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Gender and Labour Market Adjustment to Trade: The Case of India

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Abstract

Standing at 24% in 2018, India's female labour force participation is only half of the global average (48%). At the same time, India has one of the widest gender wage gaps in the world and women are less likely to be employed in the formal sector compared to men. This study focuses on the role of international trade as a source of increased competitive pressure in domestic markets, and how it affects relative wages and formal employment between men and women. Using the Revealed Symmetrical Comparative Advantage index, sectors of comparative advantage and disadvantage are identified and matched on Indian labour force surveys that contain information on sectoral employment and earnings. We find that sectors of comparative advantage in services have the lowest gender wage gap, with women earning 24% less than their male counterpart, while women in manufacturing earned on average 40% less than male workers. The Oaxaca-Blinder decomposition shows that the total gender wage gap in sectors of comparative advantage in services are minor while it is quite substantial in manufacturing, regardless of the comparative advantage. The study concludes that trade goes hand in hand with a smaller gender wage gap in the services sectors as it allows women to leverage their skills better than in manufacturing.

Keywords: Gender, international trade, jobs, earnings.

JEL *Codes*: F16, F14

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1.Introduction

Over the past few decades, India has made strides in narrowing the gender wage gap. The difference in average pay between men and women as a share of average men's wage has come down from 48% in 1993–94 to 34% in 2011–12 (International Labour Organization 2018). Yet, India remains one of the countries with the highest gender wage disparities in the world and one of the lowest female labour force participation at 29% in 2017, compared to 69% in China, 66% in USA and 57% globally.[1] Furthermore, only around 9% of employment is salaried or regular jobs, and of those, women hold 18%. This contrasts with unpaid family workers that account for roughly the same share of the population, 10%, but where there is more gender parity (share of women is 54%). There are certainly multitudes of cultural and institutional factors that determine gender differences in labour market outcomes. This study focuses on the role of international trade in determining relative wages. Trade is assumed to affect the gender wage gap due to different firm responses to increased international competitive pressure.

First, if firms' profit margins come under pressure from foreign competition, they would look for ways to cut costs. Preferences that are unrelated to productivity, such as gender discrimination, will thus contribute to higher unit labour costs, which firms can no longer afford in the face of stronger competition (Becker 1971). This channel is directly related to outright discrimination.

Second, when trade induces the most productive firms to expand and export, the least productive firms will exit the market and those in the middle will only serve the domestic market (Melitz 2003, Nataraj 2011). A possible gender dimension occurs if women are more likely to work in smaller and less productive firms. As trade exposure leads to the exit of small and low-productive firms, the separation rate becomes higher for women than for men. Conversely, as large firms expand into export markets, job creation may benefit men disproportionally if the gender composition of workers remain the same. Firms that are more productive pay higher wages, so the shift in employment from less to more productive firms raises average wages. However, it may also widen the gender wage gap if women are less likely to work in the most productive firms.

Third, trade also lead to increased specialisation and reallocation of workers to sectors of comparative advantage. If the gender composition in employment differs across sectors of comparative advantage and disadvantage, trade liberalization will have a different effect for men and women. For example, women constitute a large part of comparative advantage sectors such as textiles and clothing, making women the winners of trade liberalisation.

Although competitive pressure may increase in all sectors as a result of trade, differences in labour market regulation across manufacturing and services may result in cost differences in wage discrimination. This, in turn, may result in gender-biased reallocation of labour across sectors. To account for such changes, our analysis is conducted separately for manufacturing and services. Given India's industrial structure and gender composition of employment, one would expect that women would gain through the first and third channel but may lose from the second. The net gender effect is an empirical question which this study seeks to answer.

The data available to study gender wage differences across sectors is the Indian National Sample Survey (*NSS) Employment and Unemployment Survey* for the years 2000, 2005, 2010 and 2012. These surveys provide rich information on worker-level characteristics, daily wages, sector of employment and geographic location. Using trade data from World Input-Output Database (WIOD), we calculate revealed symmetrical comparative advantage (RSCA). With this information at hand, we can trace employment patterns by gender, and by sectors of comparative advantage and disadvantage.

[1] See https://www.ilo.org/global/statistics-and-databases/lang--en/index.htm. Earnings statistics are not available for India in the ILO statistics.

The sectors with the strongest comparative advantage are computer services, architecture and engineering, manufacture of chemicals, coke and petroleum, and textiles and clothing. The sectors for which comparative advantage has strengthened over time tend to be high- and medium-skilled manufacturing. The sectors of the strongest comparative disadvantage are legal and accounting services, insurance services, wholesale and retail trade, construction, pharmaceuticals, and manufacturing related to wood, paper and printing. Women's share of employment is higher than average in some of the sectors of comparative advantage, notably textiles, clothing, and chemicals, but otherwise the relationship between comparative advantage and gender shares in employment is not strong.

Labour market adjustments to trade liberalisation at home and abroad may be slow due to India's stringent labour market regulations. For example, firms with more than 99 employees need permission to lay off or reassign workers (The Industrial Disputes Act; The Industrial Employment (Standing Orders) Act, 1946). Firms may therefore hesitate to expand beyond the 99-worker threshold (Gupta, Hasan and Kumar 2009, Besley and Burgess 2004).

In a baseline ordinary least squares (OLS) specification with gender-neutral returns to wage-determining variables, such as education and formal employment, the lowest gender wage gap is found in services sectors with relatively strong RSCAs. In those sectors, women earn 24% less than their male counterpart, while women in manufacturing earned on average 40% less than male workers. An Oaxaca-Blinder decomposition, exposes a minor gender wage gap in services sectors of comparative advantage while the gap is substantial in manufacturing, regardless of comparative advantage status. The decomposition further indicates that women may be over-qualified for their jobs, which is a common strategy to circumvent a biased labour market (Blau och Kahn 2017).

The rest of the study is organised as follows: Section two offers an overview of the Indian economy and labour market and positions this paper in the current literature. Section three describes the data and variables used in the descriptive statistics and subsequent analysis Section four presents the ranking of sectors according to the RSCA index and its developments over time while section five relates this index to various employment patterns and wages, by gender. Section six relates the gender wage gap and formal employment by a sector's comparative advantage using an Oaxaca-Blinder decomposition accounting for worker and job characteristics, while section seven summarizes and concludes.

2. Relation to previous research

Since the seminal work on the economics of discrimination by Becker (1957), there has been a growing literature estimating and explaining the residual gender wage gap, i.e. the difference in wages between equally productive men and women. A comprehensive review of the literature in 2005 (Weichselbaumer and Winter-Ebmer 2005) foud that the mean unexplained gender wage gaps reported in the reviewed studies were on average about 23% in the 1960s compared to 19% in the 1990s. The total gender wage gap in contrast, came down by half (from 51% to 26%) during the same period as women caught up on education, training and experience. The literature consistently finds a lower wage gap in the public sector and the wage gap is larger for married employees. The reviewed studies were mainly from OECD countries.

Previous work on the gender wage gap is based on the assumption that men and women are inherently perfect substitutes in the labour market. Thus, taking into account the effect of different levels of education, age, experience and other personal characteristics, the remaining residual wage gap is considered to be due to discrimination (Juhn, Ujhelyi and Villegas-Sanchez, Men, women, and machines: How trade impacts gender inequality 2014). Work that follows this route and relates it to trade liberalisation in US manufacturing found that trade did increase competitive pressure, which subsequently reduced the gender wage gap (Black and Brainerd 2004).

However, there might be productivity differences across gender in relation to technology. That is, tasks that women have traditionally performed are more likely to complement technology than tasks dominated by

men. For instance, machines that eliminate heavy work that require physical strength may benfit women more than men. Likewise, computers have shifted labour demand from repetitive cognitve tasks such as caluclus and maths, towards tasks that require interaction with other people. Indeed, automation and computers account for a large part of the narrowing of the gender wage gap in rich countries (Black and Spitz-Oener 2010).

It is well known that trade leads to expansion into export markets of the most productive firms, exit of the least productive firms and focus on local markets for firms with productivity levels in the middle. Empirical studies find that exporting firms tend to invest in new technology, which raises productivity and wages. A study analysing the impact of trade liberalisation in Mexico found that firms entering the export market tended to invest in technology that automated some manual tasks for which men had a comparative advantage, raising the relative productivity of women (Juhn, Ujhelyi and Villegas-Sanchez, Men, women, and machines: How trade impacts gender inequality 2014).

A number of studies have found that the narrowing of the gender wage gap has taken place within industries and firms, suggesting that firm heterogeneity and increased competitive pressure are empirically most important (Juhn, Ujhelyi and Villegas-Sanchez, Trade liberalization and gender inequality 2013). In any case, the residual gender wage gap is not uniform across the wage distribution. If the wage gap is higher at the top of the income distribution, a glass ceiling may be present. Conversely, a wider wage gap at the bottom of the distribution indicates a sticky wage floor. Glass ceilings are more common in developed countries, while sticky floors are mainly found in developing countries (ILO, 2015).

