THE IMPACT OF TRADE LIBERALIZATION
ON
GENDER AND CASTE GROUPS IN INDIA

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Abstract: Based on Becker's model of taste-based employer discrimination, it is expected that as an economy becomes more competitive, employer discrimination should decline. The 1991 Indian trade reforms increased competition by lowering protection in certain manufacturing industries. Firms who could indulge a taste for discrimination when trade protection allowed supernormal profits may not be able to continue to do so as competition eliminated such profits. Using individual-level data and tariff data from pre- and post-reform periods, the paper finds that wage differences reduced for female workers relative to male workers in the more open manufacturing sector industries but there is no significant effect on the wage differential between low and high caste workers.

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1   Introduction

Wage inequalities among race, gender and social groups have been extensively studied in both developed and developing countries. The explanations provided for such wage differences are several, including the human capital theory, compensating differentials, search models, and discrimination. Human capital is the embodiment of productivity in people and the human capital theory predicts that earnings are higher for those with higher education and experience. Females and lower castes in India have lower levels of education and experience than males and higher castes. This difference in human capital can be one explanation of wage gaps between gender and caste groups. However, studies [Sambamoorthi, 1984; Banerjee and Knight, 1985] have found the existence of wage and job discrimination against female workers and low caste workers in India using decomposition analyses developed by Blinder [1973] and Oaxaca [1973]. Even after controlling for all observable factors such as education, age, experience, marital status, occupation and industry in earnings regressions developed by the human capital theory, wage differentials between workers may not be fully explained. The segment of the wage gap that is not explained by observable differences in worker characteristics is typically attributed to discrimination in the Blinder-Oaxaca decomposition technique.

Discrimination models include neoclassical models like Becker's [1970] model of taste based discrimination and statistical discrimination models proposed by Phelps [1972] and Arrow [1973]. Taste-based discrimination models assume that some agents dislike working with certain others and therefore are willing to pay a premium to avoid interacting with disliked factors. For example, employers who dislike certain workers are willing to lose profits and not employ such workers, or employ them only at a lower wage than other workers. The statistical discrimination model assumes that information about individuals is inadequate and therefore employers may use group characteristics to infer information about individuals to choose between workers from different groups. This need not be driven by any personal biases of the employer.

This paper contributes to the empirical literature on testing the neo-classical theory of discrimination by extending the analysis to an economy with a well-known social hierarchy. Becker's model predicts that as the economy becomes more competitive employer discrimination should decline, since the rents that are implicitly used to 'pay' for the discriminatory behavior are reduced. In the long run, with free entry and zero profits, the existence of potential non-discriminating firms implies that discrimination should not be sustainable in equilibrium. If some of the labor market discrimination in India is in fact taste-based employer discrimination, then we should see lesser discrimination as competition increases. Higher caste employers may dislike hiring lower caste workers, and male employers may dislike hiring female employees to conform to social norms.[1] It is

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[1] In India, traditional Hindu society divided people into social classes based on the caste system. A person's caste identifies his social and economic status. Traditionally lower castes were restricted to menial jobs and their presence was considered to defile a higher caste person. While the caste system was abolished after independence, it continues to play a role in modern Indian society. Women on the other hand have traditionally been restricted to remaining outside the labor market. It

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therefore plausible that there is taste-based employer discrimination in the Indian labor market. The key to testing Becker's theory is to find instances of increases in competition in the Indian economy. Trade reforms of 1991 provide such an instance of an exogenous increase in competition. The underlying premise of this analysis is that trade reforms increase domestic competition and therefore create pressures on all employers to set wages competitively and to employ factors of production efficiently.

Trade reforms were undertaken in India in the face of a foreign exchange crisis. But the reforms faced opposition from several fronts primarily driven by the fear that opening the economy would worsen inequality. Given the debate on advantages and drawbacks of the reforms, it is also an important policy exercise to examine the impact of the reforms on wages. Studies have examined the effect of trade reforms in India on wage inequality between skilled and unskilled workers [Banga, 2005]; poverty [Topalova, 2005]; and industry wage premiums [Kumar and Mishra, 2006]. Existing studies however provide mixed evidence of the effect of trade reforms. Assuming that one of the reasons for wage gaps between groups is the existence of taste-based discrimination by employers, the increased competition brought by the reforms should reduce the wage gap. Particularly, the extent of the reduction in the wage gap should vary according to the change in the degree of competition. Therefore, larger effects on the wage gap should be seen in sectors that experienced larger reductions in tariff protection and were relatively more concentrated before the reforms.

This paper uses changes in trade policies in India beginning in 1991 to test the effect of the resulting exogenous increase in competition on wage gaps of female relative to male workers, and lower caste relative to higher caste workers. The impact of trade liberalization is captured by measures of tariff and non-tariff barriers. I find that industries which experienced larger reductions in trade barriers experienced systematically higher reductions in the wage differential between men and women. The wage differential between low and high caste workers doesn't seem to have been significantly affected by trade liberalization. Thus I find evidence consistent with Becker's model for gender groups. I also find an increase in wages of unskilled women relative to unskilled men in sectors where protection is reduced, but there is no statistically significant effect on skilled workers. This is also consistent with predictions of traditional trade theories for an unskilled labor abundant country like India.

The paper proceeds as follows. Section 2 examines past literature; Section 3 gives an overview of the economic and cultural background and reforms in India; Section 4 describes the data; Section 5 presents the methodology; Section 6 presents the empirical analysis; Section 7 concludes.

2   Past Literature

Trade reforms have been a major aspect of development in several countries throughout the second half of the twentieth century and numerous studies have been devoted to examining the impact of more openness in

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is considered a taboo if women have to work to supplement household income. This perception has been changing and probably more so in urban areas.

previously protected economies.[2] The focus has been on the effects on worker productivity, growth, poverty, employment and wages, but the evidence has been mixed. Theory is ambiguous on expected effects on poverty since labor market rigidities might prevent or slow down the re-allocation of factors across sectors. Topalova [2005] studied the effect of the Indian trade reforms and found an adverse impact on poverty in states with inflexible labor regulations, but found no overall effect on inequality in India as a whole. Niimi et al. [2003] examined the growth channel of the effect of trade reforms on poverty in Vietnam and found an increase in incomes of the poor employed in certain sectors where trade volume rose and prices of tradable goods increased, thereby reducing poverty. Goldberg and Pavcnik [2004b] who examined the effect on employment conditions and wages didn't find any effect of trade reforms on poverty in Colombia.

While most of the East Asian economies experienced reduction in wage inequalities after trade liberalization, this has not been the case everywhere. Studies on Mexico [Feliciano, 2001; Hanson and Harrison, 1999; Revenga, 1997] found worsening wage inequalities following trade reforms, with an increase in the relative wages of skilled workers. Evidence of skill-biased technical change was found in Colombia [Attanasio et al., 2003], in addition to evidence that trade reforms affected industry wage premiums, with sectors that became more open experiencing larger decreases in wage premiums. Kumar and Mishra [2006] examined the effect of trade reforms on the Indian manufacturing sector and found evidence that reforms increased industry wage-premiums in sectors employing relatively more unskilled labor, and therefore reduced wage inequality.

2.1   Effect of Trade Reforms on Discrimination

Literature on the impact of trade reforms has also focused on competitive effects expected from neo-classical theories such as Becker's [1957] model, which predicts that competition will force out discriminating employers in the long run. Black and Brainerd [2004] analyzed the impact of increased competition via increased trade on residual gender wage gaps in concentrated relative to competitive industries that were both exposed to trade. Concentrated industries are likely to have greater market power, which they can use to sustain discriminatory tastes. Thus an increase in competition should generate larger wage gap effects in concentrated relative to competitive industries under similar circumstances. They find evidence supporting Becker's theory that discriminating employers find it harder to continue being discriminatory as competition increases, with evidence of relative improvement in the gender wage gaps in concentrated relative to competitive industries in the U.S.

The studies on effects of trade reforms on gender wage gaps in different countries suggests that effects depend on the characteristics of the reforms and the initial conditions in each country [Fontana, 1998]. Artecona and Cunnigham [2002] examined the effect of trade reforms in the Mexican manufacturing sector on the gender wage gap. They didn't find any statistically significant effect on the gender wage gap in non-competitive industries that were exposed to trade reforms but found that relative wages increased substantially for skilled

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[2] See Goldberg and Pavcnik [2004a] for a detailed review on the impact of trade reforms in developing countries.

workers. Since women are mostly unskilled, the gender wage gap is expected to worsen following the reforms. They found weakly significant results that the gender wage gap fell in industries that became more competitive as a result of trade reforms.

Oostendorp [2002] found evidence that openness is negatively related to the gender wage gap within occupational categories in a cross-country study. However, evidence to the contrary was found by Berik et al. [2003] in their analysis of Taiwan and South Korea. They compare the effects of trade reforms on wage discrimination in competitive and non-competitive industries. They found that increasing import shares were associated with rising wage discrimination against women in concentrated industries, contrary to implications of neoclassical theory. This is partly explained by a reduction in female employment in concentrated sectors, and therefore in their bargaining power. They inferred that equal pay and opportunity legislation needs to be enforced to achieve improvement in female wages. Joekes [1999] reviews the literature on effects of trade reforms on gender in different realms, such as employment, wages, and greater empowerment within the household. She observes a positive relation between trade expansion and women's employment and relative wages, with the highest impact in the lowest income countries. See Fontana [2003] also for a more detailed review of gender effects of trade liberalization.

