows that school dropouts increase with new export sector jobs. Also by 2000, the workers induced to new export sector jobs were earning less.

The trade liberalization in India affected men and women differently. In the industry the employment share of women in terms of total number of hours worked declined due to increase in the share of skilled workers and labors laws which particularly harmed women. Trade liberalization had other social consequences as shown by Anukriti and Kumler (2013) who indicate fertility increases in areas more exposed to tariff reforms. There are evidences on the impact on infant mortality and change in investment patterns in children according to gender and social status.

The changing economic conditions are at odds with existing social norms which further affects gender inequality. Munshi and Rosenzweig (2009) show that social insurance networks adversely impact lower caste males and has no impact on women.

Apart from the above mentioned social and economic factors, the ability to speak English is very important in the Indian context. Azam et al. (2013) find that knowledge of English enabled men to earn higher wages. The complementarity between English skills and education appears to have strengthened over time, only the more educated among young workers receive a premium for English-speaking ability, whereas older workers

across all education groups do.

Shastry (2012) finds that in districts where the relative costs of learning English was less benefited more from globalization. These districts witnessed a higher growth in information technology and school enrollment. Thus I look at the impact of liberalization on English ability, which is another extremely important indicator of human capital in Indian context.

3.4 Data

The human capital outcomes are from Indian Human Development Survey (IHDS), 2005. The entire dataset includes 41,554 households in 1503 villages and 971 urban neighborhoods across 215,754 individuals. The analysis in this paper is restricted to the cohorts described in Table.

This data is merged with the data available in Edmonds et al AEJ: Applied Economics (2010) by states and districts. They compile a reform intensity index [4], using using National Sample Survey (NSS) data. They primarily use rural samples in the forty-third (July 1987 to June 1988) and fifty fifth (July 1999 to June 2000) rounds.

Districts are matched across rounds so that the data assumes a geographic panel dimension. The IHDS and NSS use district definitions from different years. I formed consistent definitions of district using information in Kumar and Somanathan (2009) such that a individual in the IHDS may be matched to the appropriate policy treatment variable. [5]

[4] see Empirical Methodology

[5] The merged dataset includes 251 districts which are included in both datasets. Roughly 51 percent of the districts remained the same whereas 28 percent of the districts underwent a clean split. The remaining

An advantage of using the IHDS data over other sources of household data is that it has individual level information on education attainment of individuals. It has information on the number of years of school, the highest degree the individual has attained and English ability of individuals. It also has other valuable information which are indicators of quality of education such as the grades obtained at the secondary level and if the person has ever repeated a grade. It also has information on the choice of subjects at the secondary level which is also valuable for our analysis. These together with information on the number of years of schooling enables us to look at the quantity as well as quality of education.

3.5 Empirical Strategy

The central question of this paper is to analyze how trade liberalization affects educational attainment. I use difference in differences estimation technique. I use district level exogenous variation in exposure to reforms as the first difference. I have a single cross sectional data set, and hence compare young and old cohorts.

3.5.1 Regional Exposure to Tariff Reforms

I follow the strategy used by Edmonds et al. (2010), to measure the regional variation in tariff reforms. The regional variation in exposure to the reform comes from differences in pre-reform industrial composition. At the national level, I have measures of

21 percent had complicated boundary changes where a new district was carved out of several older districts. 66 percent of these complicated boundary changes were such that the new district was overlapping about 90 percent of the area of a particular old district. In that case the new district was assigned the nomenclature of the old district with witch it had more than 90 percent overlap. In the rest of the cases, the new district was given the nomenclature of the old district with which it had more than 60 percent overlap.

tariff changes by industry. Although this is a national policy, different districts will have different intensities of exposure to the reform based on their industrial composition. In particular, the way I measure the district exposure to tariff reform variable is the following:

For district d, industry i and time t,

$$\text{tariff}_{d,t} = \sum_i w_{i,d} \times \text{tariff}_{i,t} \tag{3.1}$$

where,

$$w_{i,d} = \text{Emp}_{i,d} / \sum_i \text{Emp}_{i,d} \tag{3.2}$$

is the industry level initial share of employment in a district and $\text{tariff}_{i,t}$ are national level tariffs in an Industry at time t. [6]

3.5.2 Definition of Cohorts

The data set that I use is a single cross section in the year 2005. The reforms started from 1991 but continued up to 1997, Topalova (2005). Hence in choosing the appropriate treatment and control groups I had to keep this 6 year period in mind. Thus, I chose 1995 as a reference year. This period is approximately 10 years before the IHDS survey was conducted. I look at the education levels of adults and compare "young" and "old"

[6] Following Edmonds et al (2010), I also use a measure of districts exposure to reforms based on traded tariffs. This measure is calculated along the same lines as the above except that the weights use only the employment in the traded sector in a district. This measure, of $TrTariff$ is not mechanically affected by the size of the non-traded sector in a district.

cohorts. ”Young” cohort is defined as the group of people whose education decisions were most likely to be affected by the reforms. They constitute the treatment group. The ”Old” cohort, on the other hand, are defined as the group of people whose education decisions were complete before the reforms in 1991 and they are the control group.

I define ”old” cohorts as individuals who were 25 to 30 years old in 1995 and would have made all education decisions by 1995. If the average age of starting a level of schooling in India is ”X”, I define individuals as ”young” if they were below ”X” years in 1995. However, while looking at the higher end of the education distribution, one needs to be careful not to include individuals who might be very young and have not yet finished school. Including these individuals would give a negative bias to the ”young” group. Also while looking at the lower grades if we include individuals who were much above the average age of completing that grade in the ”young” group, we could wrongly attribute it due to reforms.

So, I further separate the ”young” into groups of full, little and partially exposed based on average age of starting a particular grade similar to Duflo (2001). Here again, if the individual is below the average age, I define them to be fully exposed. If the individual is up to 2 to 3 years above the average age, I define them to be to be partially exposed. If the individual is above 3 to 4 years of average age I define them to be very little exposed. [7]

[7]The average age of starting primary(0-5) school is 5 years. I look at middle (5-8) with average starting age of 10 years, secondary (8-10) with average starting age of 12years, higher secondary (10-12) and college (12-15) with average starting age to be 14 and 16 years respectively.

3.5.3 Difference in Differences Estimation

I use difference in differences estimation in order to measure the the effect of tariff reforms on education outcomes of the individuals. My main specification is the following:

For an individual i, in district d and cohort c,

$$E_{i,d,c} = \beta_0 + \beta_1 \text{tariff}_{d,c} + \pi X_{i,d,c} + \delta D_d \times \tau_c + \tau_c + \mu_d + \varepsilon_{i,d,c} \tag{3.3}$$

$E_{i,d,c}$ represents education outcomes of interest. This is taken to be average years of attainment from 0-10 years. β_1, the coefficient on the tariff is the main coefficient of interest. $X_{i,d,c}$ is the vector of social and demographic controls that might be correlated with the district level measure of reform intensity. These include age fixed effects, gender and their interaction variables. The social variables include caste and religion of the individuals. The average changes in education attainment across "Young" and "Old" groups are controlled for using a "Young" group fixed effect τ_c. There might be various characteristics of the district that might be potentially correlated with tariffs such as endowments, accessibility, geography and educational facilities available. Hence, I include district fixed effects, μ_d.

The employment weights in the various industries are the ones before reforms. Thus the estimation strategy is trying to create a counterfactual situation on how education outcomes would have changed if the only parameter differing after liberalization were the tariff levels. The coefficient of tariff β_1 is identified under the assumption that unobserved district specific cohort level shocks that affect education outcomes are uncorrelated with

changes in district level tariffs over time. Only the changes in educational outcomes of cohorts that are correlated with the initial industrial composition and changes in tariffs could be a source of bias. However, the exogenous nature of the reforms assuages such fears as shown by a number of scholars.