From a developing-country perspective, the first wave of globalisation starting in the 1960s and 70s involved an expansion of export-oriented labour intensive manufacturing industries, offering new opportunities for women in the light consumer-goods producing sectors such as textiles, toys and similar (Nordås 2003). Such effects were for instance recently found for Indonesia (Kis-Katos, Pieters and Sparrow 2018). However, with the industrial upgrading to more sophisticated products and more skill-intensive jobs, women were again falling behind. Although women's job opportunties are still vastly better than before developing countries entered international markets in manufacturing, their relative gains levelled off.[2]

In developed countries, trade leads to specialisation in capital-intensive sectors, and in some cases the gender wage gap has widened following trade liberalisation. This is the mirror image of what has been observed for developing countries. For example, a widening gender wage gap was observed in the US and a narrowing gender wage gap in Mexico following NAFTA (Saure and Zoabi 2012).

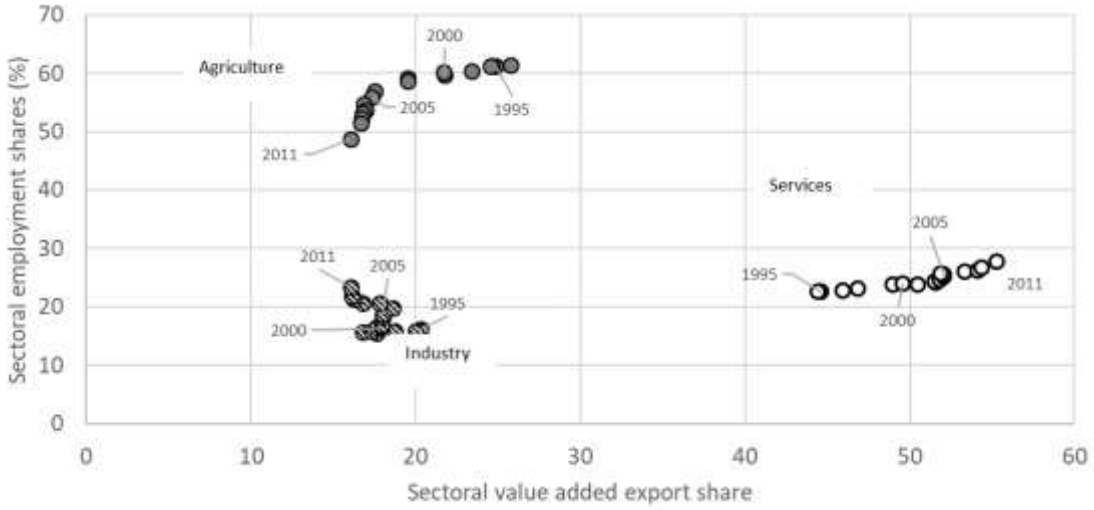
India opened up to international trade somewhat later than the South East Asian economies and did not embark on an export-led industrialisation process. The country thus did not experience a female employment boom similar to that observed first in South Korea and later in China, Vietnam and Bangladesh. Nevertheless, a similar pattern was later observed for services. ICT-enabled back-office jobs were largely filled by women everywhere, including call centers servicing foreign clients (World Bank 2012).

In India, the labour market is segmented by formal and informal sectors, region and gender. Additionally, the gender wage gap varies across the wage distribution. Thus, it declines from about 60 percentage points at the lowest income levels, to about 40 points at the 40th percentile, and then rises back to more than 60 percentage points at the 75th percentile after which it drops sharply to 13 percentage points at the top income level, indicating a sticky floor (Duraisamy and Duraisamy 2016).

Studies on trade and the gender wage gap in India largely investigate increased competition. The results are however mixed. One study found that more competitive pressure from trade in sectors that faced little domestic competition before trade liberalisation was actually associated with a widening gender wage gap (Menon and Rodgers 2009), while another study found that the residual gender wage gap had little to do with openness to trade (Dutta and Reilly 2008).

[2] See for instance the World Bank's World Development Report from 2012, which was devoted to the gender dimension of development.

FIGURE 0.1. LONG-TERM CHANGES IN EMPLOYMENT AND VALUE ADDED EXPORT SHARES, 1995–2011

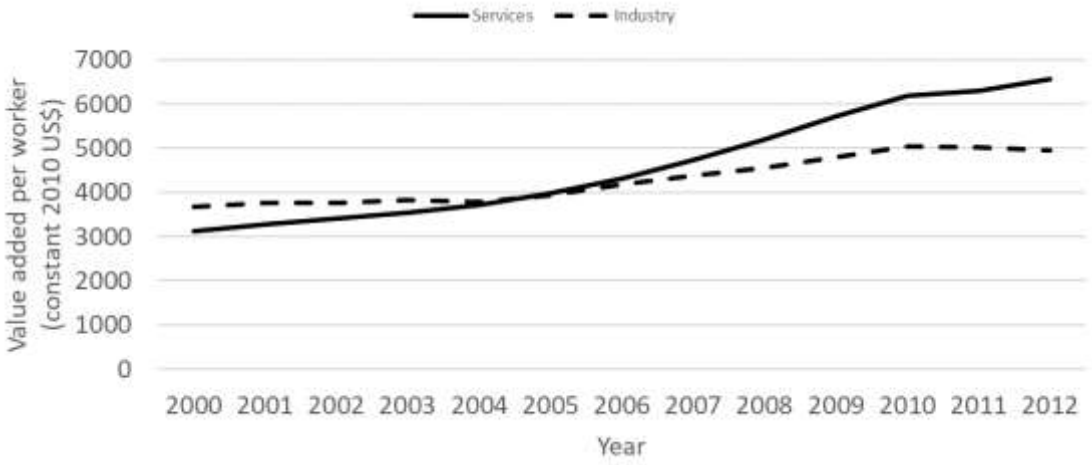


Note: Industry corresponds to ISIC divisions 10–45 and includes manufacturing and non-manufacturing sectors such as mining, construction, electricity, water, and gas.
Source: OECD.org and worldbank.org.

Services have played a major role in India's trade and employment and the expansion of the service sectors has strengthened labour demand for women in particular (Ngai and Petrongolo 2017). Trade may interact with sector-specific labour market changes as competitive pressure is moderated by domestic labour market regulation and industrial policy. In the last two decades, India's service sector exports have grown rapidly unlike manufacturing exports. This development can, in part, be attributed to sector-specific incentive programs such as Software Technology Parks of India and the deregulation of the telecommunication industry (Arnold, et al. 2015). Thus, in addition to differences between sectors of comparative advantage and disadvantage, it can be argued that there are underlying differences in competitive pressure across manufacturing and services due to the regulatory environment.

India differs from most developing countries in its industrial structure. Figure 0.1 depicts employment and export shares by broad sectors over time. Agriculture has declined while services have steadily gained export and employment shares. Interestingly, industry has increased its share in employment even though export shares remain, more or less, unchanged.

FIGURE 0.2. LABOUR PRODUCTIVITY (VALUE ADDED)



Note: Industry corresponds to ISIC divisions 10–45 and includes mining, manufacturing, construction, electricity, water, and gas.
Source: OECD.org and worldbank.org.

From 2000 to 2012, services have overtaken manufacturing in terms of labour productivity, as seen in Figure 0.2. Thus, higher trade activities are related to both higher employment shares and higher productivity in services. This certainly underscores the importance of considering service-sector outcomes in addition to manufacturing outcomes. To the best of our knowledge, this is the first study to analyse the gender dimension of services trade liberalisation in India.

3. Data

The National Sample Surveys (NSS), headed by the National Sample Survey Office collect employment and activity information from a large sample of households, from each of the 29 states and seven union territories of India. The survey is conducted every five years from 1972 and onwards. This paper uses four waves: 50th (1993–1994), 55th (1999–2000), 61st (2004–2005), and 68th (2011–2012). The main outcome variable of interest is the female-to-male wage ratio by 2-digit industries according to the National Industry Classification (NIC). Several data issues are worthy of note.

First, the variable used to identify an individual's activity status, and subsequently the wage rate, refers to a specific reference week, and not the total for the past year.[3] Second, around 11% of the individuals who reported additional subsidiary activities were excluded in the analysis since it would be impossible to disentangle sector-specific effects on wages for these individuals. Third, because individuals divide their time across several activities, total wage and salary earnings were normalised by duration (daily wage rates) to achieve comparability. Fourth, deflation of nominal wage rate was achieved using fixed effects. Fifth and lastly, during the period of analysis, the NIC was updated two times: 2004 and 2008. Although the NIC exists at the 5-digit level, it is not possible to do a perfect conversion between the classifications at that level. Therefore, the analysis is conducted at the 2-digit level, where there are 56 industries in the sample.

Several survey variables at the individual-level are used in the subsequent empirical analysis, such as an individual's age at the time of the survey, education level, household size, marital status, religion, social class, and occupation.