Clearly no generalizations can be drawn on the effects of trade liberalization on different groups. Each country produces specific results based on its unique reform experience and underlying institutional characteristics and resource endowments. While there were no significant effects on the gender wage gap in Mexico [Artecona and Cunningham, 2002], there were negative effects in Korea and Taiwan [Berik et al., 2003]. Manufacturing sector reforms in these countries, for example, generated outcomes based on different channels. While the skill-premium increased in Mexico, females lost employment and bargaining power in Taiwan and Korea. Most recently, Reilly and Dutta [2005] have examined the impact of trade reforms on the gender wage gap in India and found that trade reforms have not had any substantial effect on the industry gender wage gap. This paper uses the same individual level data as used by Reilly and Dutta but uses a different methodology and finds statistically significant impact of trade reforms on the relative wages of female workers. This paper focuses on the urban manufacturing sector while Reilly and Dutta include both rural and urban sectors. This paper therefore adds to the general literature, while being different in terms of being able to examine the impact of an exogenous increase in competition measured using trade measures.

3   Indian Economy

3.1   Past Industrial and Trade Policies of the Indian government

Following independence in 1947, the Indian government adopted a set of mixed policies wherein it combined the *laissez faire* policy of capitalist economies with the centrally planned policies of the socialist economies. The government adopted a policy of import substitution and regulated the private sector. The

government reserved production of a number of goods (including those of strategic importance) to public sector companies. The Industries Development and Regulation Act of 1951 installed the licensing system that required an entrepreneur to obtain a license to set up a new unit, expand an existing one, or to change the product mix. Licensing was to allow for better planned investment, prevent concentration of industrial power in the hands of a few, maintain regional balance of industries, protect small scale producers, encourage entry of new entrepreneurs etc. However bureaucratic delays ended up suppressing competition and entrepreneurship while promoting monopolies, which was exactly what it intended to avoid [Das, 2002]. Thus the government effectively controlled the entire manufacturing sector and the system gave the government discretionary powers in granting licenses to producers.

On the trade front, export pessimism developed from the belief that exports of primary products (which were India's main exports) would face adverse terms of trade in the world market; and a fledgling domestic industry meant that exports of manufactured goods (which stood to gain in the world market) would take time to develop. The government believed that a viable balance of payments account would require minimizing imports, which led to the adoption of import substitution policies during the late 1950s. Imports were limited through quantitative restrictions as well as high tariffs. But by the early 1960s, planners recognized the importance of exports and adopted several export promotion measures.

3.2   Economic reforms

There was a gradual shift in industrial policy in the 1980s with an emphasis on cost-efficiency in Indian industry through domestic competition. A series of unfavorable domestic and international developments created the threat of an economic crisis in June 1991. The foreign exchange reserves had plummeted to about one billion dollars and India was on the verge of defaulting on its external debt. Inflation was at a high of 17 percent per annum, industrial production was falling, and overall economic growth had fallen to 1.1 percent. To pull the Indian economy out of this crisis, a Stand-By Arrangement was worked out with the IMF, subject to India undertaking wide ranging reforms. A New Industrial Policy was announced in July 1991, which among other things abolished licensing for all but 18 industries; industries restricted for public sector investments were cut from 17 to 8; and allowed small scale enterprises to offer up to 24 percent of shareholding to large enterprises.

In the external sector, there was an immediate devaluation of the rupee by 22 percent and the introduction of a dual exchange rate system in July 1991. Import liberalization was undertaken such that except for consumer goods, almost all items of capital goods, raw materials and intermediates became freely importable. Different import lists were consolidated into a single negative list of imports requiring a license. Beginning in 1991-92, the government also began the phase of tariff reductions, bringing down the maximum from 300 percent in 1990 to 50 percent by March 1995. The dispersion of tariffs was also significantly reduced

and quantitative restrictions were eased. Export restrictions were eased and additional export promotion plans, such as the Duty Drawback Scheme and Advance Licenses Scheme, were initiated.[3],[4]

3.3 Economic and cultural position of lower castes and women in India

3.3.1 Caste system

The word *caste* is derived from the Portuguese word *casta* meaning lineage, breed or race. In the Indian context, traditional Hindu society divides people into social classes based on the caste system. It divides people into *varnas* (castes), which are hereditary and determines the social and economic status of individuals in the society. The upper castes have traditionally been richer and more influential, while the lowest caste (*untouchables*) was relegated to menial jobs. Higher castes practiced the system of *untouchability* wherein they believed that contact with *untouchables* would defile them. The higher castes didn't allow the lower castes to share the same resources (e.g., school, religious functions, etc.). Lower castes were therefore both economically and socially backward. Authors of the Indian Constitution believed in equality of all individuals and Article 17 of the Constitution abolished *untouchability*. The lower castes, including the *untouchables* were listed in a Schedule of the Constitution and are therefore called the Scheduled Castes (SC). The government also made special provisions for recruitment (in terms of reservation of jobs) of Scheduled Castes into government or public sector jobs (positive discrimination).[5]

Table 1a presents work force participation rates for different social groups in urban India. Comparing columns 1 and 2 show that between 1983 and 1999 work force participation rates have gone up slightly for male scheduled castes but have decreased slightly for female SCs. The work force participation rates are higher among lower caste women compared to higher caste women, as seen by comparing columns 2 and 4.[6] This can be partly explained by the fact that higher caste women may face greater social stigma in working outside the household, unlike lower caste females. Work force participation rates of male scheduled castes are slightly smaller than of other male workers.

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[3] Drawback means the rebate of duty chargeable on any imported materials or excisable materials used in manufacture or processing of goods that are manufactured in India and exported. Duty Drawback is equal to (a) customs duty paid on imported inputs including SAD (Special Additional Duty) plus (b) excise duty paid on indigenous inputs.

[4] Inputs required to manufacture export products can be imported without payment of customs duty under Advance License. Advance License can be granted to merchant exporter or manufacturer exporter to import raw materials. Since the raw materials can be imported before exports of final products, the licenses issued for this purpose are called 'advance licenses'.

[5] Free schooling, subsidized higher education, as well as free training to prepare for the entrance examinations for the government services were made available to lower castes. Job reservations were originally intended for a decade, but continue till date.

[6] The term *lower caste* is used interchangeably here to refer to *Scheduled castes*. It must however be noted that the scheduled castes are not the only 'lower' castes in India.

3.3.2 Women vs. Men

Women in India have traditionally been restricted to the household, but formal labor force participation rates of women have improved (since independence in 1947) just as observed in other countries across the world. Trade theory predicts that relative wages of unskilled labor will rise in the long run in an unskilled-labor abundant country that opens up to trade. It was expected that labor-intensive industries in labor abundant economies would become export competing and women who tended to dominate labor-intensive industries would stand to gain. Table 1b presents work force participation rates for male and female workers in urban India. The work force participation rates for women are lower than for men throughout the periods being studied. It is expected that opening up to trade will benefit women in a low-skill abundant country like India.[7]

4   Data

4.1   Individual Data

The individual level data comes from the *Employment and Unemployment Survey* (*Schedule 10*) of the *NSSO* (National Sample Survey Organization) of the government of India. This quinquennial survey is divided into four sub-rounds and covers both urban and rural areas.[8] The survey includes information on household characteristics like, household size, principal industry-occupation, social group, monthly per capita expenditure etc., detailed demographic particulars including age, sex, educational level, school attendance, principal and subsidiary status, industry and occupation of the employed etc., and daily time disposition. The survey adopts a stratified two-stage design.[9] Data is available for the years 1983, 1987-88, 1993-94 and 1999-2000. Thus it covers periods both before and after the 1991 reforms. The data are repeated cross-sections.

The analysis is restricted to the urban sector, which has more reliable data on wages and more individuals in the manufacturing sector than rural areas. While the agricultural sector also experienced liberalization, the analysis is restricted to the manufacturing sector due to data limitations. The tariffs were relaxed for the manufacturing sector industries post-1991 as part of the reforms. The analysis is restricted to the 72 3-digit manufacturing sector industries for which information on tariff and non-tariff barriers is available. The analysis is restricted to employed individuals in the age group of 14 to 65 years. The analysis is further restricted to 16 of the 26 States (and 6 Union Territories) that form the Indian Union. These are the states typically covered in studies on India. The omitted states are in north-east India, where frequent insurgency problems may have affected data collection. The list of states is available in the Data Appendix.

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[7] Nordås [2003] found evidence of increased likelihood of trade liberalization raising employment and relative wages of women based on a case study of Mauritius, Peru, Mexico, Philippines and Sri Lanka.

[8] The sub-rounds are from July-September, October to December, January to March, and April to June. Equal number of sample villages and blocks are allotted for survey in each of these four sub-rounds.

[9] The first-stage units are census villages in the rural sector and the NSSO urban frame survey (UFS) blocks in the urban sector. In 1993-94, the survey covered more than 69000 rural and 46000 urban households. The total sample size is determined by the relative population sizes of rural and urban areas with double weight to the urban sector. More than 97000 rural and 67000 urban households were surveyed in 1999-2000.