Edmonds et al. (2010), fear that the initial district employment shares might follow differential time trends. In order to adress this problem, following them I include $D_d \times \tau_c$, which is the vector of pre reform district conditions interacted with post reform indicator. The pre reform district conditions include the share of workers employed in agriculture, mining, manufacturing, trade, transport and services. Other pre reform conditions include the share of district's population that is scheduled caste or scheduled tribe, the share of literate population in a district, and labor law indicators. [8] Standard errors are clustered at the district level in order to avoid any potential biases arising from serial correlation at the district level. I also weight the regressions by the sampling weights so that they are representative of the population.

As shown in the conceptual framework, reforms effect school attainment at different levels of education differently. In order to test this empirically, I estimate the following equation:

[8]Edmonds et al, 2010 argue that the share of non-traded sector might be correlated with initial education levels through income. Their main outcome of interest is school attendance among children and the main mechanism through which trade effects attendance is family income. Hence they use district level measure of trade exposure using employment weights in the traded sector. They estimate the reduced form of equation 3.3 by using traded tariffs in the RHS. They then instrument traded tariff for tariff and carry out estimating equation 3.3. I look at education completion at various levels and other quality of education outcomes. As discussed in the conceptual framework, the mechanisms through which trade liberalization effects education attainment are different at different levels of education. Hence, my preferred specification is given by equation3.3. I also carry out the estimations of the reduced form and 2SLS. The results are similar to my main specification and are presented in appendix tables.

For an individual i, in district d and cohort c,

$$L_{i,d,c} = \beta_0 + \beta_1 \text{tariff}_{d,c} + \pi X_{i,d,c} + \delta D_d \times \tau_c + \tau_c + \mu_d + \varepsilon_{i,d,c} \tag{3.4}$$

Here $L_{i,d,c}$ is the level of education completion on condition that the individual has completed the previous level. The various levels that I look at are primary (0-5 and above years), middle (5-8 and above years), secondary (8-10 and above years) higher secondary (10-12 and above) and college (12-15 and above). The RHS is the same equation 3.4.

I also analyze the change in quality of education by estimating the following equation: For an individual i, in district d and cohort c,

$$Q_{i,d,c} = \beta_0 + \beta_1 \text{tariff}_{d,c} + \pi X_{i,d,c} + \delta D_d \times \tau_c + \tau_c + \mu_d + \varepsilon_{i,d,c} \tag{3.5}$$

$Q_{i,d,c}$ is the quality of education. Making use of the rich data source, I identify several measures of quality of education. First, is a measure of English ability. This is a categorical variable which takes the value 1 if the individual has some knowledge of English and 0 otherwise. Second measure for quality is the individual's performance on the secondary school leaving certificate (SSLC) examination. [9] I also use a categorical variable which takes the value 1 if the individual has ever repeated a grade and zero otherwise, as an additional measure of quality of education.

[9] In India, students must pass a standardized exam developed by the board of education under whose jurisdiction their school falls in order to receive a SSLC. A SSLC makes one eligible for further schooling, and a better SSLC exam performance enables one to attend better schools. This exam is typically taken at the end of 10th grade, and the passing categories, from highest to lowest level of distinction, are Class I, II and III. (see Azam et al (2013)). I drop individuals who do not report their Class.

Apart from changes in the quality of education, I also look at the changes in the choice of subject at the secondary level. I define a categorical variable $\S_i$

where $i = Science, Arts, Commerce$, which takes the the value 1 if the individual chooses subject i at the secondary level and 0 otherwise. In order to understand the effect of trade on the choice of subject, I estimate equation 3.5 with $\S_i$ on the L.H.S.

In a parallel work, I find that tariff liberalization effects males and females differently in the manufacturing sector. I would like to see if there are gender differences in human capital investment. Hence I estimate equations 3.3, 3.4 and 3.5 separately for males and females.

3.6 Main Results

3.6.1 Effect of Tariff Reforms on Average years of Education Attainment

The results of estimation of equation 3.3 are presented in Table 3.1. In Panel A, I include all individuals who were fully exposed by the reforms. By that I mean that they began schooling only after the reforms. [10] Column (1) presents the results of estimation of equation 3.3 for all individuals. The positive value of the coefficient (say 3.357) would mean that there has been a reduction in the level of education. This is because, tariff levels decreased universally after reforms. I find that a "young" individuals in a district with an average tariff decline (0.06) experiences a decline of 0.2 years of schooling on

[10]The average age of starting school in India is 5 years and finishing school is 15 years. I take individuals who were between 7 to 9 years old in 1995 as fully exposed. I take individuals who were between 10 - 12 years as little exposed and individuals between 13- 25 years as very little exposed.

average. These results are significant at 1 % level of significance. In columns (2) and (3) I estimate equation 3.3 separately for males and females. I find that both males and females experience a decline in average years of schooling. However the decline for males is not significant at conventional levels. Overall results seem to be driven by decline of female average years of schooling. A young female in a district with average tariff decline experiences a 0.27 years of schooling.

In Panel B and Panel C, I look at individuals who were little exposed and those that were very little exposed by the tariff reforms. I define little exposed as those individuals who had already started school (e. g in primary school) when the reforms came by. I define very little exposed as those individuals who were at higher level of schooling (e. g in middle or secondary) but had not finished school. [11] Here again I find that there the average years of education have declined for all among partially and little exposed. However, I find that the magnitude of change is much higher for very little exposed than little exposed. Females experience a much bigger decline in very little exposed group. The decline in males for the little exposed group becomes significant.

This leads me to believe, that the effect of trade on education is different at different levels of education. [12]. I also find gender differences at different levels.

[11] See 3.6.1 for the details of age groups.

[12] See Conceptual Framework for more details

3.6.2 Effect of Tariff Reforms on Average years of Education Distribution

In this section I estimate equation 3.4. Table 3.2 looks at different levels of school education separately. The levels of education that I look at are primary, middle and secondary school. I find that there is a reduction in primary school completion for all. Similar patterns are seen in males and females for all levels of exposure. However, females have a more significant relationship than males.

I find that the sign of the coefficient reverses (turns negative) for males at the middle school level. This means that a reduction in tariffs led to an increase in attainment among treated cohorts in more exposed districts. However, it is not significant. The relationship remains positive for females.

Interestingly, I find that there is a significant increase among males in secondary school completion. A young male in a district exposed to average tariff liberalization experiences a 0.03 years increase in secondary school. However, for females I find that there is a decline for all levels of exposure. There is a significant decline for little exposure which could possibly reflect higher dropout rates among females at the secondary school level.

Table 3.3 gives the results of estimation of equation 3.4 for the college level. I do not find any significant effects for either males or females. However an interesting point to note is that the positive effects of tariff reduction for males at the secondary level goes away at higher levels.

3.6.3 Effect of Tariff Reforms on Quality of Education and Choice of Subjects

Table 3.4 gives the result of estimation of equation 3.5 for English ability of individuals. I find that there is an increase in English ability of individuals. A young individual in a district experiencing average exposure to tariff is 0.01 percentage points more likely to know English. Interestingly, the effect on females is much stronger than males. This is however, not surprising as we have seen an increase in dropout rates among females. So it might be the case that those who remain behind are higher ability females who have higher quality.