[3] There is also a supplemental variable that reports an individual's *main* activity during the last 365 days but unfortunately there are no wage or salary data associated with this activity.

India has eight years of compulsory schooling, between the ages of six and 14, with secondary education starting at 12 and ending at 18 years old. This study accounts for three education levels, aggregated from an initial 14: below secondary, upper secondary and tertiary education. The latter includes both university and technical (vocational) education. Household size is the number of individuals that lives in the same household as the participant. Married status is a binary variable where non-married individuals include those who have never been married, widows/widowers and divorced/separated. Since religion is specified only for the head of the household, it is assumed that all individuals share the same religion within a household. This should be a reasonable assumption, given that inter-faith marriages only constitute 2.7% of all Indian marriages in 2005 (Goli, Singh and Sekher 2013).

Occupations are reported as an individual's main activity during the reference week and are classified according to the National Classification of Occupations (NCO) at the 3-digit level. Approximately 57% of observations are categorised under an older NCO classification (1968) while the more recent from 2004 applies to the rest (43%). In the older classification, there were 460 occupation categories at the 3-digit level, while there are 114 occupation *groups* in the newer classification (though 2,498 at the 6-digit level). Unfortunately, harmonisation across the older and newer NCO is impossible. For this reason, all occupations are re-classified into seven broad occupational divisions (**Fel! Hittar inte referenskälla.**). Around 8% of occupations could not be classified reliably and were therefore removed. Also removed was a very small share of observations, around 0.65% where the individual did not report any occupation.

Lastly, the survey asks a few retrospective questions regarding changes in participants' labour market status, occupation and job changes, making it possible to calculate labour market transitions, albeit in a limited fashion. Although there is a question about past separations, the reference period is two years, while the rest of the survey questions cover a one-year period. Furthermore, there is no information on the sector in which a separation occurred. For this reason, it is only possible to infer accession rates using other questions. In particular, one question asks a participant how many months they have been unemployed during the last 365 days. If a participant answers strictly less than 12 months, but more than zero, we infer that a participant left a job at some point during the last year. Conditional on a participant being separated at some point during the last 365 days, we infer an accession if they are currently employed. Since it is not possible to observe all job changes during the year, the inferred accession rates are lower bounds.

Sectors in the Indian Labour Force survey are classified according to the National Industrial Classification (NIC) 2004 and 2008, which was then broadly divided into manufacturing and commercial services (henceforth services). Consequently, industries in agriculture and public services such as waste collection, utilities and public administration (including defence) were excluded from the final sample. One reason for excluding the primary sector is the lack of recognized employment (formal or informal) that is attached to salaries. The final sample covers around 50% of workers in India.

In order to explore the trade aspect of labour market outcomes, several different sources were used. First, India's export structure and sectors of comparative advantage are examined by using UNCTAD trade data and associated industry classification in relation to level of skill and technology (Basu and Das 2011). Second, India's labour force surveys are matched with trade data from the World Input-Output Database, WIOD 2016 release, (Timmer, et al. 2015).

4. Revealed symmetrical comparative advantage

To identify sectors of comparative advantage, revealed comparative advantage (RCA) is computed for each sector as follows: the numerator is total Indian exports in sector i, as a share of total Indian exports across all sectors. The denominator is world exports in sectors i, w^i, as a share of total world exports (W) across all sectors.

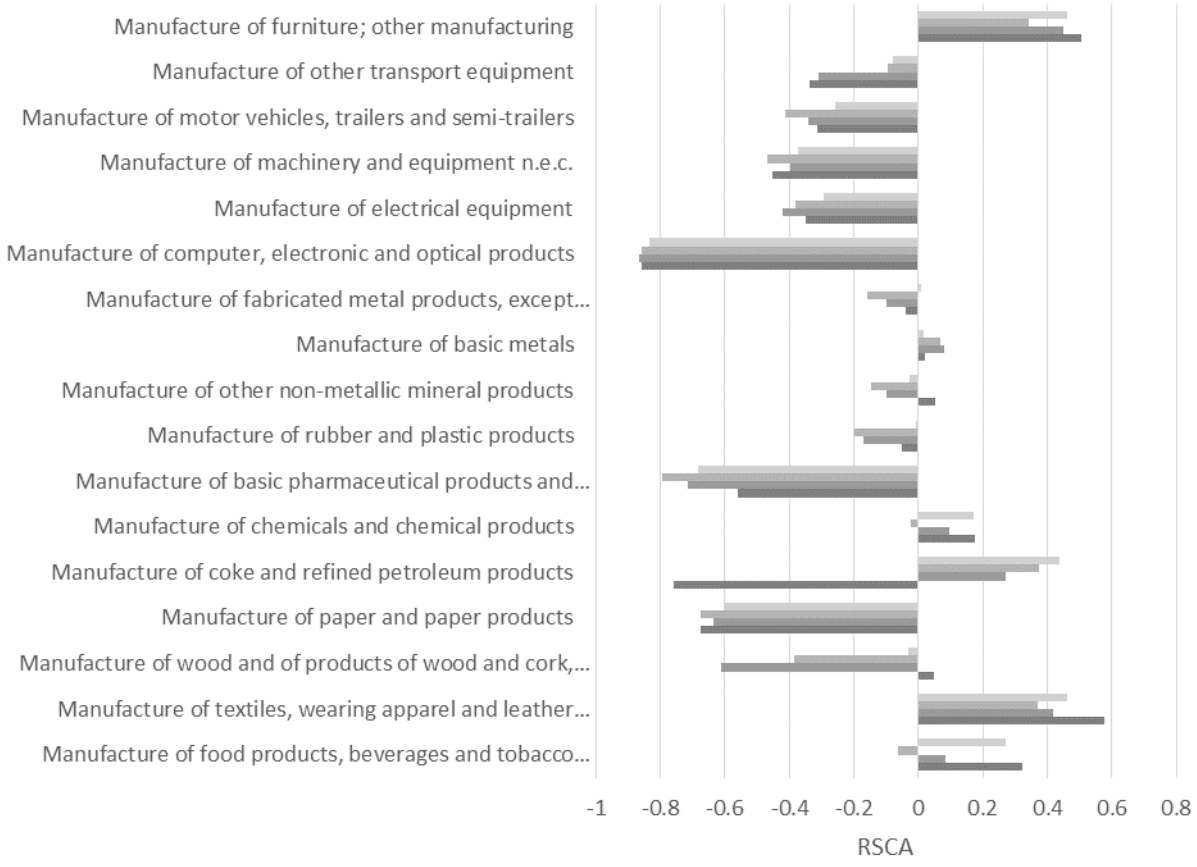
$$RCA = \frac{x^i/X}{w^i/W}$$

As is standard, the RCA is adjusted to become symmetric around zero, giving the *revealed symmetrical comparative advantage* (RSCA). An RSCA value of zero would represent a situation where the country's export share is identical to the world total export share, for this sector (Laursen 2015).

$$RSCA = \frac{RCA - 1}{RCA + 1}$$

Fel! Hittar inte referenskälla. and **Fel! Hittar inte referenskälla.** presents the RSCA index for 1- and 2-digit industry codes (NACE), which were calculated using WIOD. In manufacturing, India appears to have a comparative advantage in chemicals, coke and refined petroleum products, basic metals, furniture, and textiles. In services, their comparative advantage lies mainly in architecture, computer programming, retail trade and land transport.