Wages, reported in the survey as weekly earnings, have been converted to constant rupee terms using consumer price indices from the International Financial Statistics database. The top and bottom 1% of wages are trimmed to omit outliers. Education variables are defined as dummy variables for each level of education completed. There are 10 education categories: those not literate (*notlit*); literate but with no formal education (*noformal*); those with below primary education (*belowpr*); completed primary schooling (*pr*); completed middle school (*mid*); completed secondary school (*sec*); graduate with agricultural degree (*agrigr*); engineering graduate (*engr*); medicine graduate (*medgr*); graduate in other subjects (*othergrad*). The omitted category is *notlit*. Age variables are included as a fourth order polynomial. *Marital status* is a dummy that equals one for those currently married and is zero else. *Household head* equals one if the individual is the head of the household, and zero else. Information on social group identifies whether the individual belongs to a scheduled caste. Based on figures from the 2001 census, Scheduled Castes form about 17% of the Indian population. Information on household religion identifies whether the individual is a Muslim. Muslims are the second largest majority and comprise about 12% of the Indian population (Census 2001). The results presented here omit Muslims to distinguish effects more clearly for gender and caste groups without further effects on female Muslims being different than effect on male Muslims. The analysis is therefore restricted to Hindus.

Summary statistics are presented in Tables 2a. Summary statistics reveal that women on average earn significantly less than male workers, and the average relative wage ratio improved from 0.27 to 0.33 over the time period under analysis. Female workers are also younger, and less educated than the male workers. Lower caste workers in fact have higher earnings than females. The relative wage ratio of lower castes to higher caste workers improved from 0.76 to 0.83 over the entire period. Lower caste and female workers have lower levels of education than their counterparts, but there is improvement over time for all the groups. The numbers show that the educational levels completed have improved for each group between 1983 and 1999-00.

Detailed information is available on the activity status of individuals, who can be self-employed, in salaried employment, or seeking work. Information is also available on the occupation within each industry, and this is used to construct occupation categories based on Banerjee and Knight's (1985) analysis. Individuals are classified into six occupations, namely professional, skilled, clerical, service, unskilled, and production. Occupation dummies are included in some of the regression specifications and the omitted category is skilled workers. The industry classification is given by the *National Industrial Classification (NIC)* of the *Government of India*. Concordance tables were used to convert all the industry codes into their *NIC-87* equivalents. The list of manufacturing industries is provided in the Data Appendix.

4.2   Trade Data

Tariff data is obtained from Das (2003). Das computes the Corden measure of the Effective Rate of Protection (ERP) for 72 3-digit Indian manufacturing industries, for the four phases 1980-81 to 1985-86, 1986-

87 to 1990-91, 1991-92 to 1994-95, and 1995-96 to 1999-00. He also calculates the import coverage ratio and the import penetration rate for these industries for the same period.

The Corden measure of **effective rate of protection** equals the percentage excess of domestic value added over foreign value added, due to tariffs, which Das (2003) calculates as follows:

$$\textbf{ERP}_{\textbf{j}} = (\textbf{VA}^{*}_{\textbf{j}} - \textbf{VA}_{\textbf{j}}) \textbf{ / VA}_{\textbf{j}}, \tag{1.1}$$

where VA^{*}_{j} is the value added at free trade prices, and VA_{j} is value added at tariff distorted prices for final product j.[10] The effective rate of protection measures the protection to domestic factors of production based on tariffs on both input prices and output prices, and thus is a better measure than the nominal rate of protection which doesn't account for tariffs on inputs. Higher ERP therefore imply higher degree of protection. It must be noted however that in a country like India, which relied heavily on quantitative restrictions (and other non-tariff barriers) in addition to high tariffs, the effective rate of protection alone might not give a complete picture of the degree of protection.

The **import coverage ratio** (ICR) is a measure of the frequency of non-tariff barriers (NTBs) weighted by imports or by production.[11] The change in the import coverage ratio gives some idea of the trend in NTBs, but do not capture the exact price advantage to domestic producers from such protection. Higher import coverage ratio indicates greater protection.

The **import penetration rate** (IPR) measures the combined effect of both tools of protection, namely tariffs and NTBs. It is expected that lower tariffs along with lower NTBs (for example more items shifted from the restricted list to the open general list) will raise imports and vice-versa. The import penetration rate is defined as the ratio of industry imports to domestic availability, where domestic availability is defined as domestic production plus imports minus exports. Exports and imports of product lines are aggregated to obtain the industry levels.[12] Higher import penetration rates imply lower levels of protection.

Summary statistics are presented in Table 2b. Trends in ERP across industries between 1983 and 1999 are shown in Figure 1. The summary statistics reflect substantial declines in both tariffs and non-tariff barriers. The average effective rate of protection declined from 115% to about 40% over the period under analysis, and the average import coverage ratio declined from 97% to 25%. While in the first phase, nearly 70% of industries had ERP in the range of 50 to 150%, in the last phase of reforms, almost 80% of the industries had tariffs in the

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[10] The value added functions are defined as $VA_j = (1-\sum a_{ij})$ and $VA^*_j = (1+t_j) - \sum(1+a_{ij})$, such that ERP can be expressed as $ERP_j = (T_j - \sum a_{ij}T_i) / (1 - \sum a_{ij})$, where j is the j'th activity or product, T_j is the nominal tariff rate for j'th product, T_i (i=1,2,…,n) are the nominal tariff rates of tradable intermediate inputs used in the j'th activity, a_{ij} (i=1,2,…,n) are the cost shares of inputs in production of j'th activity, $\sum a_{ij}$ is sum of shares of intermediate inputs in the final value of j, and is a weighted average of input tariffs on all intermediate inputs with weights according to input shares (Das, 2003).
[11] Das (2003) defines the Import Coverage Ratio as $C_j = \sum D_i M_i / \sum M_i$, where j is industry and i is a particular product line within an industry; D_i is a dummy variable which equals one if the product is listed under restricted (or banned/limited permissible/canalized) imports, and zero if the product is on the open general list (and is freely importable); M_i is the value of imports of the ith product category which is subject to NTBs; and $\sum M_i$ is the sum of the value of imports of all the product lines within the industry.
[12] Das (2003) defined the import penetration rate as $MPR_j = M_j / (P_j + M_j - X_j)$, where j is industry; P is domestic production; M is imports; and X is exports.

range of 0 to 50%, and none of the industries had tariffs above 100%. Almost 92% of industries had 100% import restrictions in the first phase, which declined to 5 industries in the last phase (Das, 2003).

4.3   Annual Survey of Industries (ASI) Data

This dataset is used to get information on the number of firms, and the gross fixed capital formation for each industry. The number of firms is used to generate a measure of industrial concentration to account for changes other than changes in trade protection levels for each industry. The results presented are based on using the *percentage change in the number of firms* between 1983 and 1999 relative to 1983 as the measure of change in industry concentration. The gross fixed capital formation provides information on all the new physical investments in an industry and is used to control for changes in terms of foreign direct investments and increased domestic investments as a result of trade reforms and industrial de-regulation. Data is available at the 3-digit industry level, which is the level of aggregation of the trade data as well.

5   Methodology

Gersen [2004] suggests it may be more reasonable to test for a negative relation between competition and employer discrimination.[13] To test for a negative relationship between competition and discrimination, I look at the effect on individual's wages in industries that experienced a reduction in tariffs. I expect that industries experiencing larger decreases in tariffs, since they become more competitive, would see a larger reduction in discrimination, measured in terms of relative wage differentials between the groups of interest.

It is generally believed that increasing international competition in a previously protected economy will force the domestic producers to become more competitive. Levinsohn [1993] terms this *imports-as-market-discipline hypothesis*. The hypothesis assumes that firms are technically efficient and predicts that price-marginal cost markups for previously imperfectly competitive firms will fall as a result of trade liberalization via lower tariffs and quotas. Several formal trade theories provide different implications of an economy opening to trade subject to different conditions pertaining to factor mobility and resource endowments. While there are conflicting theories on the impact of more openness, the underlying premise in this paper is that trade reforms increase domestic competition and therefore create pressures on all employers to set wages competitively.[14]

In this analysis, I assume that there already exists a wage gap between groups and test for an improvement in relative wages between groups. The extent of the decrease in the wage gap would vary according to the change in the degree of competition. I expect larger effects on the wage gap in a sector that

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[13] Customer and employee discrimination can however persist in the long run.
[14] Aghion and Howitt ["*Endogenous Growth Theory*", 1998, Cambridge, Massachusetts, MIT Press] discuss the possibility that openness in the international arena may not always lead to growth and development in a country unless accompanied by knowledge accumulation and institutions that provide incentives for technological innovations [Betancourt and Seiglie, 1999].

experiences larger reductions in tariff protection, and therefore experiences a larger increase in competition relative to other sectors.

5.1   Individual Level Analysis

The individual level analysis involves standard Mincerian earnings regressions with log of real weekly wages as the dependent variable, demographic characteristics (such as gender and caste dummies, age, education, marital status, sex of the head of the household, occupation etc.) and measures of protection in each industry. Gender and caste dummies indicate whether these groups get higher or lower returns than the comparison group. The impact of trade reforms on gender (caste) groups is captured by the coefficient on the interaction term between the trade protection measure and the female (caste) dummy variable, which is expected to be negative. The negative coefficient would indicate that lowered protection raises wages of female (lower caste) workers relative to male (higher caste) workers.

The main equation used to assess the impact on wages is the within group regression:

$$Ln\ w_{ijtk} = \alpha + \beta(X_{ijtk}) + \gamma_0(Female_i) + \gamma_1(Protect_{jt}) + \gamma_2(Protect_{jt} \times Female_i) + \lambda_t + \phi_k + \theta_j + \psi_{jt} + \varepsilon_{ijtk}.$$

(1.2)

where $ln\ w_{ijtk}$ is the natural log of weekly earnings of individual i in industry j in time t in state k; X consists of the individual characteristics comprising age (in quartic), nine education dummies for each level of education completed, marital status (equals one if married and zero else) , and household head dummy (equals one if head of household, zero else); *Female* is a dummy variable which equals one if individual is a female and zero else; *Protect* includes the tariff and non-tariff measures of protection of the industry; $\phi, \lambda,$ and θ denote state, post-liberalization and industry fixed effects. For simplicity the regression is written for gender groups. *Caste* dummy and its interaction terms would be included to analyze the effect for caste groups. Since the tariff and non-tariff barriers are reported at the industry level, the standard errors are corrected by clustering at the industry level. The regressions are weighted using sampling-weights.