Table 3.5 shows that overall there has been a decline in grade obtained. The negative coefficient means that young individuals in districts more exposed to reforms are getting worse Class of grades. (Class I means the best possible grade and Class III mean the worst possible grade.) Here again mostly the results are driven by males. Table 3.6 shows that overall more people repeated a class. The results are mostly driven by males. This reflects similar patters to table 3.5. As I find in Table 3.2, that more men are finishing secondary school, I would think the worsening of performance is due to increase at the extensive margin.

In table 3.7, I look at the choice of subjects after the secondary level. I do not find any change in the choice of science subjects as a result of exposure to trade reforms. In panel B, I find that there is an increase in the choice of arts subjects which is mostly driven by males. In panel C, I find that there is a decline in choice of commence related subjects among males. Hence, on the whole trade liberalization seems to be altering the choice of

subjects taken up especially for males.

3.7 Robustness of the Main Results

3.7.1 Robustness Checks

The impact of reforms would be biased if the reform intensity index was correlated with district level omitted variables between the "Young" and "Old" cohorts. As a control experiment, equation 3.3 is estimated with taking cohorts aged 40-50 and 55-65. The idea behind taking these two cohorts is that their schooling decisions had been completed much before the reforms look place. Therefore the measured outcome variables should not be impacted at all by the reforms. This is presented in Table 3.8. I find that the coefficient is not significant. Hence, this assuages my fears of omitted variable bias and establishes the parallel trend assumption.

During 1991, several other reforms were implemented apart from the tariff reforms which occurred at the same time. Some of these include removal of licenses in various operations, reforms in the financial and banking sector, growth of exports and improvements in primary school access. The estimation is repeated using other reform controls which include industry licensing, foreign direct investment (FDI), banks per 1000, exports and number of primary schools per capita following Edmonds (2004). The controls are constructed taking the district employment weighted share of industries subject to industrial licensing, district employment weighted share of industries open to FDI and district employment weighted share of industry exports. The number of bank branches per 1000 individuals controls for the impact of bank reforms. The number of primary schools per

capita in a district controls for variation in school access.

Estimation is also done taking region levels controls in order to see if the results still hold at this level of aggregation. The rsutls remain broadly similar as shown in table 3.11 in the appendix.

3.8 Conclusion

Overall, I find an increase in education inequality which is driven by females. I find that there is greater dropout at the primary and college levels among young cohorts more exposed to reforms. However, at the secondary level education attainment increases for men. There is no consensus in the existing empirical literature on the effect of globalization on education. Edmonds et al. (2010) show that there has been an a negative impact of tariff reforms on school attendance and child labor. On the other hand Millett and Oster (2013) find that there are large increases in enrollment due to the IT sector. In this paper I attempt to show that the effects can be different for different levels of education and also depend on the gender of the individual.

I put forward a hypothesis in which I expect that the education attainment is a function of standard of living, cost of education and the returns to education. All these three factors might vary for different levels of education and gender.I do find that education attainment are different for different at levels. However, I am unable to test these channels explicitly due to data limitations.

Another interesting finding of this paper is that trade liberalization alters the quality of

education. To understand the quality of education I use the English ability, the score obtained in secondary school and whether an individual has ever repeated a grade as outcome measures. I find that there is an improvement in English ability of both males and females. One would expect this in the light of findings by Azam et al. (2013). However, in terms of scores obtained at the secondary level and repeating a grade, men seem to perform worse. This could however be due to more men, who would have otherwise dropped out, finishing secondary education.

I also find that liberalization also had an effect on the choice of subjects that men choose. Young men in districts more exposed to reforms are choosing more arts related subjects and less of commerce related subjects. There is no significant effect of the change is subjects chosen by female. I have not been able to understand the reason for this change completely and hence further investigation is warranted.

One of the big challenges in this paper was to disentangle the amount of exposure among individuals. The main reason is that the year of survey of IHDS was in 2005, which is less than 15 years from the reforms. On average an individual takes around 20 years to finish college. Hence in this data, it is hard to measure the effect of higher education on the treated group. Also one might expect a difference in long term versus short term effects of exposure to reforms on education. IHDS is expected to bring out a a second round of the survey shortly and hence I expect to address some of these concerns.

Table 3.1: Effect of Tariff Reforms on Average Years of Education (0-10)

	All (1)	Males (2)	Females (3)
		Panel A	
Full Exposure	3.357**	1.515	4.552***
	(1.628)	(1.829)	(1.609)
Observations	31767	16173	15544
R^2	0.268	0.224	0.369
		Panel B	
Little Exposure	4.476 ***	2.461*	5.652**
	(1.442)	(1.255)	(1.604)
Observations	32150	16004	16146
R^2	0.244	0.234	0.336
		Panel C	
Very Little Exposure	4.943 ***	2.124	6.677***
	(1.638)	(1.802)	(1.703)
Observations	30874	15509	15365
R^2	0.234	0.225	0.328

***, **, * denote significance at 1%, 5%, 10% levels respectively. Dependent variable is education 0-10 plus years. Young cohort includes individuals between 5-9 years in 1995 for full exposure. Young cohort includes individuals between 10-12 years in 1995 for little exposure. Young cohort includes individuals between 13-15 years in 1995 for very little exposure and the old cohort includes people between 25 to 30 years in 1995. Each cell indicates a separate regression. Columns (1) estimates equation 3.3 for all. Columns (2) estimates equation 3.3 for males. Columns (3) estimates equation 3.3 for females. The Standard errors are clustered at district level. All regressions include district fixed effects and age fixed effects. All regressions include controls for household characteristics caste and religion. All regressions include a control for young which is the treated group.
All regressions include initial district conditions that are interacted with young indicator. These include the percentage of workers in a district employed. agriculture, mining, manufacturing, trade, transport and services. the share of districts population of schedule caste and schedule tribe percentage of literate population and state labor laws. Standard errors in parentheses All regressions are clustered at the district level and weighted by sampling weights.

Table 3.2: Effect of Tariff Reforms on Education Distribution- School

	All (1)	Males (2)	Females (3)
	Primary school - 0-5 +		
Full Exposure	2.413***	1.186	3.076***
	(0.859)	(0.966)	(0.966)
Little Exposure	2.387***	0.990	3.401***
	(0.840)	(1.829)	(0.892)
Very Little Exposure	2.368**	1.414	2.907***
	(0.966)	(1.829)	(0.861)
	Middle School- 5-8 +		
Full Exposure	-0.095	-0.460	0.469
	(0.277)	(0.485)	(0.704)
Little Exposure	0.051	-0.117	0.494
	(0.238)	(0.422)	(0.485)
Very little Exposure	-0.103	-0.372	0.549
	(0.288)	(0.395)	(0.564)
	Secondary School- 8-10 +		
Full Exposure	-0.158	-0.473*	0.257
	(0.221)	(0.261)	(0.331)
Little Exposure	0.006	-0.468	0.611*
	(0.261)	(0.319)	(0.334)
Very Little Exposure	- 0.037	-0.312	0.402
	(0.242)	(0.280)	(0.318)

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard errors in parentheses These are the results of estimation of Equation:3.4 Young Cohort- Primary Level-Full(2-4), Little(5-7), Very Little(8-20) Young Cohort- Middle Level-Full Exposure(5-7), Little(8-10), Very Little(11-13) Young Cohort- Secondary Level-Full Exposure(7-9), Little(10-12), Very Little(23-25) and the old cohort includes people between 25 to 30 years in 1995. The specifications and controls are same as Table3.1