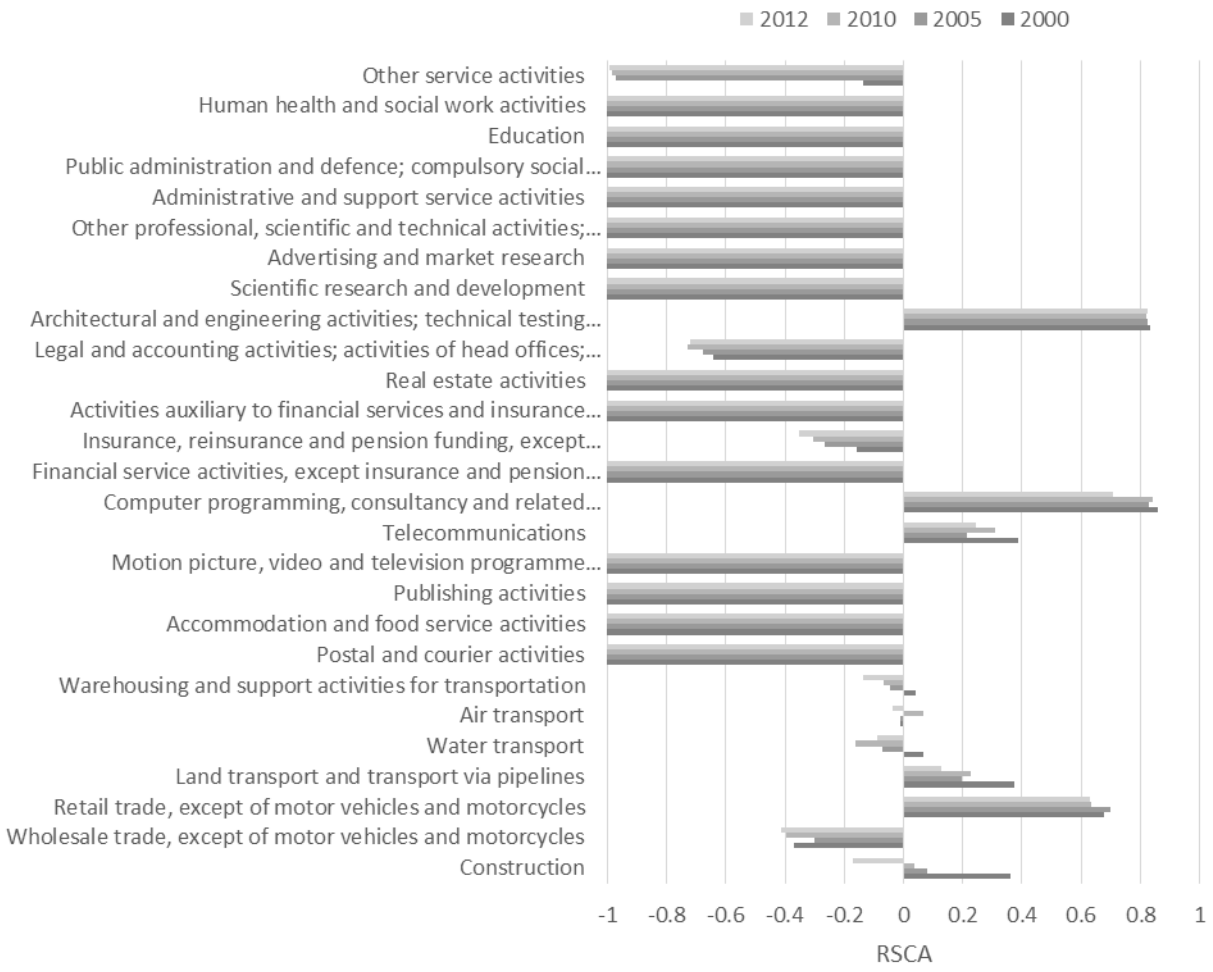
FIGURE 0.3. RSCA: MANUFACTURING



Source: World Input-Output Database.

The figures also reveal that some sectors change from having comparative advantage to comparative disadvantage, and vice versa. For example, manufacture of motor vehicles, trailers and semi-trailers, as well as manufacture of coke and refined petroleum products have revealed stronger comparative advantage over time. Nevertheless, comparative advantage and disadvantage, overall, appears to have been relatively stable over a 12-year period.

FIGURE 0.4. RSCA: SERVICES



Source: World Input-Output Database.

5. Descriptive statistics

This section presents descriptive statistics for some key variables: wages, share of female workers, higher education and, formal employment. Note that, although the RSCA index is a continuous measure with cardinal properties, it will only be used here to identify which sectors have comparative advantage or disadvantage as it has poor ordinal ranking properties (Yeats 1985).

Figure 0.5 shows the distribution of workers by broad economic sector, comparative advantage and gender. In these two broad sectors, the almost 75% of women work in services, while men are distributed equally between manufacturing and services. The largest gender difference is found in sectors of comparative advantage in manufacturing where 37% of women works, compared to 15% of men.

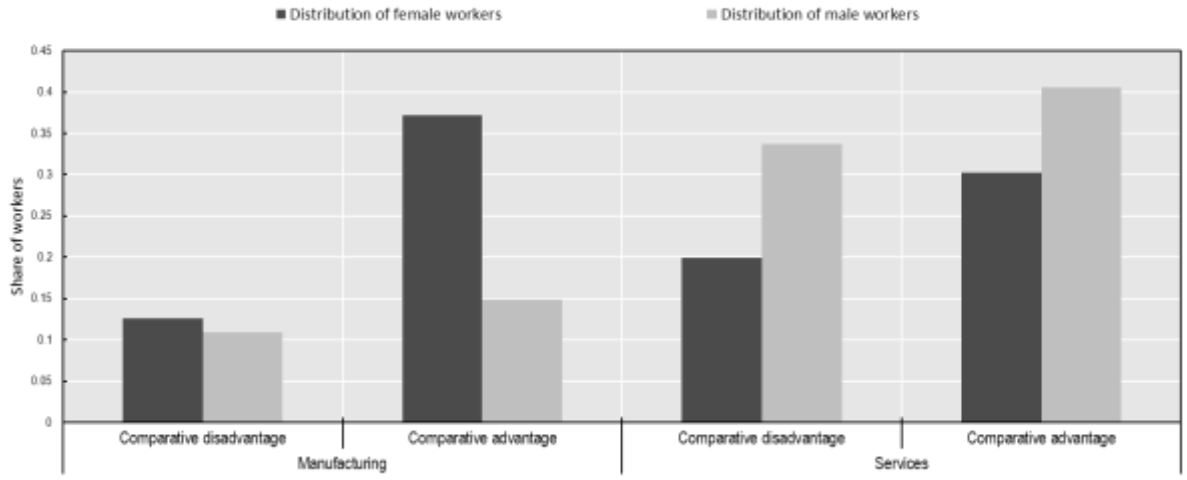
Figure 0.6 reports the average wage of women relative to the average wage of men by broad sector. It shows that the female wage ratio is the highest in services sectors, and in sectors of comparative advantage in particular, where women earn around 90% of male wages. Women's average wages, relative to men, are the lowest in manufacturing sectors with comparative advantage, where women earn 70% of male wages.

Note: Shares calculated using survey weights.

Source: Indian Labour Force Survey, 2000, 2005, 2010, 2012

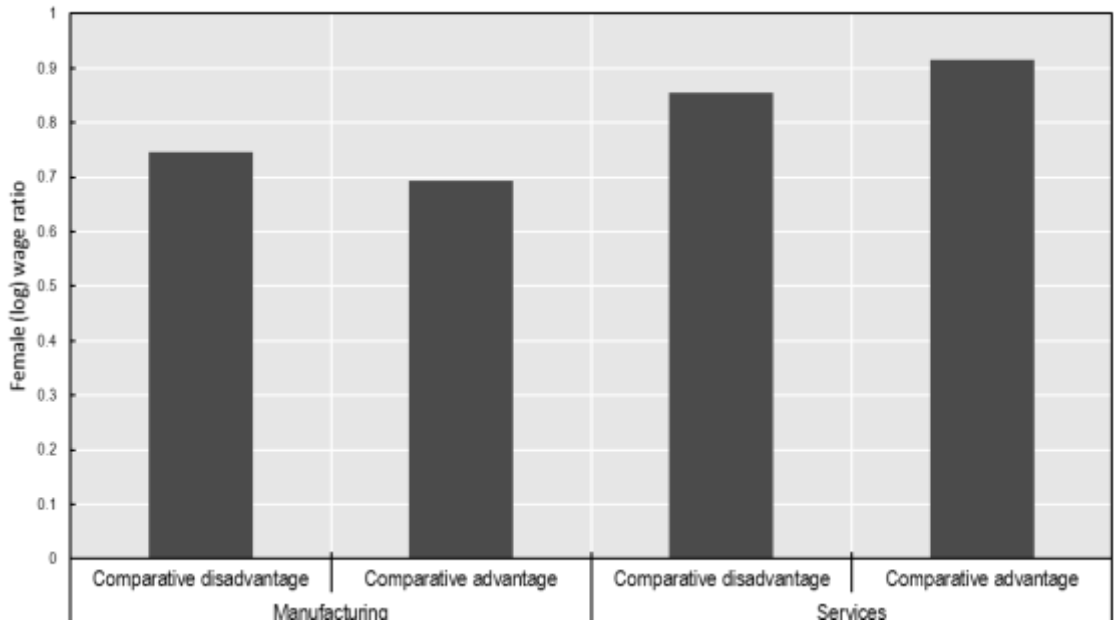
Figure 0.7 plots the share of workers in formal employment by gender and sectors. The largest imbalance in terms of formal employment is found in manufacturing where around 40% of men are formally employed, while only 13–14% of women are in formal employment. Women are better off in services where around 20% are formally employed with little to no difference between men and women.