By including the *female* dummy variable, the method assumes that there exist wage differences between these groups. *Protection* measures indicate the overall impact of the change in protection on wages in the economy across groups. This method assumes that lower effective rate of protection and import coverage ratios, and higher import penetration rates imply increased competition within an industry. The negative of the import penetration variable is used to simplify comparison between coefficients. The coefficients of the protection measures are expected to be negative if lower protection raises wages.

The *protection* measures interacted with *female* are the main variables of interest. The coefficient of *protection x female* indicates the impact of a change in the degree of protection on the relative wages of females across industries. Increased competition in the sectors experiencing more openness will cause employers to be

less discriminatory and therefore females will experience an increase in their wages relative to male workers. I expect *protection x female* to be negative.

The regression is run for the full sample consisting of males, females, low and high caste workers, and also separately for gender and caste groups. The full sample is restricted to looking at Hindus alone to simplify the analysis rather than including additional terms for Muslims. In looking at the gender groups alone, the sample is restricted to the higher castes, while in examining the caste groups the sample is restricted to males.

5.1.1 Why Within-Industry Analysis?

Levels of protection vary across industries and over time. Across-industry (cross-section) differences in levels of protection indicate the correlation between wages and levels of protection, which would also be a function of other characteristics of the industry. It would not account for the effect of a change in protection within an industry. Since the aim is to analyze the effect of different magnitudes of changes in protection over time rather than difference in levels of protection across industries in any one year, industry fixed effects are included to focus on within-industry comparisons. While protection levels have changed in each of the four years (protection was increased between the first two years of data, and decreased after 1991) under analysis, I intend to capture the effect of the trade reforms in 1991. Therefore *industry x post-liberalization* interaction terms are included to account for changes in the post-liberalization period. *Industry x PostLib x Female* interaction term is also included to account for differential returns to men and women of changes in post-reform period across industries.

5.1.2 Additional Controls

I include *Industry* x *female* and *education* x *protection* measures to account differential returns to women workers across industries and differential effect of protection on people with different educational achievements respectively. I also include *state* fixed effects in the regressions. States in India have significant linguistic barriers that make migration across states more difficult.[15] While states vary in terms of their levels of industrialization, the changes in trade protection were at the industrial level and applied uniformly across states. However, labor markets are considered differentially rigid across states, which make it meaningful to include *state* and *female (*or *caste)* interaction terms to account for different experiences across states.[16]

5.1.3 Limitations and concerns

The analysis here focuses on looking at the wage effect. The labor force participation rates of women have not changed much during the entire period under study. Thus it does not appear to be the case that the

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[15] While seasonal migration between states might occur, this is mostly in the rural and agricultural sector than in organized manufacturing.

[16] The results with inclusion of *state x female* and *state x caste* are not presented here, but it doesn't change the results much, though the *state x female* and *state x caste* coefficients are jointly significant in each set of regressions for gender and caste groups respectively.

results are being driven by a significant increase in the number of women entering the labor force. This is seen from decreasing labor force participation of women as shown in Table 1b. It is possible that the impact on employment probabilities of women are more likely than the wage impact, but the analysis at this point doesn't address this issue.

Inclusion of protection measures captures differences in the degree of protection and in the resulting degree of competition across industries. However changes in competition between industries because of industrial de-regulation may bias the estimates by overestimating the impact of lowered trade protection. While trade reforms began in mid-1991, industrial de-regulation had begun in the late 1980s. Ideally the regression should directly control for changes in the industrial structure resulting from de-regulation so that effects of trade reforms can be clearly and separately analyzed. The degree of concentration of the domestic industry would be a useful measure in this context. The domestic economy would become less 'concentrated' over time, both due to de-regulation and due to trade liberalization. Unfortunately the data has no direct measure of industrial concentration. The *percentage change in the number of firms* within an industry over time is used as a crude measure to capture the change in degree of concentration within that industry. While inter-industry comparisons wouldn't be of much use in this case, including this measure would nevertheless provide additional information.[17]

It is possible that political clout of bigger firms in an industry prior to reforms in 1991 could have influenced the actual level of tariffs that was fixed for that industry.[18] Since the reforms were effectively imposed in India as a condition to receiving aid from the IMF to avoid a financial crisis, the political influence of industries should not matter in the tariff levels decided as part of the reforms.[19] Apart from offering protection, the high tariffs were also used to generate revenue. The decision regarding which industries continued getting protection was determined on the basis of ideas of strategic importance and products which were important for mass-consumption, rather than considerations to favor the bigger firms across industries. Thus industry-level changes were guided by concerns of economic policy more than nepotism. The *change* in the protection levels can be considered exogenous and therefore OLS should generate consistent estimates.

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[17]Traditional industry concentration measures such as the Herfindahl Index and the Concentration Ratio account for market share of each firm. While the measure constructed here is not able to capture market share, it is included nevertheless to capture changes in industrial structure.

[18] Bertrand (2004) found evidence that increase in foreign competition in the US changed the sensitivity of current wages to current unemployment rate, with larger effects in more financially constrained industries.

[19] The paper assumes that political influence of different firms doesn't affect wage-setting. The public (government controlled) sector was pre-dominant in organized sector production and therefore the government influenced wage setting not only in the public sector but also in the private sector. Collective bargaining is therefore generally believed to be less important than the role of government in wage setting in India. Minimum wage laws were imposed in both organized and unorganized sectors. Also, labor laws in India are quite rigid. The Industrial Disputes Act of 1947 made it very hard for firms to fire workers, with firms employing more than 100 workers requiring prior permission, which was seldom granted, from state governments.

Tariff and non-tariff barriers were reduced across the board for all industries and the paper captures the effect of the difference in the extent of decrease in protection across industries.

An improvement in women's unobserved characteristics or their selection criteria (to work or not) could also help explain their relative wage increase. But as long as there is no systematic difference in the improvement of these characteristics (for example, women stay longer in the labor force) across industries or sectors based on the openness of those sectors, it should not affect differences in results across sectors, which is the main result of interest in this paper.

6   Empirical Analysis

Tables 3 and 4 present results for the manufacturing sector based on regression Equation 1.2, for the entire sample and gender groups respectively. The sample is restricted to Hindus. Each column represents a separate regression, with the same dependent variable (log of real weekly earnings).

6.1   Results for Entire Sample

Results are presented in Tables 3a and 3b. Starting with the simplest specification in column 1 of Table 3a, which includes demographic characteristics, *female* and *caste* dummy variables, explains almost 50% of the changes in log weekly earnings. Note that the coefficient of the caste dummy is positive and significant in columns 1 to 4. I also run regressions (not reported here) similar to the specification in column 1 for skilled and unskilled workers (these regressions don't include *education x female* and *education x caste*). Skill groups are defined on the basis of education levels completed. If skilled workers are considered to be those with more than high school education (that is, have at least some college education), then earnings differentials between females and males are statistically significant only for unskilled workers. The coefficients of *PostLib* and *PostLib x Female* are both positive and statistically significant for unskilled workers while they are both insignificant for skilled workers. This provides evidence that unskilled female workers benefited post-liberalization. The earnings differential between castes is statistically significant only for skilled workers.

Column 2 of Table 3a includes the ERP measure of protection, *ERP x caste* and *ERP x female* to capture the effect of lowered protection on wages of each group. *ERP x female* and *ERP x caste* are both statistically significant and negative as expected. The magnitude of the effect of lower protection is larger for females relative to males, than for lower castes relative to higher castes. The coefficient of *ERP x female* is -0.197 and is -0.05 for *ERP x caste*, which implies a 1.97% increase in relative wages of females, and a 0.5% increase in relative wages of lower castes when the ERP is reduced by 10-percentage points.

Industry fixed effects are included in column 3 to focus on within-industry effects. The inclusion of industry fixed effects reduces the magnitude of the effect of lower protection slightly for females, while both effects on females and lower castes remain statistically significant. *Industry x PostLib* effects are included to account for changes across industries before and after reforms, along with *PostLib x Female* and *PostLib x Caste*

to account for changes affecting the groups differently before and after reforms. The effect of lower protection on caste groups becomes statistically insignificant once *PostLib* is included, while the effect on females remains statistically significant.

Additional specifications in columns 5-8 include *Industry x Female*, *Industry x Caste* to account for differential returns to groups across industries; and *Industry x PostLib x Female* and *Industry x PostLib x Caste* to account for returns to groups across industries before and after reforms. *Occupational* dummies as well as their interactions with female and caste dummy variables are included in columns 7 and 8. Across all the specifications, there is a statistically significant effect of lower ERP on relative female wages, but there is no significant effect of lower ERP on relative wages of lower caste workers (once *PostLib* is included). The last column includes the import penetration measure, which however doesn't have a significant effect on relative wages of either group, as indicated by coefficients of *–IPR x female* and *–IPR x caste*.