Table 3.3: Effect of Tariff Reforms on Education Distribution - College

	All (1)	Males (2)	Females (3)
	Junior College - 10-12 +		
Full Exposure	0.132	0.088	0.145
	(0.354)	(0.471)	(0.471)
Little Exposure	0.279	0.228	0.390
	(0.375)	(0.441)	(0.547)
Very Little Exposure	-0.180	-0.208	0.0246
	(0.357)	(0.357)	(0.577)
	College- 12-15+		
Full Exposure	0.410	0.166	0.956
	(0.576)	(0.714)	(1.071)
Little Exposure	1.330**	1.439**	1.342
	(0.623)	(0.711)	(1.029)
Very little Exposure	0.244	-0.406	1.987 ***
	(0.667)	(0.938)	(0.716)

***, **, * denote significance at 1%, 5%, 10% levels respectively. These are the results of estimation of Equation 3.4 Young Cohort- Junior College-Full(9-11), Little(12-14), Very Little(15-17) Young Cohort- Middle Level-Full Exposure(12-14), Little(15-17), Very Little(18-20) and the old cohort includes people between 25 to 30 years in 1995. The specifications and controls are same as Table3.1 Standard errors in parentheses

Table 3.4: Effect of Tariff Reforms on English Ability

	All (1)	Male (2)	Female (3)
Full Exposure	-0.189*	-0.107	-0.269**
	(0.114)	(0.119)	(0.131)
Observations	50679	25286	25393
R^2	0.452	0.450	0.463
Little Exposure	-0.0169	0.114	-0.142*
	(0.0730)	(0.0837)	(0.0792)
Observations	44726	22330	22396
R^2	0.466	0.467	0.460

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard errors in parentheses. Dependent variable is 1 if the individual knows english and 0 otherwise. This table presents results of estimating equation3.5.

Table 3.5: Effect of Tariff Reforms on Class Secondary Degree

	All (1)	Male (2)	Female (3)
Full Exposure	-1.331**	-1.598***	-1.019
	(0.529)	(0.475)	(0.674)
Observations	9562	5643	3919
R^2	0.207	0.236	0.231

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard errors in parentheses Dependent variable is class obtained at secondary level Class I is the best whereas Class III is the worst

Table 3.6: Effect of Tariff Reforms on Repeating a Class

	All (1)	Male (2)	Female (3)
Full Exposure	-0.357*	-0.318*	-0.308
	(0.192)	(0.179)	(0.316)
Observations	9181	5614	3567
R^2	0.127	0.159	0.151

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard errors in parentheses Dependent variable is a categorical variable which takes the value 1 if the person has ever repeated a grade and 0 otherwise.

Table 3.7: Effect of Tariff Reforms on the Choice of Post Secondary Subjects

	All (1)	Male (2)	Female (3)
	Panel A: Choice of Science Subjects		
Full Exposure	0.153	0.0582	0.314
	(0.213)	(0.230)	(0.499)
	Panel B: Choice of Arts Subjects		
Full Exposure	-0.691***	-0.724**	-0.625
	(0.216)	(0.356)	(0.571)
	Panel A: Choice of Commerce Subjects		
Full Exposure	0.588***	0.770***	0.234
	(0.170)	(0.272)	(0.195)
Observations	6011	3751	2260
R^2	0.129	0.161	0.238

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard errors in parentheses Dependent variable is a categorical variable which takes the value 1 if the person has chosen subject i and 0 otherwise (i =Science in Panel A, Arts in Panel B and Commerce in Panel C).

Table 3.8: Effect of Tariff Reforms on Education- No Exposure

	All (1)	Male (2)	Female (3)
	Panel A: 0-10 + years		
No Exposure	0.848	0.985	1.093
	(1.432)	(1.714)	(1.666)
	Panel B: 0-5 + years		
No Exposure	1.122	0.967	1.588
	(0.807)	(0.851)	(1.067)
	Panel C: 5-8 + years		
No Exposure	-0.956	-0.476	-2.051
	(0.624)	(0.667)	(1.248)
	Panel D: 8-10 + years		
No Exposure	-0.460	-0.538	0.063
	(0.585)	(0.600)	(0.828)
	Panel E: 10-12 + years		
No Exposure	-0.736	-0.880	-0.581
	(0.743)	(0.837)	(2.268)
	Panel F: 12-15+ years		
No Exposure	-0.771	-2.191	0.889
	(1.508)	(1.566)	(5.966)

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard errors in parentheses Dependent variable given in panels A,B,C,D,E and F. Young cohort includes individuals between 40-45 years in 1995 and the old cohort includes people between 46- 50 years in 1995. Each cell indicates a separate OLS regression. These are the results of estimation of Equation 3.3 The controls are same as Table3.1

3.9 Appendix Tables to Chapter 3

Table 3.9: Summary Statistics: Average Years of Education

	All (1)	Male (2)	Female (3)
	Panel A: 0-10 + years		
Young	4.38	5.60	3.17
	(4.21)	(4.12)	(3.94)
Old	6.80	7.35	6.22
	(3.71)	(3.36)	(3.97)
	Panel B: 0-5 + years		
Young	2.73	3.39	2.08
	(2.40)	(2.23)	(2.38)
Old	4.15	4.23	4.06
	(1.59)	(1.49)	(1.69)
	Panel C: 5-8 + years		
Young	7.23	7.43	7.14
	(1.01)	(1.05)	(1.20)
Old	7.42	7.44	7.39
	(1.02)	(0.99)	(1.04)
	Panel D: 8-10 + years		
Young	9.45	9.50	9.36
	(0.78)	(0.75)	(0.83)
Old	9.49	9.49	9.48
	(0.73)	(0.73)	(0.74)
	Panel E: 10-12 + years		
Young	11.14	11.20	11.01
	(0.96)	(0.95)	(0.97)
Old	11.31	11.32	11.31
	(0.89)	(0.88)	(0.90)
	Panel F: 12-15+ years		
Young	13.74	13.75	13.70
	(1.46)	(1.45)	(1.46)
Old	13.66	13.61	13.72
	(1.43)	(1.42)	(1.44)

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard deviations in parentheses

Table 3.10: Summary Statistics: Tariff

	Mean Before (1)	Mean After (2)
Tariff	0.09 0	0.029
	(0.076)	(0.023)
Traded Tariff	0.885	0.307
	(0.109)	(0.062)

Standard deviations in parentheses

Table 3.11: Effect of Tariff Reforms on 0-10 years with Region and other controls

	ALL		Males		Females	
	Region Cntl	Other Cntl	Region Cntl	Other Cntl	Region Cntl	Other Cntl
Tariff	0.644	1.991	-0.540	0.0945	1.430	3.599**
	(1.360)	(1.440)	(1.520)	(1.804)	(1.495)	(1.676)
Observations	31638	31638	16101	16101	15537	15537
R^2	0.246	0.268	0.215	0.244	0.340	0.370

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard errors in parentheses. Dependent variable is education 0-10 years. The specifications are 2SLS with IV. Column (1), (3) and (5) represents regressions with region controls. Columns (2), (4) and (6) includes other reform controls.