FIGURE 0.5. DISTRIBUTION OF WORKERS ACROSS SECTORS



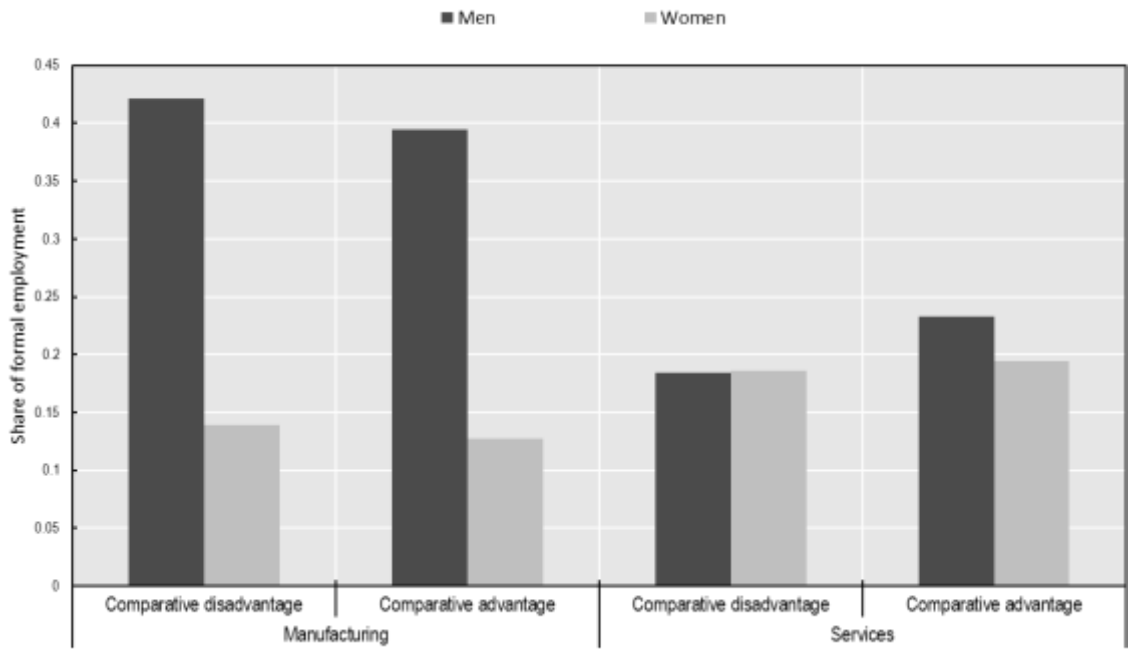
Note: Shares calculated using survey weights.
Source: Indian Labour Force Survey, 2000, 2005, 2010, 2012.

FIGURE 0.6. FEMALE WAGE RATIO



Note: Shares calculated using survey weights.
Source: Indian Labour Force Survey, 2000, 2005, 2010, 2012

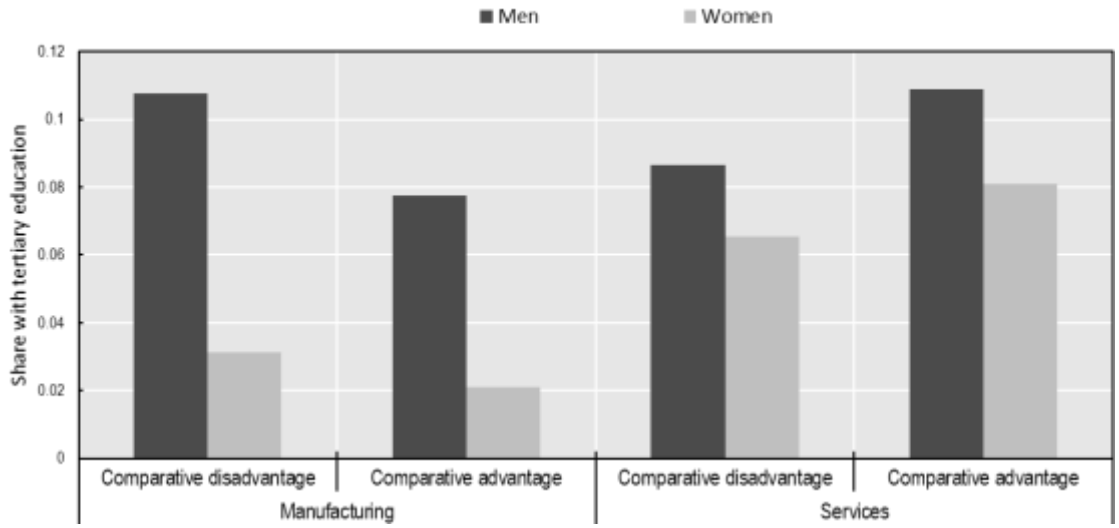
FIGURE 0.7. SHARE IN FORMAL EMPLOYMENT



Note: Shares calculated using survey weights.
Source: Indian Labour Force Survey, 2000, 2005, 2010, 2012.

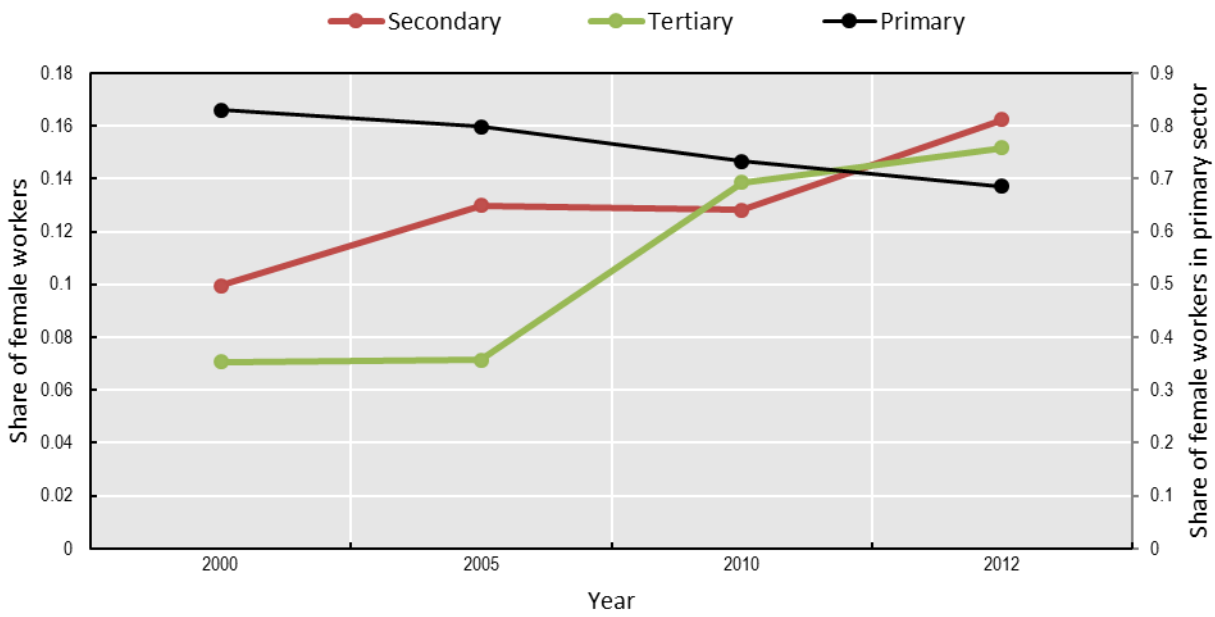
The higher female to male wage ratio reported for services in Figure 5.2 could reflect a smaller skills gap in services. In Figure 0.8, the share of workers with tertiary education is clearly the highest in services sectors of comparative advantage, with around 11% men and 8% women with higher education. Again, the largest gender discrepancy is found in manufacturing where sectors of comparative disadvantage have 11% men with tertiary education compared to only 3% of the women.

FIGURE 0.8. SHARE OF WORKERS WITH TERTIARY EDUCATION



Note: Shares calculated using survey weights.
Source: Indian Labour Force Survey, 2000, 2005, 2010, 2012.