Table 3b presents additions to specifications in Table 3a for the entire sample. These specifications include all three measures of protection. *Protection x PostLib* is included in some specifications to account for the overall effects of lowered protection before and after liberalization. Table 3b also includes the industry concentration measure of *percentage change in number of firms*, and the *gross fixed capital formation* of industries. *ERP x education* are seen to be mostly jointly insignificant. The overall conclusion from all the specifications is that there is a significant effect of lowered protection on female relative to male workers, while there is no significant effect for lower caste workers. *Protection x PostLib x Female* captures the effect of lowered protection post-liberalization for women relative to men. The negative coefficient on this multiple interaction term implies improved outcomes for female workers in less protected sectors post-reforms. Employers in these sectors may experience greater competitive pressures from other sources as well in the post-reform period, one of which may be de-regulation of the domestic economy. *Protection x PostLib x Female* are statistically significant using both *ERP* and *IPR* measures and plausibly indicates that other changes (such as domestic de-regulation) in the economy in the post-liberalization period had a heightened effect in the less protected industries than others. The combined effect of lower protection on female wages relative to male wages, in terms of *ERP* is the sum of the effects on *ERP x female* and *ERP x PostLib x female*. This equals -0.747 [= -0.182 -0.565], which implies that for a 10-percentage point fall in the ERP there is a 7.5% increase in wages of females relative to male workers. *IPR x PostLib x Female* is statistically significant and the combined effect of a change in the *import penetration rate* is -0.292 [= -1.720 + 1.428], which implies that for a 10-percentage point increase in the import penetration rate, there is a 2.9% increase in the relative wages of female workers. There is however no significant effect on lower castes. An interaction term between *female* and *caste* dummies is included in the last two specifications but was statistically insignificant. The next section analyzes the effect on gender groups.

6.2   Results for Gender Groups

The sample used to analyze the impact on males and females is restricted to higher castes to avoid problems of differential impact on these groups across higher and lower castes. Results are presented in Tables 4a, 4b and 4c. The first column of Table 4a shows the simplest specification for gender groups. Including all demographic characteristics of age, education, marital status etc. explains 47% of variations in log weekly earnings. A *female* dummy variable is included to capture relative differences in earnings between gender groups. The coefficient of *female* is negative and significant and implies 57% lower earnings for female relative to male workers. The second column includes the *ERP* measure of protection to capture the effect of lower protection on wages. The coefficient of *ERP* is -0.086 and indicates that a 10-percentage point decrease in the *ERP* increases wages for everyone by 0.8%. Next, *industry* fixed effects are included in column 3 to focus on within-industry variations. This raises the effect of lower protection to a 1% increase in wages for a 10-percentage point decrease in *ERP* as reflected by the coefficient of *ERP* (-0.110).

Since reforms were introduced in 1991, to account for changes pre- and post-reforms, a *PostLib* dummy variable is included. While the coefficient of *ERP* (-0.070) is still statistically significant, the magnitude is lower. *ERP x female* is included next in column 5 to account for the differential effect of lower protection on women workers compared to male workers. The coefficient of *ERP x female* is negative and statistically significant and indicates that for a 10-percentage point decline in the effective rate of protection, there is a 2% increase in wages of female relative to male workers. To account for changes across industries in the post-liberalization period compared to the pre-reform period, *industry x PostLib* is included, which reduces the impact of lower protection on relative female wages to 1.67% for a 10 percentage point decrease in ERP. When state fixed effects are included (not reported here) to the specification in column 6 of Table 4a, it doesn't change the magnitude or significance of the primary variable of interest, *ERP x female*.

6.2.1   Including Other Measures of Protection

Table 4b presents additions to specifications in Table 4a that include other measures of protection. Column 7 includes only the IPR measure which is statistically insignificant, but *–IPR x female* is significant and negative and implies that when the import penetration increases by 10-percentage points, the wages of female workers increase by 5.5% compared to wages of male workers. Column 8 includes both ERP and IPR measures. The *import penetration rate* is statistically insignificant in all the specifications while the *ERP* is statistically significant. However, *ERP x female* is mostly insignificant once other measures are included, while *-IPR x female* is mostly significant. Thus lower protection through increased penetration seems to have a greater effect on relative female earnings than lowered tariffs. *Industry x female* is included since females may be impacted differently across industries. The coefficient of *negative IPR x female* in column 11 is statistically significant and indicates that for a 10-percentage point increase in the import penetration rate (which indicates lowered protection) there is about 5% increase in relative wages of female workers. The *ERP x female* coefficient (which

is significant in this specification) indicates a corresponding 2% increase in relative female wages for a change in the ERP. *Occupation* and *occupation x female* variables are also included. To account for differential impact on men and women post-reforms across industries, additional interaction terms *industry x PostLib x female* are included in the last two specifications. The *IPR x female* coefficient remains significant but is smaller and indicates a 4% increase in relative wages of female workers when the import penetration rate increases by 10 percentage points. Meanwhile the *ERP x female* coefficient is no longer significant. *Percentage change in number of firms*; and *real gross fixed capital formation* are included in the last specification to account for changes in industry concentration and growth. Inclusion of these industry measures make both *ERP x female* and *IPR x female* insignificant.

Table 4c presents additional specifications for gender groups. Column 14 includes *protection x PostLib x female*. These multiple interaction terms provide the effect of other changes in the economy, which interact with changes in protection, to further affect wages. It might be expected that an industry that is de-regulated domestically, allowing existing firms to expand and new firms to enter, will experience greater increase in competition as a result of trade reforms. The coefficient of *ERP x female* is insignificant in all but the first specification. The coefficient of *ERP x PostLib x female* is significant in all but the first specification and indicates that a 10-percentage point fall in the *ERP* raises relative female wages by more than 5% in the post-reform period. *IPR x female* is statistically significant in columns 17, 18 and 19. The last specification includes the third measure of protection, the import coverage ratio and interactions similar to those for the other measures, but *ICR x female* and *ICR x PostLib x Female* are insignificant.

The *percentage change in the number of firms* is included in columns 16-19. It is significant, though small and positive across all the specifications. A positive coefficient on the concentration variable implies an increase in the wages due to increased competition. However, *concentration x female* and *concentration x caste* were insignificant (results not reported here), which implies that there was no differential effect across groups of a change in the degree of concentration of industries. The *gross fixed capital formation* variable is also very small in magnitude but positive and weakly significant.

6.2.2   Potential Explanations

There can be several explanations for the reduction in the wage gap between men and women, for instance higher female educational attainment; occupational changes; supply-side changes such as greater commitment to staying on longer in the labor force; or even lesser discrimination against females. The educational changes are accounted for by including the education dummies.[20] When *education x PostLib* is included, *IPR x Female* is still significant, and *education x PostLib* variables are jointly significant. This accounts for changes in education over time. *Education x female* are jointly significant accounts for differential

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[20] *Education* is a set of 9 dummy variables. *Not literate* is the omitted category.

returns to education for female relative to male workers. *Occupation x female* is also jointly significant.[21] The latter significance result points to relative improvements in returns for females within occupations. Table 5 shows the relationship between the percentage of female employment by industry and the percentage change in the ERP between the first and last year. The figures are presented for five industries each with highest and lowest ERP levels in 1983. There is no systematic relationship between these changes, assuring us that the results are not the by-product of women disproportionately entering industries where the ERP declined substantially. Thus after having controlled for these changes, the significant coefficient of *protection x female* plausibly indicates the actual effect of the increased competition, rather than a spillover from the higher educational achievements of women workers, or changes in industrial composition over time.

Several studies have presented evidence on the existence of differential returns to gender in India. Sambamoorthi (1984) using data from a city in south India found evidence that about 36% of the wage gap between men and women was attributable to discrimination. Madheswaran and Lakshmanasamy (1996) found that over 98% of occupational disparity between males and females was unexplained (and could be due to discrimination by firms, or women's preferences or both) and that the predominant cause of lower female relative wages was within-occupation differences rather than disadvantageous occupational distribution of female workers. My results for gender groups are consistent with results from the Blinder-Oaxaca decomposition of the wage gap into explained and unexplained parts. The decomposition results (summarized in Table 6) point towards greater relevance of a discrimination-based wage gap story for gender rather than caste groups.[22] The numbers show that a larger part of the wage gap is explained for lower castes than for females relative to higher castes and males respectively. This can explain the statistically significant impact of lowered protection on potential discrimination against female workers.

The common association studied between trade reforms and wages operates through differential impact on skill groups. Studies [see Banga, 2005; Dutta, 2005] examining the impact of trade reforms on wage inequalities between skilled and unskilled workers find that wage inequalities have gone up. The educational distribution of women is poorer than of men.[23] Even after accounting for such differences, there is a significant impact of lowered protection on relative wages of female workers.

For males and females, separate regressions (not reported here) are run for those with more than high school education and for those with less than high school education, which is the usual basis of defining skilled workers. For those with more than high school education (skilled workers), none of the *protection x female* terms is statistically significant, whereas for those with less than high school education (unskilled workers), *-IPR x*

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[21] *Occupation* is a set of 5 dummy variables. *Skilled* is the omitted category.
[22] Detailed results of the decomposition are available upon request.
[23] While about 40% of female workers in the sample are not literate, only 14% of male workers are not literate. Those who have completed primary schooling form the second highest proportion of female workers (about 18%), while the corresponding group for male workers is those who have completed secondary schooling (about 24%). Female graduate workers only comprise 4% of the sample while male graduate workers comprise about 9% of the sample.

female is still significant. This implies a beneficial effect of lowered protection on the relative wages of females with less than high school education, while there is no statistically significant improvement in the relative wages of females with more than high school education as a result of higher import penetration. This indicates improvements in returns to the less skilled female workers which are in keeping with our expectation that in an unskilled labor abundant country the returns to unskilled labor should increase if the country has a comparative advantage in the production of the unskilled labor intensive good. These results are consistent with Kumar and Mishra's (2006) findings that unskilled workers (males and females) benefited from trade reforms in the urban manufacturing sector.