Table 3.12: Effect of Tariff Reforms on Primary School Education 0-5 years (Full Exposure)

	OLS	RF	2SLS
		Panel A: All	
Tariff	2.413***		5.931
	(0.859)		(3.595)
Traded Tariff		1.674**	
		(0.646)	
Observations	35242	35242	35242
R^2	0.253	0.253	0.250
		Panel B: Males	
Tariff	1.186		5.928
	(0.966)		(4.187)
Traded Tariff		1.594**	
		(0.741)	
Observations	18053	18053	18053
R^2	0.200	0.201	0.195
		Panel C: Females	
Tariff	3.076***		6.674*
	(0.943)		(3.789)
Traded Tariff		1.929***	
		(0.699)	
Observations	17189	17189	17189
R^2	0.371	0.370	0.368

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard errors in parentheses Dependent variable is education 0-5 years. Young cohort includes individuals between 12-14 years and the old cohort includes people between 35 to 40 years. Each cell indicates a separate regression. Columns (1)OLS regressions for all. Columns (2) gives the reduced form. Columns (3) the 2SLS regressions with traded tariff used as an IV for tariff. The Standard errors are clustered at district level. All regressions include district fixed effects and age fixed effects. All regressions include controls for household characteristics caste and religion. All regressions include a control for young which is the treated group. Demographic controls such as gender and interaction of age with gender are also included. All regressions include initial district conditions that are interacted with young indicator. These include the percentage of workers in a district employed. agriculture, mining, manufacturing, trade, transport and services. the share of districts population of schedule caste and schedule tribe percentage of literate population and state labor laws.

Table 3.13: Effect of Tariff Reforms on Primary School Education 0-5 years (Little Exposure)

	OLS	RF	2SLS
		Panel A: All	
Tariff	2.387***		4.788
	(0.840)		(3.098)
Traded Tariff		1.474**	
		(0.663)	
Observations	32586	32586	32586
R^2	0.239	0.239	0.238
		Panel B: Males	
Tariff	0.990		4.572
	(0.892)		(3.695)
Traded Tariff		1.282*	
		(0.735)	
Observations	16560	16560	16560
R^2	0.203	0.204	0.200
		Panel C: Females	
Tariff	3.401***		5.173*
	(0.976)		(3.006)
Traded Tariff		1.697**	
		(0.724)	
Observations	16026	16026	16026
R^2	0.343	0.342	0.342

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard errors in parentheses Dependent variable is education 0-5 years. Young cohort includes individuals between 15-17 years and the old cohort includes people between 35 to 40 years. Each cell indicates a separate regression. Columns (1)OLS regressions for all. Columns (2) gives the reduced form. Columns (3) the 2SLS regressions with traded tariff used as an IV for tariff. The Standard errors are clustered at district level. All regressions include district fixed effects and age fixed effects. All regressions include controls for household characteristics caste and religion. All regressions include a control for young which is the treated group. Demographic controls such as gender and interaction of age with gender are also included. All regressions include initial district conditions that are interacted with young indicator. These include the percentage of workers in a district employed. agriculture, mining, manufacturing, trade, transport and services. the share of districts population of schedule caste and schedule tribe percentage of literate population and state labor laws.

Table 3.14: Effect of Tariff Reforms on Primary School Education 0-5 years (Very Little Exposure)

	OLS	RF	2SLS
		Panel A: All	
Tariff	2.368**		4.472
	(0.966)		(3.275)
Traded Tariff		1.399**	
		(0.704)	
Observations	33384	33384	33384
R^2	0.215	0.215	0.213
		Panel B: Males	
Tariff	1.414		4.145
	(0.861)		(3.495)
Traded Tariff		1.232*	
		(0.729)	
Observations	16719	16719	16719
R^2	0.190	0.190	0.188
		Panel C: Females	
Tariff	2.907**		3.892
	(1.162)		(3.269)
Traded Tariff		1.284	
		(0.795)	
Observations	16665	16665	16665
R^2	0.305	0.304	0.304

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard errors in parentheses Dependent variable is education 0-5 years. Young cohort includes individuals between 18-20 years and the old cohort includes people between 35 to 40 years. Each cell indicates a separate regression. Columns (1)OLS regressions for all. Columns (2) gives the reduced form. Columns (3) the 2SLS regressions with traded tariff used as an IV for tariff. The Standard errors are clustered at district level. All regressions include district fixed effects and age fixed effects. All regressions include controls for household characteristics caste and religion. All regressions include a control for young which is the treated group. Demographic controls such as gender and interaction of age with gender are also included. All regressions include initial district conditions that are interacted with young indicator. These include the percentage of workers in a district employed. agriculture, mining, manufacturing, trade, transport and services. the share of districts population of schedule caste and schedule tribe percentage of literate population and state labor laws.

Table 3.15: Effect of Tariff Reforms on Middle School Education 5-8 years (Full Exposure)

	OLS	RF	2SLS
		Panel A: All	
Tariff	-0.0948		0.263
	(0.277)		(0.867)
Traded Tariff		0.255	
		(0.354)	
Observations	10280	10280	10280
R^2	0.095	0.096	0.093
		Panel B: Males	
Tariff	-0.460		-0.0512
	(0.485)		(1.100)
Traded Tariff		0.122	
		(0.489)	
Observations	6393	6393	6393
R^2	0.116	0.116	0.114
		Panel C: Females	
Tariff	0.469		0.810
	(0.704)		(1.411)
Traded Tariff		0.512	
		(0.632)	
Observations	3887	3887	3887
R^2	0.182	0.182	0.179

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard errors in parentheses Dependent variable is education 0-5 years. Young cohort includes individuals between 15-17 years and the old cohort includes people between 35 to 40 years. Each cell indicates a separate regression. Columns (1)OLS regressions for all. Columns (2) gives the reduced form. Columns (3) the 2SLS regressions with traded tariff used as an IV for tariff. The Standard errors are clustered at district level. All regressions include district fixed effects and age fixed effects. All regressions include controls for household characteristics caste and religion. All regressions include a control for young which is the treated group. Demographic controls such as gender and interaction of age with gender are also included. All regressions include initial district conditions that are interacted with young indicator. These include the percentage of workers in a district employed. agriculture, mining, manufacturing, trade, transport and services. the share of districts population of schedule caste and schedule tribe percentage of literate population and state labor laws.

Table 3.16: Effect of Tariff Reforms on Middle School Education 5-8 years (Little Exposure)

	OLS	RF	2SLS
		Panel A: All	
Tariff	0.0511		0.368
	(0.238)		(0.869)
Traded Tariff		0.175	
		(0.253)	
Observations	20635	20635	20635
R^2	0.100	0.100	0.100
		Panel B: Males	
Tariff	-0.117		0.620
	(0.422)		(1.300)
Traded Tariff		0.218	
		(0.356)	
Observations	11971	11971	11971
R^2	0.101	0.101	0.100
		Panel C: Females	
Tariff	0.494		-0.143
	(0.485)		(1.004)
Traded Tariff		0.0516	
		(0.308)	
Observations	8664	8664	8664
R^2	0.167	0.167	0.166

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard errors in parentheses Dependent variable is education 0-5 years. Young cohort includes individuals between 18-20 years and the old cohort includes people between 35 to 40 years. Each cell indicates a separate regression. Columns (1)OLS regressions for all. Columns (2) gives the reduced form. Columns (3) the 2SLS regressions with traded tariff used as an IV for tariff. The Standard errors are clustered at district level. All regressions include district fixed effects and age fixed effects. All regressions include controls for household characteristics caste and religion. All regressions include a control for young which is the treated group. Demographic controls such as gender and interaction of age with gender are also included. All regressions include initial district conditions that are interacted with young indicator. These include the percentage of workers in a district employed. agriculture, mining, manufacturing, trade, transport and services. the share of districts population of schedule caste and schedule tribe percentage of literate population and state labor laws.