FIGURE 0.9. STRUCTURAL SHIFTS IN EMPLOYMENT, WOMEN



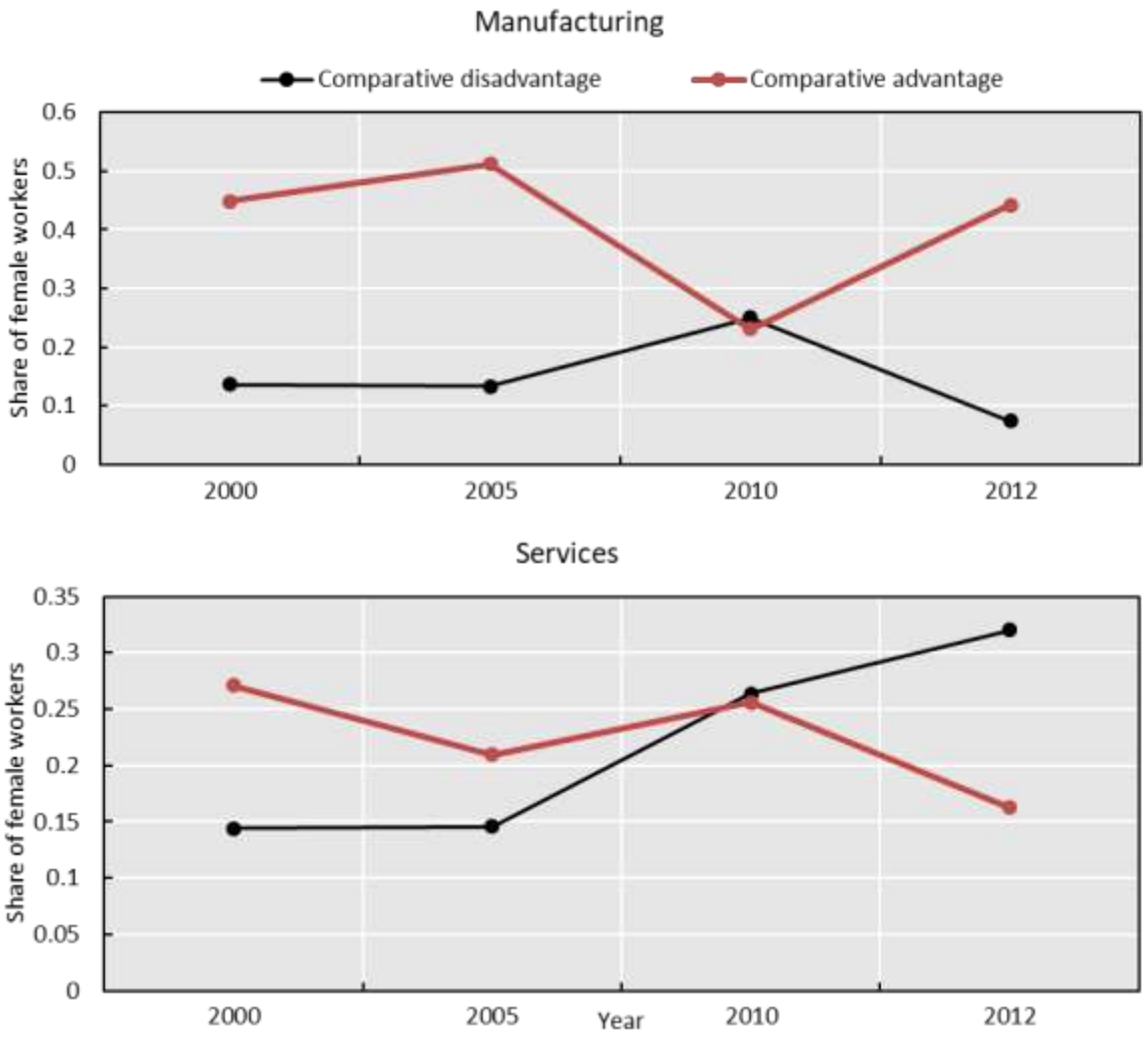
Note: Shares calculated using survey weights.
Source: Indian Labour Force Survey, 2000, 2005, 2010, 2012.

In general, gender discrepancies in terms of wages, formal employment and tertiary education seem to be smaller in services compared to manufacturing. As women tend to work in service-related jobs, it could help to explain the better gender equality in this sector. At the same time, better conditions for women may have attracted more female workers to the services sector. In terms of structural changes, female labour has largely shifted away from the primary sector in favour of work in both secondary and tertiary sectors, as

seen in Figure 0.9. This is in comparison to male workers who primarily relocated to the tertiary sectors (**Fel! Hittar inte referenskälla.**).

However, further decomposing female labour mobility in **Fel! Ogiltig självreferens i bokmärke.** shows that the largest changes in female labour force has been an increase in sectors of comparative disadvantage in services from 14% in 2000 to 32% in 2012. At the same time, there was a relatively large decrease in sectors of comparative disadvantage in manufacturing, from 14% in 2000 to 7.5% in 2012.

FIGURE 0.10. STRUCTURAL SHIFTS BY COMPARATIVE ADVANTAGE, WOMEN.



Note: Shares calculated using survey weights.
Source: Indian Labour Force Survey, 2000, 2005, 2010, 2012

6. Explaining the gender wage gap

Descriptive statistics on the gender wage gap and formal employment are informative in regard to measuring the differences in labour market outcomes between men and women. However, it does not explain the differences taking into account worker characteristics that influence wages such as education and age. To uncover a gender wage gap which takes into account such wage-setting factors, we estimate a wage equation

using OLS. The baseline specification captures the simple difference between men and women through a dummy variable denoted *F* and is specified as follows:

$$W_{i,k} = \gamma F_{i,k} + \mathbf{x}_{i,k}\beta_k + \varepsilon_{i,k}.$$

For each individual *i* in sector *k*, the outcome variable W is the daily wage rate, in logs.[4] **A** vector of wage-setting predictors, **x**, is included to control for factors such as age (linear and quadratic), education levels (no education, primary, upper secondary and tertiary), household size, area (urban or rural), marital status (married or not), and occupation. The model also accounts for regional differences, such as labour market policies, between all 35 states and union territories of India, excluding the newly formed state Telangana, which separated from Andhra Pradesh in 2014. This equation is estimated separately for manufacturing and services and, further by comparative advantage or disadvantage.

The simple OLS approach, however, assumes that the return to wage-determining variables is the same for both men and women. In order to further examine the gender wage gap, this assumption is relaxed. A common method for explaining differences in the mean outcome of a variable between two groups is the Oaxaca-Blinder decomposition (Oaxaca 1973). For each group, in this case men and women, a separate wage-setting equation is estimated, where the resulting wage difference is referred to as the residual wage gap.

The wage gap is estimated by taking the coefficients in the men's wage equation and use it in the women's in order to generate women's counterfactual wages. That is, the wage women would have received if women's wages were determined in the same way as men's wages. It is then decomposed into three sources. The first source of the wage gap are differences in wage-determining variables, or endowments, between men and women. The second part are differences in the returns to these variables, simply by being a man or a woman, referred to as coefficient effects. Significant gender differences in coefficients are commonly interpreted as gender discrimination. Note however, that this second part of the wage gap should be interpreted with caution as the empirical model may not fully capture all relevant factors that explain received wages. The third source is an interaction effect that takes into account the additional impact when there are differences in observable variables combined with differences in their returns on wages. The Oaxaca-Blinder decomposition of the expected wage difference between men and women is thus decomposed as follows:

$$D = \underbrace{\left[\mathrm{E}(X_m) - \mathrm{E}(X_f)\right]'\beta_f}_{Endowment} + \underbrace{\mathrm{E}(X_f)'(\beta_m - \beta_f)}_{Coefficient} + \underbrace{\left[\mathrm{E}(X_m) - \mathrm{E}(X_f)\right]'(\beta_m - \beta_f)}_{Interaction}$$

under the standard assumption $\mathrm{E}(\varepsilon_{i,k}) = 0$.

Lastly, it should be noted that the analysis is conducted on a sample of only employed persons. In India, as in many developing countries, there is a high probability that an individual is employed, given that the individual is part of the labour force. However, as already mentioned, one of the primary issues in India is the low female labour force participation, which means that subsequent results stem from relatively small group of working women.

Fel! Hittar inte referenskälla. presents the results of the baseline model of the gender wage gap. By including a gender variable in the model (row?? 1), it measures the wage difference between men and women, accounting for differences in wage-determining factors such as education, assuming that all other variables have the same marginal effect on men and women's wages. The average pay gap in manufacturing

[4] The wage rate distribution is heavily skewed to lower wages, as expected.

is estimated at around 40% lower wages for women and on average 28% in services.[5] There is, however, a relatively smaller gender wage gap in sectors of comparative advantage.

Age, rural areas, and marital status have relatively small effect on wages, though they are statistically significant, especially in comparison with tertiary education. Tertiary education is, as expected, highly influential in determining wages in all sectors, with those workers earning around 67% higher wages compared to those with only primary education (reference category). Having a full-time job matters most in comparative advantaged sectors across both manufacturing and services, with such workers receiving around 30–40% higher wages than those on other types of contracts (part-time or fixed term contracts). Plant size have substantial effect on wages in services sectors of comparative advantage, where workers in large plants (above 20 employees) on average earn 60% higher wages than those in smaller plants. However, plant size does have significant effects overall. Workers in formal employment have around 20% higher wages, except in services sectors of comparative disadvantage, where formal employment appears to have minor influence on wages.

In the next step, the assumption of gender-neutral marginal effects of wage-determining factors is relaxed. For example, tertiary education may not give rise to the same job and wage opportunities for women as for men, for a variety of reasons, such as gender discrimination. In this event, Oaxaca-Blinder is an appropriate method.

Figure 0.11 presents the total wage gap from an Oaxaca-Blinder decomposition (full set of results can be found in 0). The total wage gap is smallest in services sectors, in general, and in the comparative advantage sectors, in particular, though it is not statistically significant. In manufacturing, men have, on average, 76% higher wage than women and the differences are statistically significant.

Decomposing the total wage gap into endowment and coefficient effects in Figure 0.12 shows a negative endowment effect in service sectors of comparative advantage. That is, women in these industries with the same score on observable wage-determining variables as men, receive 20% lower wages. Since the actual wage gap is much smaller in this sector, a possible explanation is that women might compensate, for example in terms of education, to circumvent gender bias. Especially since men obtain around 32% higher returns on the factors that determine wages. Overall, in all other sectors, men have substantially higher returns on wage-determining factors.