6.3   Results for caste groups

The sample is restricted to males for this set of regressions. While the *caste* dummy is negative and statistically significant, the interaction terms involving *caste* and other variables are not significant. The results are presented in Table 7. The results imply that lower castes do not benefit any differently from lowered protection than do higher castes. This result is consistent with findings from the decomposition of the wage gap into explained and unexplained parts. While wage gaps do exist between low and high caste workers, it doesn't stem from discrimination, rather from poorer educational achievements of lower castes. The individual level regressions are also run separately for skilled and unskilled workers. While *protection x caste* was insignificant for both groups of workers, *protection x caste x postlib* was significant for skilled workers, indicating that there is a significant effect of lowered protection on high skilled low caste relative to high caste workers.

7   Conclusion

Previous studies have established the evidence of wage gaps between females and males and between low and high castes. Even after controlling for all observable productive characteristics, the wage gap persists. While the entire wage gap is not necessarily due to discrimination, there is evidence of discrimination against females and lower castes in India. While direct evidence in the labor market on discrimination is scant, there is substantial evidence of its persistence in the social realm.[24] If some of this is taste-based discrimination on the part of males and higher caste employers conforming to social norms, it is expected that an increase in competition will reduce the extent of employer discrimination by reducing rents. I used the trade reforms in India as an exogenous change in the degree of competition in the domestic economy to examine the impact of increased competition on wage discrimination.

Based on industry and individual level analysis, results show that industries that experience more liberalization experience a systematically higher reduction in the wage differential between women and men, but

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[24] Betancourt and Gleason (2000) found evidence of unequal treatment of lower castes in allocation of publicly provided goods such as health and education in rural areas. Chattopadhyay and Duflo (2003) examined the impact of empowering women in rural areas by reserving posts for them in Gram Panchayats (village councils) to increase their representation in local governance.

not in the wage differential between lower and upper castes. Lower protection in terms of lower tariffs and greater import penetration increase the wages of female relative to male workers. The result for gender groups is consistent with the implication of Becker's theory of discrimination. In addition, there is a greater effect of other changes in the post-liberalization period on the industries which experience lower protection and therefore on relative wages in these sectors. However, the lack of any direct measures of concentration in the industrial sector precludes an analysis similar to past studies which compare the effect of increased competition across concentrated and less concentrated sectors.

After accounting for productive characteristics, I find statistically significant increase in relative wages of females compared to males in the more open sectors but no significant effect on wage differentials between skilled male and female workers as a result of more openness. This indicates evidence of decrease in unskilled worker wage differentials for gender groups which is consistent with traditional trade theories that predict that opening up an unskilled labor abundant country should increase the returns to the unskilled labor input if it is used intensively in the producing the product in which the country has a comparative advantage. There is mixed evidence on the effect of reforms on wage inequality between skill groups in India. My result is consistent with Kumar and Mishra (2006) who used the same data and found evidence of improvement in wages of unskilled workers relative to skilled workers.

Though *a priori* I expected to find a significant impact of lower protection on lower castes, the results are statistically insignificant for lower castes relative to higher castes. This might be explained by the fact that the analysis focuses on the urban areas where the social stigma of belonging to a lower caste group might be lesser than in rural areas. Also, the affirmative action program of reservations for lower castes in government jobs has contributed to increased opportunities for lower castes in public sector jobs, which might in turn result in their lower numbers in urban manufacturing which might explain the insignificant results.

The result from this paper is relevant both as a contribution to the empirical literature on the economics of discrimination and as means for policy analysis of the economic impacts of trade reforms in India. The empirical literature provided mixed evidence with evidence of increased competition leading to a reduction in wage discrimination in the US, while studies for developing countries obtained insignificant or sometimes opposite results. This result bolsters the argument in favor of the *Beckerian* theory of discrimination. In terms of policy analysis, the welfare effects of trade liberalization in India are still subject to debate. The result that greater openness has in fact increased the relative wages of female workers and therefore reduced the extent of the wage gap contributes to an argument in favor of liberalization in India.

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Tables and Figures

Table 1a: Work Force Participation Rates for Social Groups in Urban India

Year	Scheduled Castes		Others (not including STs)	
	Male (1)	Female (2)	Male (3)	Female (4)
1983	490	205	514	139
1987-88	492	213	509	140
1993-94	505	199	523	145
1999-00	503	185	522	128

Source: Sarvekshana, 87th Volume, Government of India.
Notes: Numbers are for all workers (reported using the 'usual' status). They represent number of persons employed per 1000 persons in India as a whole. 'Usual status' includes persons who had, for a relatively longer period of the year, either worked or were looking for work, and also those from among the remaining population who had at least for some time with some regularity.
ST is scheduled tribes, i.e. backward tribes who were listed in the Constitution and provided with reservations (7.5%) in government jobs. For 1999-00, 'Others' includes Other Backward Classes (i.e. groups other than Scheduled Castes who were included in another list eligible for reservations in 1989).

Table 1b: Work Force Participation Rates for Males and Females in Urban India

Year	Category of Work	Male	Female
1983	Principal status	500	120
1987-88	Principal status	496	118
1993-94	Principal status	513	121
1999-00	Principal status	513	117

Source: Sarvekshana, 87th Volume, GOI. [Nos. in %]
Notes: Numbers are Number of persons employed per 1000 persons according to the usual status for all of India. 'Usual status' includes persons who had, for a relatively longer period of the year, either worked or were looking for work, and also those from among the remaining population who had at least for some time with some regularity.

Table 2a: Summary Statistics by Gender and Caste

	1983		1999-00		1983		1999-00	
	Female	**Male**	**Female**	**Male**	**SC**	**Non-SC**	**SC**	**Non-SC**
Real Weekly Earnings (Rs.)	80.1	296.3	133.6	401.2	208.1	274.1	308.5	369.9
Earnings Ratio	0.27		0.33		0.76		0.83	
Age	31.6	33.3	31.6	34.5	32.7	33.1	32.9	34.3
Proportion (%)								
No formal	2.2	2.7	0.9	0.8	2.9	2.6	2.3	0.6
Below Primary	9.6	12.4	10.7	10.2	18.3	11.3	15.4	9.5
Primary	17.8	20.3	17.8	13.8	19.9	20.0	16.1	14.1
Middle	11.8	19.4	17.2	19.6	15.6	18.7	22.5	18.7
Secondary	9.7	20.1	15.2	30.0	9.7	19.8	18.1	29.3
Other Grad	2.2	6.1	5.5	11.2	0.5	6.2	2.8	11.5
Married	56.7	70.6	55.7	71.5	73.7	68.1	69.7	69.1
N	1043	6591	888	5157	840	6794	794	5251

Table 2b: Summary statistics of Trade measures

	Phase 1 (1980-85)	Phase 2 (1986-90)	Phase 3 (1991-95)	Phase 4 (1996-00)
Average Effective Rate of Protection	115.1	125.9	80.2	40.4
Average Import Coverage Ratio	97.6	91.6	37.9	24.8
Average Import Penetration Ratio	0.10	0.11	0.12	0.16

Source: Das (2003)

Table 3a: Individual Level Results for Entire Sample (Hindus only)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Female	-0.772*** (.083)	-0.590*** (.124)	-0.522*** (.110)	-0.382** (.147)	-0.336*** (.122)	-0.163 (.184)	-0.049 (.231)	-0.128 (.269)
Low Caste	0.087* (.044)	0.136*** (.049)	0.117*** (.044)	0.050 (.056)	-0.088 (.075)	-0.291** (.129)	-0.293*** (.104)	-0.314*** (.113)
ERP		-0.086*** (.021)	-0.107*** (.026)	-0.152*** (.052)	-0.132*** (.044)	-0.134*** (.047)	-0.139*** (.043)	-0.137*** (.043)
ERP x Female		-0.197** (.079)	-0.180** (.074)	-0.234* (.125)	-0.282*** (.102)	-0.389** (.165)	-0.441** (.178)	-0.392* (.206)
ERP x Caste		-0.050*** (.017)	-0.053*** (.018)	-0.031 (.024)	-0.036 (.062)	0.077 (.113)	0.079 (.103)	0.088 (.105)
- IPR								-0.065 (.121)
-IPR x Female								-0.246 (.241)
-IPR x Caste								-0.120 (.271)
PostLib				-0.042 (.042)	-0.045 (.038)	-0.004 (.028)	-0.005 (.027)	-0.002 (.028)
PostLib*Female				-0.148 (.123)	-0.154 (.109)	-0.534*** (.089)	-0.554*** (.094)	-0.517*** (.109)
Post-Lib * Caste				0.066 (.047)	0.103* (.056)	0.653*** (.072)	0.652*** (.081)	0.660*** (.089)
Industry			Yes	Yes	Yes	Yes	Yes	Yes
Industry x PostLib				Yes	Yes	Yes	Yes	Yes
Industry x Female, Industry x Caste					Yes	Yes	Yes	Yes
Industry x PostLib x Female, Industry x PostLib x Caste						Yes	Yes	Yes
Occupation dummies							Yes	Yes
Occupation * Female Occupation * Caste							Yes	Yes
Demographic characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R squared	0.4989	0.5060	0.5442	0.5538	0.5708	0.5777	0.5864	0.5865
No. of Observations	14844	14844	14844	14844	14844	14844	14844	14844

Notes: Dependent variable is log of real weekly earnings of each individual. Numbers in parentheses are standard errors.
All regressions include age (quartic), education, married, head, state, female, caste, education*female, education*caste. * denotes significance at the 10% level, ** denotes significance at the 5% level, *** denotes significance at the 1% level. The standard errors are clustered by industry.