Table 3.17: Effect of Tariff Reforms on Middle School Education 5-8 years (Very Little Exposure)

	OLS	RF	2SLS
		Panel A: All	
[1em] Tariff	-0.103		-0.740
	(0.288)		(0.873)
Traded Tariff		-0.146	
		(0.263)	
Observations	18013	18013	18013
R^2	0.093	0.093	0.091
		Panel B: Males	
Tariff	-0.372		-0.385
	(0.395)		(0.963)
Traded Tariff		-0.0597	
		(0.307)	
Observations	10576	10576	10576
R^2	0.101	0.101	0.100
		Panel C: Females	
Tariff	0.549		-0.047
	(0.564)		(1.177)
Traded Tariff		0.117	
		(0.371)	
Observations	7437	7437	7437
R^2	0.156	0.156	0.154

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard errors in parentheses Dependent variable is education 0-5 years. Young cohort includes individuals between 21-23 years and the old cohort includes people between 35 to 40 years. Each cell indicates a separate regression. Columns (1)OLS regressions for all. Columns (2) gives the reduced form. Columns (3) the 2SLS regressions with traded tariff used as an IV for tariff. The Standard errors are clustered at district level. All regressions include district fixed effects and age fixed effects. All regressions include controls for household characteristics caste and religion. All regressions include a control for young which is the treated group. Demographic controls such as gender and interaction of age with gender are also included. All regressions include initial district conditions that are interacted with young indicator. These include the percentage of workers in a district employed. agriculture, mining, manufacturing, trade, transport and services. the share of districts population of schedule caste and schedule tribe percentage of literate population and state labor laws.

Table 3.18: Effect of Tariff Reforms on Secondary School Education 8-10 years (Full Exposure)

	OLS	RF	2SLS
		Panel A: All	
Tariff	-0.158		0.183
	(0.221)		(0.749)
Traded Tariff		0.0417	
		(0.209)	
Observations	14794	14794	14794
R^2	0.102	0.102	0.101
		Panel B: Males	
Tariff	-0.473*		-0.327
	(0.261)		(0.973)
Traded Tariff		-0.117	
		(0.268)	
Observations	8953	8953	8953
R^2	0.129	0.128	0.128
		Panel C: Females	
Tariff	0.257		0.855
	(0.331)		(0.850)
Traded Tariff		0.308	
		(0.247)	
Observations	5841	5841	5841
R^2	0.144	0.144	0.142

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard errors in parentheses Dependent variable is education 0-5 years. Young cohort includes individuals between 17-19 years and the old cohort includes people between 35 to 40 years. Each cell indicates a separate regression. Columns (1)OLS regressions for all. Columns (2) gives the reduced form. Columns (3) the 2SLS regressions with traded tariff used as an IV for tariff. The Standard errors are clustered at district level. All regressions include district fixed effects and age fixed effects. All regressions include controls for household characteristics caste and religion. All regressions include a control for young which is the treated group. Demographic controls such as gender and interaction of age with gender are also included. All regressions include initial district conditions that are interacted with young indicator. These include the percentage of workers in a district employed. agriculture, mining, manufacturing, trade, transport and services. the share of districts population of schedule caste and schedule tribe percentage of literate population and state labor laws.

Table 3.19: Effect of Tariff Reforms on Secondary School Education 8-10 years (Little Exposure)

	OLS	RF	2SLS
		Panel A: All	
Tariff	0.00670		0.612
	(0.261)		(0.637)
Traded Tariff		0.163	
		(0.162)	
Observations	14421	14421	14421
R^2	0.097	0.097	0.096
		Panel B: Males	
Tariff	-0.468		0.208
	(0.319)		(0.926)
Traded Tariff		-0.0120	
		(0.242)	
Observations	8691	8691	8691
R^2	0.124	0.124	0.122
		Panel C: Females	
Tariff	0.611*		1.157
	(0.334)		(0.785)
Traded Tariff		0.429*	
		(0.231)	
Observations	5730	5730	5730
R^2	0.133	0.133	0.132

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard errors in parentheses Dependent variable is education 0-5 years. Young cohort includes individuals between 20-22 years and the old cohort includes people between 35 to 40 years. Each cell indicates a separate regression. Columns (1)OLS regressions for all. Columns (2) gives the reduced form. Columns (3) the 2SLS regressions with traded tariff used as an IV for tariff. The Standard errors are clustered at district level. All regressions include district fixed effects and age fixed effects. All regressions include controls for household characteristics caste and religion. All regressions include a control for young which is the treated group. Demographic controls such as gender and interaction of age with gender are also included. All regressions include initial district conditions that are interacted with young indicator. These include the percentage of workers in a district employed. agriculture, mining, manufacturing, trade, transport and services. the share of districts population of schedule caste and schedule tribe percentage of literate population and state labor laws.

Table 3.20: Effect of Tariff Reforms on Secondary School Education 8-10 years (Very Little Exposure)

	OLS	RF	2SLS
		Panel A: All	
Tariff	-0.0372		0.663
	(0.242)		(0.772)
Traded Tariff		0.205	
		(0.220)	
Observations	13350	13350	13350
R^2	0.084	0.084	0.083
		Panel B: Males	
Tariff	-0.312		0.216
	(0.280)		(1.000)
Traded Tariff		0.00558	
		(0.280)	
Observations	8260	8260	8260
R^2	0.106	0.106	0.105
		Panel C: Females	
Tariff	0.402		1.648
	(0.318)		(1.039)
Traded Tariff		0.658**	
		(0.303)	
Observations	5090	5090	5090
R^2	0.139	0.140	0.135

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard errors in parentheses Dependent variable is education 8-10 years. Young cohort includes individuals between 23-25 years and the old cohort includes people between 35 to 40 years. Each cell indicates a separate regression. Columns (1)OLS regressions for all. Columns (2) gives the reduced form. Columns (3) the 2SLS regressions with traded tariff used as an IV for tariff. The Standard errors are clustered at district level. All regressions include district fixed effects and age fixed effects. All regressions include controls for household characteristics caste and religion. All regressions include a control for young which is the treated group. Demographic controls such as gender and interaction of age with gender are also included. All regressions include initial district conditions that are interacted with young indicator. These include the percentage of workers in a district employed. agriculture, mining, manufacturing, trade, transport and services. the share of districts population of schedule caste and schedule tribe percentage of literate population and state labor laws.

Table 3.21: Effect of Tariff Reforms on Junior College Education 10-12 years (Full Exposure)

	OLS	RF	2SLS
	Panel A: All		
Tariff	0.132		1.300
	(0.354)		(1.093)
Traded Tariff		0.367	
		(0.326)	
Observations	9181	9181	9181
R^2	0.094	0.094	0.091
	Panel B: Males		
Tariff	0.0884		2.147
	(0.471)		(1.571)
Traded Tariff		0.511	
		(0.364)	
Observations	5614	5614	5614
R^2	0.125	0.126	0.119
	Panel C: Females		
Tariff	0.145		0.243
	(0.471)		(1.168)
Traded Tariff		0.176	
		(0.399)	
Observations	3567	3567	3567
R^2	0.160	0.160	0.155

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard errors in parentheses Dependent variable is education 10-12 years. Young cohort includes individuals between 19-21 years and the old cohort includes people between 35 to 40 years. Each cell indicates a separate regression. Columns (1)OLS regressions for all. Columns (2) gives the reduced form. Columns (3) the 2SLS regressions with traded tariff used as an IV for tariff. The Standard errors are clustered at district level. All regressions include district fixed effects and age fixed effects. All regressions include controls for household characteristics caste and religion. All regressions include a control for young which is the treated group. Demographic controls such as gender and interaction of age with gender are also included. All regressions include initial district conditions that are interacted with young indicator. These include the percentage of workers in a district employed. agriculture, mining, manufacturing, trade, transport and services. the share of districts population of schedule caste and schedule tribe percentage of literate population and state labor laws.