The following graphs show the decomposition for two important determinants of wages, namely tertiary education, and formal employment. There is little difference in returns on tertiary education between men and women, but a larger difference in endowments, as seen in

[5] Correct non-linear marginal effects were obtain as follows: $\left(e^{\beta}-1\right)\cdot 100$

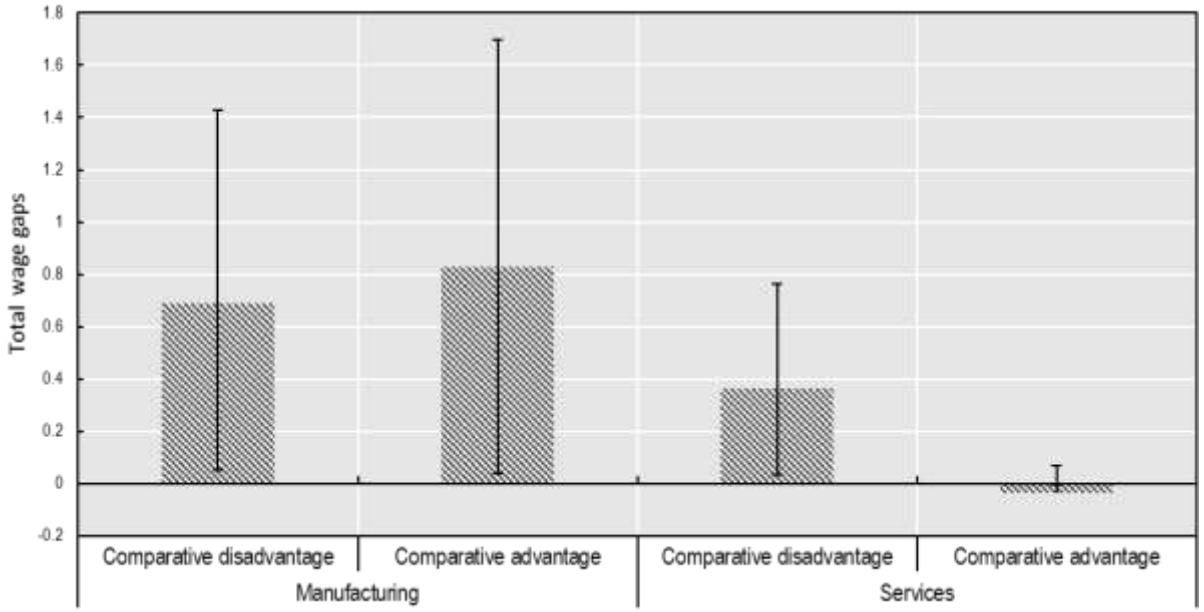
Figure 0.13. If women had the same level of tertiary education as men in services sectors of comparative advantage, they would receive 9.6% lower wages. Thus, it seems as the wage differentials depicted in Figure 0.11 is, in large part, constrained by the fact that a large share of women have higher education.
Lastly, Figure 0.15 shows gender differences in the share of workers in formal employment (salaried). The gender differences, in general, are minor, but significant except in services sectors of comparative advantage. Differences in endowments is the largest in manufacturing sectors of comparative disadvantage where women's wages would increase by 6.6% if they were formally employed at the same rate as men. It is only in this sector where the gender difference is attributed to endowments rather than returns. In all other sectors, there are notably higher returns for men compared to women from being formally employed.

TABLE 0.1. RESULTS–THE SIMPLE GENDER WAGE GAP
Dependant variable: log hourly wage

	Manufacturing		Services	
VARIABLES	Comparative disadvantage	Comparative advantage	Comparative disadvantage	Comparative advantage
Woman	-0.446***	-0.540***	-0.386***	-0.271***
	(0.0313)	(0.0200)	(0.0164)	(0.0332)
Age	0.0415***	0.0494***	0.0268***	0.0428***
	(0.00523)	(0.00489)	(0.00320)	(0.00552)
Age (sq)	-0.000385***	-0.000551***	-0.000266***	-0.000391***
	(6.72e-05)	(6.44e-05)	(4.21e-05)	(7.14e-05)
No education	-0.155*	-0.357	0.338***	0.631
	(0.0842)	(0.428)	(0.0977)	(0.406)
Upper secondary education	0.247***	0.245***	0.175***	0.213***
	(0.0334)	(0.0280)	(0.0207)	(0.0216)
Tertiary education	0.462***	0.523***	0.564***	0.508***
	(0.0404)	(0.0414)	(0.0290)	(0.0316)
Large plant (>20 workers)	0.199***	0.209***	0.260***	0.460***
	(0.0191)	(0.0156)	(0.0200)	(0.0236)
Formal employment	0.168***	0.133***	0.0507***	0.159***
	(0.0203)	(0.0153)	(0.0184)	(0.0213)
Rural	-0.0691***	-0.155***	-0.145***	-0.150***
	(0.0210)	(0.0164)	(0.0108)	(0.0161)
Full time employment	0.0309	0.292***	0.138***	0.351***
	(0.0532)	(0.0469)	(0.0343)	(0.111)
Married	0.0873***	0.0930***	0.0786***	0.0781***
	(0.0265)	(0.0196)	(0.0125)	(0.0233)
Constant	1.550***	1.130***	1.936***	0.766***
	(0.125)	(0.119)	(0.0840)	(0.154)
Observations	11,682	14,905	31,375	19,993
R-squared	0.658	0.640	0.650	0.639

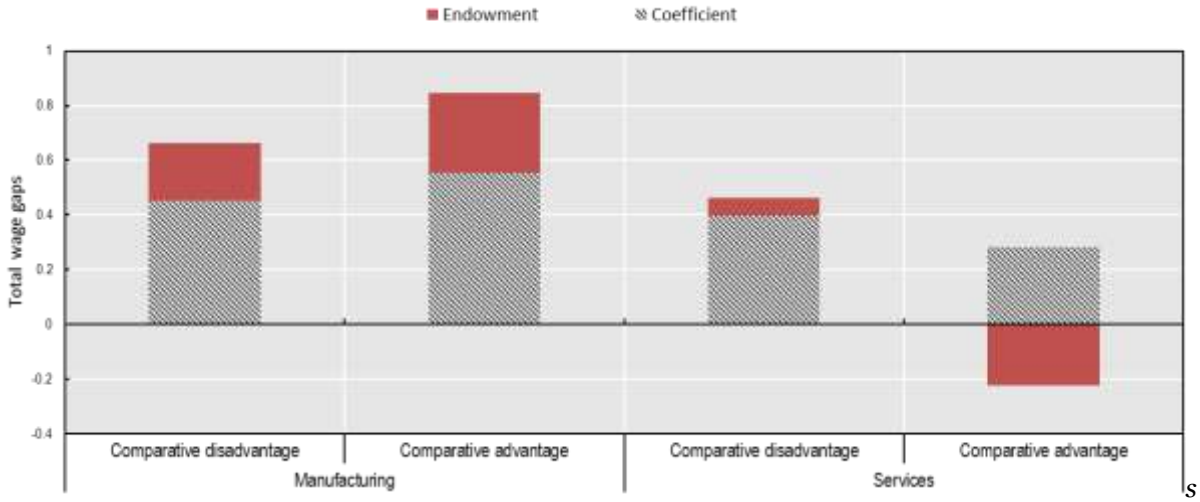
Note: Fixed effects include: industry, year, occupations, state, household size, and land ownership. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Source: Indian Labour Force Survey, 2000, 2005, 2010, 2012

FIGURE 0.11. OAXACA-BLINDER RESULTS–TOTAL WAGE GAP



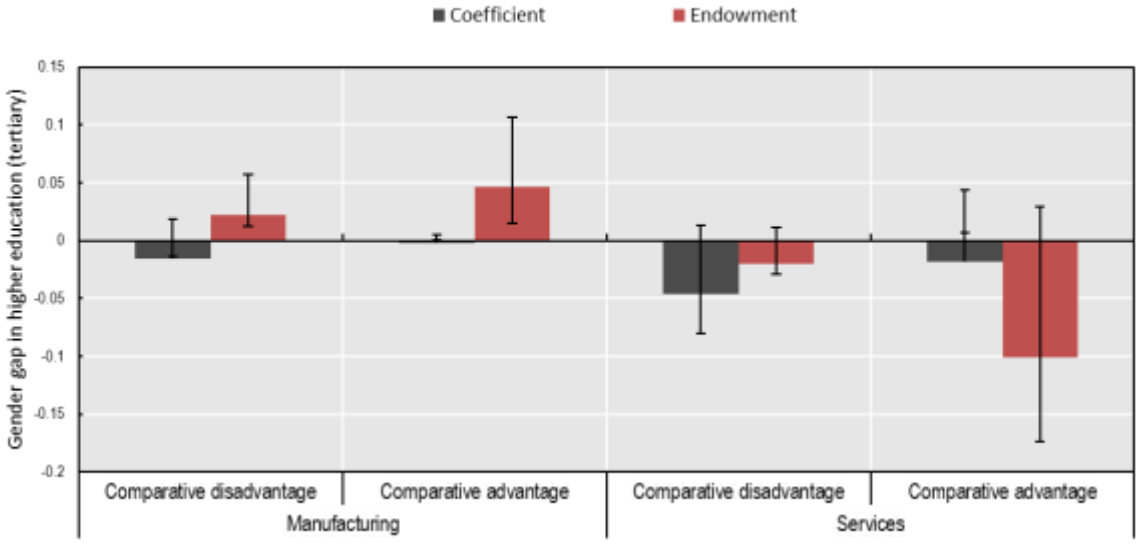
Note: Fixed effects include: industry, year, occupations, state, and land ownership. 95% confidence intervals are included. For detailed results see 0.
Source: Indian Labour Force Survey, 2000, 2005, 2010, 2012.