Table 3b: Individual Level Results for Entire Sample (Hindus only)

	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Female	-0.338**	-0.572***	-0.132	-0.559**	-0.689**	-0.677**	-0.606***
	(.165)	(.094)	(.269)	(.242)	(.264)	(.262)	(.187)
Caste	-0.079	-0.010	-0.311***	-0.428**	-.400**	-0.413**	-0.076
	(.088)	(.042)	(.112)	(.183)	(.187)	(.190)	(.088)
ERP	-0.173***	-0.103**	-0.176***	-0.149**	-0.147**	-0.146**	-0.114**
	(.048)	(.045)	(.049)	(.058)	(.058)	(.058)	(.042)
ERP x Female	**-0.267***	-0.111	**-0.388***	-0.009	-0.003	-0.011	**-0.182**
	(.102)	(.069)	(.206)	(.123)	(.126)	(.128)	(.070)
ERP x Caste	-0.035	**-0.099***	-0.090	0.187	0.187	0.192	-0.063
	(.057)	(.031)	(.102)	(.139)	(.137)	(.140)	(.050)
Negative IPR	-0.095	-0.291	-0.094	-0.079	-0.273	0.267	-0.249
	(.115)	(.208)	(.136)	(.143)	(.195)	(.195)	(.196)
-IPR x Female	**-0.416***	**-0.365***	-0.223	0.192	-1.177	-1.042	**-1.720**
	(.123)	(.118)	(.246)	(.329)	(.894)	(.916)	(.731)
-IPR x Caste	-0.071	0.023	-0.095	-0.082	0.234	0.205	0.194
	(.177)	(.158)	(.280)	(.268)	(.608)	(.599)	(.234)
PostLib	-0.028	0.079	-0.003	0.042	0.067	0.048	0.025
	(.045)	(.080)	(.030)	(.067)	(.076)	(.083)	(.074)
PostLib x Female	-0.177*		-0.529***	0.155	0.292	0.193	0.442***
	(.106)		(.108)	(.245)	(.259)	(.311)	(.182)
PostLib x Caste	0.095*		0.656***	0.795***	0.755***	0.702	0.166*
	(.056)		(.088)	(.187)	(.210)	(.214)	(.089)
ERP x PostLib		-0.130		-0.052	-0.060	-0.032	-0.089
		(.099)		(.080)	(.087)	(.096)	(.090)
ERP x PostLib x Female				**-0.823**	**-0.846**	**-0.715***	**-0.565**
				(.351)	(.348)	(.411)	(.271)
ERP x PostLib x Caste				-0.142	-0.134	-0.046	0.055
				(.211)	(.219)	(.216)	(.113)
-IPR x PostLib		0.305			0.308	0.284	0.378
		(.270)			(.247)	(.257)	(.269)
-IPR x PostLib x Female					1.336	1.126	**1.428***
					(.882)	(.900)	(.790)
-IPR x PostLib x Caste					-0.429		-0.257
					(.667)		(.223)
ICR, ICR x Female, ICR x Caste						Yes	Yes
ICR x Post, ICR x Post x Female, ICR x Post x Caste							Yes
Ind x Post x Female; Ind x Post x Caste			Yes	Yes	Yes	Yes	
Occupation; Occupation x Female; Occupation x Caste	Yes			Yes	Yes	Yes	Yes
R squared	0.5801	0.5717	0.5868	0.5875	0.5876	0.5878	0.5881
No. of Observations	14844	14844	14844	14844	14844	14794	14794

Notes: Dependent variable is log of weekly earnings of each individual. Numbers in parentheses are standard errors. The standard errors are clustered by industry. All regressions include age (quartic), education, married, head; state, education x female, education x caste, education x ERP, industry, industry x PostLib, industry x female, industry x caste; Concentration measured by Percentage Change in Number of Firms between 1983 and 1999 relative to 1983; and real gross fixed capital formation.
* denotes significance at the 10% level, ** denotes significance at the 5% level, *** denotes significance at the 1% level.

Table 4a: Individual Level Results for Gender Groups (Higher Caste Hindus Only)

	(1)	(2)	(3)	(4)	(5)	(6)
ERP		-0.086** (.034)	-0.110*** (.032)	-0.070** (.034)	-0.058* (.032)	-0.162*** (.058)
ERP*Female					**-0.205** (.086)	**-0.167*** (.083)
Female	-0.577*** (.040)	-0.586*** (.067)	-0.511*** (.057)	-0.515*** (.056)	-0.324*** (.094)	-0.353*** (.088)
Demographic Variables	Yes	Yes	Yes	Yes	Yes	Yes
Industry			Yes	Yes	Yes	Yes
PostLib				Yes	Yes	Yes
Industry x PostLib						Yes
R squared	0.4742	0.4779	0.5284	0.5289	0.5300	0.5396
No. of Observations	12823	12823	12823	12823	12823	12823

Notes: Dependent variable is log of weekly earnings of each individual. Numbers in parentheses are standard errors. Standard errors are clustered by industry. Sample is restricted to higher castes. Demographic variables include age(quartic), education dummies, married, head. * denotes significance at the 10% level, ** denotes significance at the 5% level, *** denotes significance at the 1% level.

Table 4b: Individual Level Results for Gender Groups (Higher Caste Hindus Only)

	(7)	(8)	(9)	(10)	(11)	(12)	(13)
ERP		-0.153*** (.054)	-0.159*** (.050)	-0.164*** (.052)	-0.148*** (.046)	-0.142*** (.044)	-0.146*** (.045)
ERP x Female		-0.130 (.090)	-0.111 (.089)	-0.091 (.080)	**-0.203*** (.104)	-0.231 (.191)	-0.233 (.191)
Negative IPR	-0.194 (.116)	-0.072 (.122)	-0.082 (.123)	-0.084 (.124)	-0.055 (.117)	-0.075 (.127)	-0.092 (.139)
Negative IPR x Female	**-0.549*** (.187)	**-0.436** (.213)	**-0.430*** (.229)	-0.374 (.291)	**-0.512*** (.154)	**-0.414*** (.233)	-0.396 (.240)
Female	-0.542*** (.047)	-0.407*** (.096)	-0.428*** (.098)	-0.533*** (.103)	-0.347* (.204)	-0.257 (.297)	-0.255 (.297)
Occupation			Yes	Yes	Yes	Yes	Yes
Occupation x Female				Yes	Yes	Yes	Yes
PostLib x Female					-0.113 (.111)	-0.394*** (.115)	-0.394*** (.115)
Industry x Female					Yes	Yes	Yes
Industry x PostLib x Female						Yes	Yes
% Change in No. Firms							Yes
Real Gross Fixed Capital Formation							Yes
R squared	0.5551	0.5571	0.5652	0.5681	0.5799	0.5852	0.5853
No. of Observations	12823	12823	12823	12823	12823	12823	12823

Notes: Dependent variable is log of real weekly earnings. Numbers in parentheses are standard errors. Each regression includes demographic characteristics; industry, industry x PostLib, PostLib, and state dummies. Standard errors are clustered by industry. * denotes significance at the 10% level, ** denotes significance at the 5% level, *** denotes significance at the 1% level.

Table 4c: Individual Level Results for Gender Groups (Higher Caste Hindus Only)

	(14)	(15)	(16)	(17)	(18)	(19)[#]
ERP*Female	**-0.229**[**]	-0.090	-0.092	-0.084	-0.117	-0.126
	(.111)	(.085)	(.084)	(.081)	(.096)	(.095)
-IPR*Female	-0.923	-1.119	-1.112	**-1.229**[*]	**-1.248**[*]	**-1.439**[*]
	(.687)	(.735)	(.736)	(.730)	(.707)	(.739)
Female	-0.522[***]	-0.713[***]	-0.710[***]	-0.703[***]	-0.589[***]	-0.626[***]
	(.132)	(.110)	(.110)	(.108)	(.185)	(.193)
ERP*PostLib*Female	-0.250	**-0.603**[**]	**-0.598**[**]	**-0.584**[*]	**-0.581**[*]	**-0.511**[*]
	(.182)	(.301)	(.301)	(.305)	(.295)	(.292)
-IPR * PostLib* Female	0.645	0.950	0.954	1.058	1.036	-1.088
	(.748)	(.822)	(.821)	(.815)	(.794)	(.798)
Post-liberalization	0.046	0.005	-0.009	0.016	0.015	-0.019
	(.043)	(.078)	(.079)	(.078)	(.079)	(.085)
Post-Lib * Female		0.388[**]	0.386[**]	0.377[**]	0.359[*]	0.426[**]
		(.176)	(.176)	(.178)	(.182)	(.191)
Concentration, GFKF			Yes	Yes	Yes	Yes
Occupation dummies				Yes	Yes	Yes
Occupation * Female					Yes	Yes
R squared	0.5732	0.5735	0.5736	0.5814	0.5824	0.5826
No. of Observations	12823	12823	12823	12823	12823	12786

Notes: Dependent variable is log of weekly earnings of each individual. Numbers in parentheses are standard errors. Sample is restricted to higher castes Standard errors are clustered by industry.
All regressions include demographic characteristics, state, education x female, education x ERP, industry, industry x PostLib, industry x female, ERP, IPR, ERP x PostLib, IPR x PostLib. [#]column 19 includes ICR, ICR x female, ICR x postlib, ICR x postlib x female. [*] denotes significance at 10% level, [**] denotes significance at 5% level, [***] denotes significance at 1% level.