Table 3.22: Effect of Tariff Reforms on Junior College Education 10-12 years (Little Exposure)

	OLS	RF	2SLS
		Panel A: All	
Tariff	0.297		2.115*
	(0.375)		(1.102)
Traded Tariff		0.709***	
		(0.271)	
Observations	8985	8985	8985
R^2	0.097	0.098	0.092
		Panel B: Males	
Tariff	0.228		2.384
	(0.441)		(1.731)
Traded Tariff		0.682**	
		(0.337)	
Observations	5544	5544	5544
R^2	0.119	0.120	0.113
		Panel C: Females	
Tariff	0.390		1.850
	(0.549)		(1.264)
Traded Tariff		0.800*	
		(0.474)	
Observations	3441	3441	3441
R^2	0.165	0.166	0.160

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard errors in parentheses Dependent variable is education 10-12 years. Young cohort includes individuals between 22-24 years and the old cohort includes people between 35 to 40 years. Each cell indicates a separate regression. Columns (1)OLS regressions for all. Columns (2) gives the reduced form. Columns (3) the 2SLS regressions with traded tariff used as an IV for tariff. The Standard errors are clustered at district level. All regressions include district fixed effects and age fixed effects. All regressions include controls for household characteristics caste and religion. All regressions include a control for young which is the treated group. Demographic controls such as gender and interaction of age with gender are also included. All regressions include initial district conditions that are interacted with young indicator. These include the percentage of workers in a district employed. agriculture, mining, manufacturing, trade, transport and services. the share of districts population of schedule caste and schedule tribe percentage of literate population and state labor laws.

Table 3.23: Effect of Tariff Reforms on Junior College Education 10-12 years (Very Little Exposure)

	OLS	RF	2SLS
		Panel A: All	
Tariff	-0.180		0.825
	(0.360)		(1.005)
Traded Tariff		0.232	
		(0.324)	
Observations	8300	8300	8300
R^2	0.098	0.098	0.096
		Panel B: Males	
Tariff	-0.208		1.315
	(0.357)		(1.749)
Traded Tariff		0.270	
		(0.444)	
Observations	5311	5311	5311
R^2	0.136	0.136	0.133
		Panel C: Females	
Tariff	0.0246		0.265
	(0.577)		(1.111)
Traded Tariff		0.192	
		(0.465)	
Observations	2989	2989	2989
R^2	0.165	0.165	0.162

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard errors in parentheses Dependent variable is education 10-12 years. Young cohort includes individuals between 25-27 years and the old cohort includes people between 35 to 40 years. Each cell indicates a separate regression. Columns (1)OLS regressions for all. Columns (2) gives the reduced form. Columns (3) the 2SLS regressions with traded tariff used as an IV for tariff. The Standard errors are clustered at district level. All regressions include district fixed effects and age fixed effects. All regressions include controls for household characteristics caste and religion. All regressions include a control for young which is the treated group. Demographic controls such as gender and interaction of age with gender are also included. All regressions include initial district conditions that are interacted with young indicator. These include the percentage of workers in a district employed. agriculture, mining, manufacturing, trade, transport and services. the share of districts population of schedule caste and schedule tribe percentage of literate population and state labor laws.

Table 3.24: Effect of Tariff Reforms on College Education 12-15 years (Full Exposure)

	OLS	RF	2SLS
		Panel A: All	
Tariff	0.410		1.680
	(0.576)		(1.947)
Traded Tariff		0.432	
		(0.523)	
Observations	5317	5317	5317
R^2	0.120	0.120	0.118
		Panel B: Males	
Tariff	0.166		0.955
	(0.714)		(2.628)
Traded Tariff		0.220	
		(0.623)	
Observations	3335	3335	3335
R^2	0.155	0.155	0.154
		Panel C: Females	
Tariff	0.965		4.031
	(1.071)		(2.624)
Traded Tariff		1.437	
		(1.188)	
Observations	1982	1982	1982
R^2	0.205	0.206	0.198

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard errors in parentheses Dependent variable is education 12-15 years. Young cohort includes individuals between 22-24 years and the old cohort includes people between 35 to 40 years. Each cell indicates a separate regression. Columns (1)OLS regressions for all. Columns (2) gives the reduced form. Columns (3) the 2SLS regressions with traded tariff used as an IV for tariff. The Standard errors are clustered at district level. All regressions include district fixed effects and age fixed effects. All regressions include controls for household characteristics caste and religion. All regressions include a control for young which is the treated group. Demographic controls such as gender and interaction of age with gender are also included. All regressions include initial district conditions that are interacted with young indicator. These include the percentage of workers in a district employed. agriculture, mining, manufacturing, trade, transport and services. the share of districts population of schedule caste and schedule tribe percentage of literate population and state labor laws.

Table 3.25: Effect of Tariff Reforms on College Education 12-15 years (Little Exposure)

	OLS	RF	2SLS
		Panel A: All	
Tariff	1.330**		1.796
	(0.623)		(1.352)
Traded Tariff		0.638	
		(0.447)	
Observations	4766	4766	4766
R^2	0.107	0.107	0.106
		Panel B: Males	
Tariff	1.439**		1.119
	(0.711)		(1.702)
Traded Tariff		0.293	
		(0.465)	
Observations	3155	3155	3155
R^2	0.135	0.135	0.134
		Panel C: Females	
Tariff	1.342		2.624
	(1.029)		(2.892)
Traded Tariff		1.505	
		(1.227)	
Observations	1611	1611	1611
R^2	0.210	0.210	0.197

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard errors in parentheses Dependent variable is education 12-15 years. Young cohort includes individuals between 25-27 years and the old cohort includes people between 35 to 40 years. Each cell indicates a separate regression. Columns (1)OLS regressions for all. Columns (2) gives the reduced form. Columns (3) the 2SLS regressions with traded tariff used as an IV for tariff. The Standard errors are clustered at district level. All regressions include district fixed effects and age fixed effects. All regressions include controls for household characteristics caste and religion. All regressions include a control for young which is the treated group. Demographic controls such as gender and interaction of age with gender are also included. All regressions include initial district conditions that are interacted with young indicator. These include the percentage of workers in a district employed. agriculture, mining, manufacturing, trade, transport and services. the share of districts population of schedule caste and schedule tribe percentage of literate population and state labor laws.

Table 3.26: Effect of Tariff Reforms on College Education 12-15 years (Very Little Exposure)

	OLS	RF	2SLS
		Panel A: All	
Tariff	0.244		1.697
	(0.667)		(1.835)
Traded Tariff		0.466	
		(0.451)	
Observations	4745	4745	4745
R^2	0.132	0.132	0.129
		Panel B: Males	
Tariff	-0.406		0.473
	(0.938)		(2.351)
Traded Tariff		0.249	
		(0.494)	
Observations	3207	3207	3207
R^2	0.165	0.165	0.163
		Panel C: Females	
Tariff	1.987***		4.730*
	(0.716)		(2.441)
Traded Tariff		1.398	
		(1.110)	
Observations	1538	1538	1538
R^2	0.240	0.239	0.231

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard errors in parentheses Dependent variable is education 12-15 years. Young cohort includes individuals between 25-27 years and the old cohort includes people between 35 to 40 years. Each cell indicates a separate regression. Columns (1)OLS regressions for all. Columns (2) gives the reduced form. Columns (3) the 2SLS regressions with traded tariff used as an IV for tariff. The Standard errors are clustered at district level. All regressions include district fixed effects and age fixed effects. All regressions include controls for household characteristics caste and religion. All regressions include a control for young which is the treated group. Demographic controls such as gender and interaction of age with gender are also included. All regressions include initial district conditions that are interacted with young indicator. These include the percentage of workers in a district employed. agriculture, mining, manufacturing, trade, transport and services. the share of districts population of schedule caste and schedule tribe percentage of literate population and state labor laws.

Table 3.27: Effect of Tariff Reforms on 0-10 years (Full Exposure)

	OLS	RF	2SLS
		Panel A: All	
Tariff	3.357**		8.098
	(1.628)		(6.693)
Traded Tariff		2.584*	
		(1.433)	
Observations	31767	31767	31767
R^2	0.268	0.268	0.266
		Panel B: Males	
Tariff	1.515		8.017
	(1.829)		(7.993)
Traded Tariff		2.418	
		(1.656)	
Observations	16173	16173	16173
R^2	0.244	0.245	0.241
		Panel C: Females	
t Tariff	4.552***		7.441
	(1.609)		(6.005)
Traded Tariff		2.493*	
		(1.419)	
Observations	15594	15594	15594
R^2	0.369	0.368	0.367

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard errors in parentheses Dependent variable is education 0-10 years. Young cohort includes individuals between 17- 19 years and the old cohort includes people between 35 to 40 years. Each cell indicates a separate regression. Columns (1)OLS regressions for all. Columns (2) gives the reduced form. Columns (3) the 2SLS regressions with traded tariff used as an IV for tariff. The Standard errors are clustered at district level. All regressions include district fixed effects and age fixed effects. All regressions include controls for household characteristics caste and religion. All regressions include a control for young which is the treated group. Demographic controls such as gender and interaction of age with gender are also included. All regressions include initial district conditions that are interacted with young indicator. These include the percentage of workers in a district employed. agriculture, mining, manufacturing, trade, transport and services. the share of districts population of schedule caste and schedule tribe percentage of literate population and state labor laws.

Table 3.28: Effect of Tariff Reforms on 0-10 years (Little Exposure)

	OLS	RF	2SLS
		Panel A: All	
Tariff	4.476***		6.992
	(1.442)		(4.990)
Traded Tariff		2.283*	
		(1.187)	
Observations	32150	32150	32150
R^2	0.244	0.243	0.243
		Panel B: Males	
Tariff	2.461*		9.021
	(1.355)		(6.890)
Traded Tariff		2.679**	
		(1.349)	
Observations	16004	16004	16004
R^2	0.234	0.234	0.231
		Panel C: Females	
Tariff	5.652***		4.865
	(1.604)		(5.052)
Traded Tariff		1.769	
		(1.478)	
Observations	16146	16146	16146
R^2	0.336	0.334	0.335

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard errors in parentheses Dependent variable is education 0-10 years. Young cohort includes individuals between 20-22 years and the old cohort includes people between 35 to 40 years. Each cell indicates a separate regression. Columns (1)OLS regressions for all. Columns (2) gives the reduced form. Columns (3) the 2SLS regressions with traded tariff used as an IV for tariff. The Standard errors are clustered at district level. All regressions include district fixed effects and age fixed effects. All regressions include controls for household characteristics caste and religion. All regressions include a control for young which is the treated group. Demographic controls such as gender and interaction of age with gender are also included. All regressions include initial district conditions that are interacted with young indicator. These include the percentage of workers in a district employed. agriculture, mining, manufacturing, trade, transport and services. the share of districts population of schedule caste and schedule tribe percentage of literate population and state labor laws.

Table 3.29: Effect of Tariff Reforms on 0-10 years (Very Little Exposure)

	OLS	RF	2SLS
		Panel A: All	
Tariff	4.943***		6.969
	(1.638)		(5.089)
Traded Tariff		2.301*	
		(1.279)	
Observations	30874	30874	30874
R^2	0.234	0.233	0.233
		Panel B: Males	
t Tariff	2.124		5.070
	(1.802)		(5.618)
Traded Tariff		1.717	
		(1.484)	
Observations	15509	15509	15509
R^2	0.225	0.225	0.224
		Panel C: Females	
Tariff	6.677***		10.76*
	(1.703)		(6.045)
Traded Tariff		3.429**	
		(1.324)	
Observations	15365	15365	15365
R^2	0.328	0.327	0.326

***, **, * denote significance at 1%, 5%, 10% levels respectively. Standard errors in parentheses Dependent variable is education 0-10 years. Young cohort includes individuals between 23-25 years and the old cohort includes people between 35 to 40 years. Each cell indicates a separate regression. Columns (1)OLS regressions for all. Columns (2) gives the reduced form. Columns (3) the 2SLS regressions with traded tariff used as an IV for tariff. The Standard errors are clustered at district level. All regressions include district fixed effects and age fixed effects. All regressions include controls for household characteristics caste and religion. All regressions include a control for young which is the treated group. Demographic controls such as gender and interaction of age with gender are also included. All regressions include initial district conditions that are interacted with young indicator. These include the percentage of workers in a district employed agriculture, mining, manufacturing, trade, transport and services. the share of districts population of schedule caste and schedule tribe percentage of literate population and state labor laws.

Chapter 4

Conclusion

The larger question addressed in this dissertation is how trade liberalization policies in India impacted gender inequality in the labor market and education attainment. I find that trade liberalization in India led to an increase in gender inequality in the labor market and education attainment. My analysis suggests that women did not benefit from trade liberalization policies and in fact these policies may have increased, rather than decreased, gender inequality. This is broadly consistent with the conclusions of Topalova (2010) and Edmonds et al. (2010) who find that regions with exposure to trade liberalization policies had relatively slower reductions in poverty and child labor in India. My results, however, are counter to some recent papers which examine the impact of trade liberalization on gender inequality in Mexico, Columbia and United States.

However, my analysis is narrower than what would have been ideal. While studying the effects on labor market I only look at production workers in the formal manufacturing sector. It would be ideal to be able to examine the impact on both production and non-production workers. Unfortunately, the establishment data gives the breakdown of

female and male employment only for production workers. Thus, my study is confined to examining how tariff reductions impacted the female share of employment among production workers. Using the Survey of Unorganized Manufacturing (SUM), I would like to extend my analysis to the informal sector, which consists of a substantial proportion of manufacturing and see if the changes in gender composition in the informal sector are similar to those in the formal sector. Also I find that trade liberalization leads to less job opportunities for women and that the hours constraints are an important factor. By looking the employment opportunities in different sectors and by considering the differences in implementation of the labor laws in different states I hope to get a better understanding of the underlying channels.

As has been emphasized multiple time in the course of this thesis the trade liberalization policy in India came as an external shock. The system naturally would take time to adjust itself to this change. Thus one can expect that the outcomes observed in the short run to be different from the long run. However the long term effects are empirically harder to estimate as it is harder to establish exogeneity. At the same time one might have to wait longer to get the relevant set of data. For example, the second round of IHDS survey is expected to be out shortly and this would enable one to study the long term effects on education.

Labor market opportunities and education attainment are inter- related. Hence, this might lead to a vicious circle. These could have further negative long term impacts through effects on health, education and other outcomes for children. Thus, the negative effect of trade liberalization could be much deeper and widespread than what appears at first glance. In my analysis I do find evidence that women might be losing out in the labor marking due

to skill upgrading of workers. At the same time I find that investment for girls education is less in regions more exposed to reforms. A natural question to ask is whether the two effects are related, that is, if returns and costs of education changed due to the trade reforms for men and women differently. A thorough empirical study on this is warranted. We also know that regions more exposed to trade liberalization had slower reductions in poverty. Hence, I would like to examine if regions specializing in female intensive sectors were particularly vulnerable to increases in poverty.

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