Table 5: Relation between Percentage of Females Employed and the Percentage Change in ERP

Industry	ERP (In %) 1983	ERP (In %) 1999	%Female 1983	% Female 1999	% change ERP
Industries with highest ERP in 1983					
Fabricated Structural Metal Products	428.7	50.6	8.20	10.04	88
Iron & Steel	225.2	51.7	8.11	9.36	77
Cells & Batteries	199.9	61.8	0.00	8.26	69
Synthetic Rubber	173.1	40.6	8.92	10.52	77
Paints, Varnishes	171.7	39.2	6.28	2.46	77
Industries with lowest ERP in 1983					
Agricultural Machinery, Equipments etc	30.4	27.9	3.30	0.00	8.0
Locomotives and Parts	47.1	28.8	4.36	5.57	39
Food and Textile Machinery	48.7	29.3	0.00	4.95	40
Fertilizers and Pesticides	50.8	28.7	2.93	5.57	44
Wires and Cables	51.5	66.5	5.60	1.26	-29

Notes: ERP denotes Effective Rate of Protection. % Female denotes percentage of female workers in each industry.

Table 6: Blinder-Oaxaca Decomposition Results for Gender and Caste groups

	Percentage of total wage gap explained for Gender groups	Percentage of total wage gap explained for Caste groups
1983	37%	94%
1987-88	35%	96%
1993-94	26.6%	100%
1999-00	45.5%	93.8%

Note: These numbers are based on Blinder-Oaxaca decomposition using males and higher castes as the omitted groups respectively for gender and caste groups. The regression models include 5 education dummy variables; 4th order polynomials in age; state, industry, occupation and season fixed effects. All the numbers for gender groups are statistically significant. For caste groups, only 1983 and 1999 numbers are statistically significant.

**Table 7: Individual Level Results for Caste Groups (Male Hindus Only)**

	(1)	(2)	(3)	(4)	(5)
ERP*Caste	**-0.068***	-0.050	-0.051	-0.045	-0.047
	(.039)	(.040)	(.039)	(.041)	(.041)
-IPR*Caste	**-0.425****	-0.376	-0.375	-0.305	-0.302
	(.211)	(.229)	(.228)	(.227)	(.229)
ICR*Caste	0.001	0.002	0.002	0.002	0.002
	(.001)	(.001)	(.001)	(.001)	(.001)
ERP*PostLib*Caste	0.140	0.083	0.080	0.099	0.096
	(.089)	(.095)	(.095)	(.093)	(.092)
-IPR * PostLib* Caste	0.451**	**0.377***	**0.376***	0.304	0.296
	(.205)	(.217)	(.217)	(.211)	(.211)
ICR * PostLib* Caste	-0.000	-0.001	-0.001	-0.001	-0.001
	(.001)	(.001)	(.001)	(.001)	(.001)
Caste	-0.186***	-0.212***	-0.211***	-0.194***	-0.201**
	(.053)	(.061)	(.061)	(.061)	(.080)
Post-liberalization	0.080	0.074	0.083	0.088	0.089
	(.078)	(.076)	(.078)	(.077)	(.077)
Post-Lib * Caste		0.143	0.144	0.142	0.142
		(.115)	(.115)	(.116)	(.117)
Concentration, GFKF			Yes	Yes	Yes
Occupation dummies				Yes	Yes
Occupation * Caste					Yes
R squared	0.5235	0.5236	0.5237	0.5322	0.5323
No. of Observations	13322	13322	13322	13322	13322

Notes: Dependent variable is log of weekly earnings of each individual. Numbers in parentheses are standard errors. Sample is restricted to males. Standard errors are clustered by industry.

All regressions include demographic characteristics, state, education x caste, education x ERP, industry, industry x PostLib, industry x caste, ERP, IPR, ICR, ERP x PostLib, IPR*PostLib, ICR*PostLib.

*denotes significance at 10% level, ** denotes significance at the 5% level, *** denotes significance at the 1% level.

Figure 1: Trends in Effective Rate of Protection
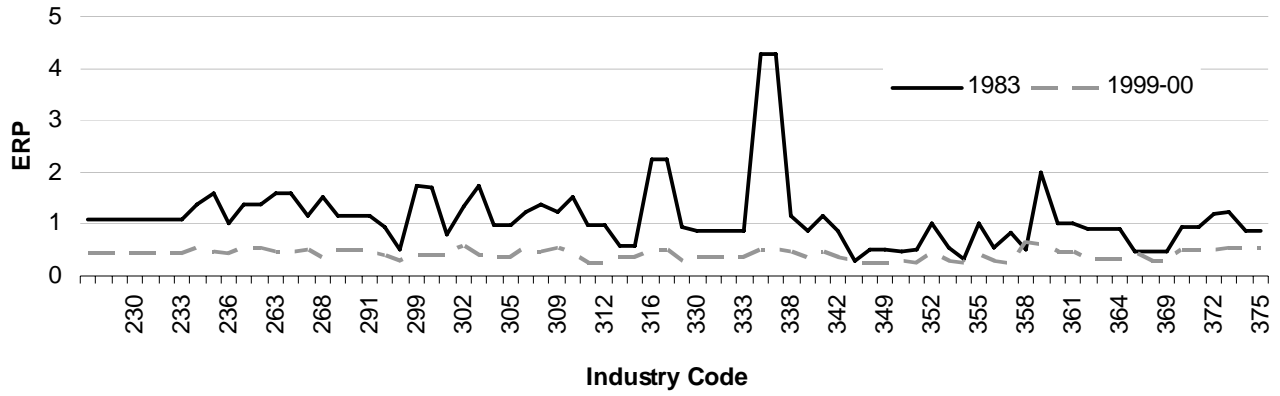
Appendix 1: Data

Table A1: Indian States and Union Territories

	Included States				Other States & Union Territories	
1	Andhra Pradesh	9	Madhya Pradesh	17	Arunachal Pradesh	Andaman & Nicobar Islands
2	Bihar	10	Maharashtra	18	Assam	Chandigarh
3	Delhi	11	Orissa	19	Manipur	Dadra & Nagar Haveli
4	Gujarat	12	Punjab	20	Meghalaya	Daman & Diu
5	Haryana	13	Rajasthan	21	Mizoram	Lakshdweep
6	Himachal Pradesh	14	Tamil Nadu	22	Nagaland	Pondicherry
7	Karnataka	15	Uttar Pradesh	23	Sikkim	
8	Kerala	16	West Bengal	24	Tripura	
				25	Goa	
				26	Jammu & Kashmir	

States 1 to 16 is included in the analysis. The union territories and states listed in 17-26 are not included. Post 2000, Bihar was further divided into Bihar and Jharkhand; Madhya Pradesh was divided into Chattisgarh and Madhya Pradesh; Uttar Pradesh was divided into Uttaranchal and Uttar Pradesh.

Table A2: Manufacturing Industries

Code	Three-Digit Classification	Code	Three-Digit Classification
NIC-87	Description	NIC-87	Description
232	W&F cotton Khadi	331	Iron And Steel in SF form
233	W&F of Cotton- Handloom	332	Ferro Alloys
234	W&F of Cotton-Powerloom	333	Copper Manufacturing
236	Printing of Cotton Textiles	335	Aluminum manufacturing
260	Knitted or Crocheted Textiles	336	Zinc Manufacturing
263	Blankets,Shawl,Carpets& Rugs	338+ 339	Metal scraps & Non Ferrous
265	Textile Garments &Accessories	340	Fab Structural Metal Prods
269	Textile Products nec	341	Fab Structural Metal nec
290	Tanning and Curing of Leather	342	Furniture & Fixtures
291	Leather Footwear		
292	Apparel of Leather & Subs	346	Metal Kitchen Ware
293	Leather Products & Substitutes	343+349	Hand-tools, Weights etc
299	Leather & Fur Products nec	350	Agricultural machinery, Equipments & Parts
300	Organic & Inorganic Chemicals	351	Construction /Mining Machinery
		352	Prime Movers & Boilers
301	Fertilizer & Pesticides	353	Food & Textile Machinery
		354	Other Machinery
		355	Refrigerators & Air conditioners
302+306	Synthetic Rubber & Manmade Fiber	356	General Purpose Machinery
		357	Machine-Tools & Accessories
303	Paints, Varnishes etc	358	Office & Computing Machinery
304	Drugs & Medicines	359	Special Purpose Machinery
305	Perfumes, Cosmetics & lotions	360	Electrical Industrial Machinery
308	Explosives etc	361	Wires & Cables
309	Chemical Products nec	362	Cells & Batteries
310	Tires & Tubes	365+366	Radio & TV
		363	Lamps & Domestic Appliances
311	Rubber & Plastic Footwear	368	Electronic Valves & Tubes
312	Rubber Products nec	369	X-ray Machinery
		370	Ships and Boats
313	Plastic Products nec	371	Locomotives & Parts
314	Refined Petroleum Products	372	Wagons & Coaches
316	Refined Petro Products, nec	373 + 374	Motor Vehicles, Cars & products.
		377	Aircraft & related products
318	Coke Oven Products	379	Transport equipment nec
319	Other Coal Tar Products		
330	Iron and Steel in P/SF form		

Source: Das (2003). Note: nec denotes not elsewhere classified.