FIGURE 0.12. OAXACA-BLINDER RESULTS–DECOMPOSITION OF TOTAL WAGE GAP



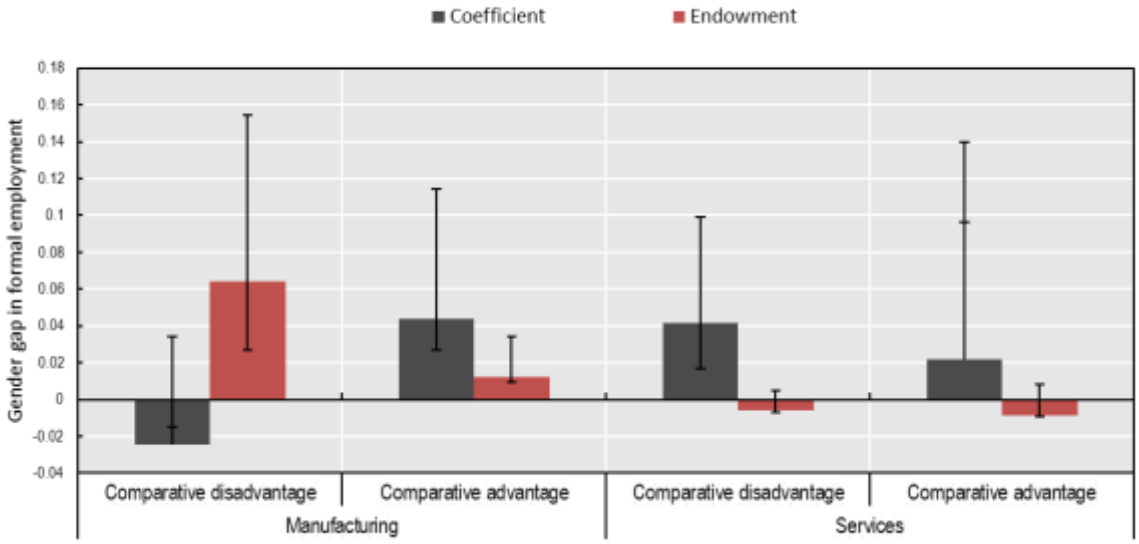
Note: Fixed effects include: industry, year, occupations, state, and land ownership. 95% confidence intervals are included. For detailed results see 0.
Source: Indian Labour Force Survey, 2000, 2005, 2010, 2012.

FIGURE 0.13. OAXACA-BLINDER RESULTS–DECOMPOSITION OF THE GENDER GAP IN HIGHER EDUCATION



Note: Fixed effects include: industry, year, occupations, state, and land ownership. 95% confidence intervals are included. For detailed results see 0.

FIGURE 0.14FIGURE 0.15. OAXACA-BLINDER RESULTS–DECOMPOSITION OF THE GENDER GAP IN (FORMAL) EMPLOYMENT GAP



Note: Fixed effects include: industry, year, occupations, state, and land ownership. 95% confidence intervals are included. For detailed results see 0.
Source: Indian Labour Force Survey, 2000, 2005, 2010, 2012

We finally estimate the gender gap in wages and formal employment for one of the most important sectors of comparative advantage for manufacturing and services respectively namely textiles and computer programming. Around 34% of textile workers are women, but **Fel! Hittar inte referenskälla.** shows that men earn around 61% more than women in that sector do. In contrast, only 15% of women work in the computer programming sector, but the wage difference is only 5% higher for men, and statistically insignificant. Men are 21% more likely to be employed formally in textiles compared to women, while in computer programming, women are slightly more likely to be in regular employment. Table 7.2 shows that there are large differences across sectors. .

TABLE 7.2. COMPARATIVE ADVANTAGE SECTORS: TEXTILES AND COMPUTER PROGRAMMING

	Wages				Salaried employment			
	Textiles		Computer programming		Textiles		Computer programming	
Difference	1.618***		1.047		0.209***		-0.0531***	
	(-0.0374)		(-0.0677)		(-0.00591)		(-0.0174)	
Explained		1.036**		1.075		0.110***		-0.0583***
		(-0.0169)		(-0.0474)		(-0.00502)		(-0.0134)
Unexplained		1.563***		0.975		0.0993***		0.0052
		(-0.0292)		(-0.0464)		(-0.00511)		(-0.0175)
Observations	7,369	7,369	1,609	1,609	21,604	21,604	1,901	1,901

Note: Explained differences, only. *** p<0.01, ** p<0.05, * p<0.1. Coefficients for log daily wage rate are shown in the form exp(β). Fixed effects included for states, occupations, firm size, sector of main activity, household size and year.

7. Concluding remarks

This study has examined the relationship between trade as measured by revealed comparative advantage and the gender wage gap in India. As a developing country with a rapidly growing economy, it is important to level the playing field for women to encourage increased labour force participation, especially considering that India has one of the lowest participation rates in the world. One factor that influences women's decision to join the labour force is wage equality. However, despite the fact that rigorous anti-discrimination laws are in place, the gender wage gap remains high.

To analyse the relationship between gender gaps and trade, in the face of limited worker-level data, this paper approach the question by identifying sectors of comparative advantage and disadvantage using the revealed symmetrical comparative advantage index..

The gender wage gap is assumed to be affected by increased international competitive pressure through three channels: first, firms must cut costs to increase efficiency. Gender discrimination will thus become less affordable since wage premiums on gender preferences are unrelated to productivity. Second, less productive firms will exit. If female workers are mostly employed in less productive firms, women may experience higher turnover rates. Third, trade may lead to gender-biased expansion of firms. If a large share of female workers is found in India's comparative advantage sectors, female employment may rise. Our analysis explores, first, to what extent gender biases vary by comparative advantage status. Second, we study gender biases regarding the marginal impact of wage determining variables such as education, and whether there are systematic differences across sectors of comparative advantage or disadvantages. Assuming that gender biases are less sustainable when under competitive pressure, we can also infer how comparative advantage is related to competitive pressure in the labour market, and thus the channels through which gender biases may be affected by trade.

An initial baseline analysis estimates a simple gender wage gap using an OLS specification with gender-neutral returns to wage-determining variables, such as education and formal employment. We show that this simple gender wage gap is smallest in services sectors of comparative advantage. Although there is still a gender wage gap in favour of men, women earn 24% less than their male counterpart, which is still substantially better than women in manufacturing who earned on average 40% less than male workers. Also as expected, there are significant gender wage gaps among workers with higher education and those in formal employment.

Oaxaca-Blinder decomposition allows each explanatory variable to vary with gender, relaxing the assumption of gender-neutral returns. The Oaxaca-Blinder decomposition shows that the total gender wage gap in services sectors of comparative advantage are small while it is quite substantial in manufacturing, regardless comparative advantage. The decomposition further indicates that female workers in services sectors of comparative advantage most likely compensate for lower wages all else equal by attaining a higher level of education.

There is no significant wage difference among workers in formal employment in services sectors of comparative advantage. However, manufacturing sectors of comparative advantage, women's wages would be 6.6% higher if they were formally employed at the same rate as men. In all other sectors, there are significantly higher returns for men compared to women by being formally employed. Overall, gender discrepancies are the smallest in services.

Taken together, service sector employment seems to go hand in hand with a smaller gender wage gap, and even more so for services sectors of comparative advantage. These results would suggest that the labour market in services is sufficiently competitive for women to be able to leverage higher education. More open markets coupled with policies that support girls to attain better skills, may aid in meeting future labour demand in India. Especially as manufacturing is already seeing skill-biased technological change, which will only continue to advance.

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Annex

TABLE A FEL! INGEN TEXT MED ANGIVET FORMAT I DOKUMENTET.**.1. DESCRIPTIVE STATISTICS**
Key control variables

	Manufacturing		Services	
Variables	Comparative disadvantage	Comparative advantage	Comparative disadvantage	Comparative advantage
log daily wages	2.528	2.368	2.487	2.460
Age	35.544	34.428	35.357	36.338
Primary education	0.809	0.864	0.848	0.785
Upper secondary education	0.098	0.077	0.067	0.109
Tertiary education	0.093	0.059	0.084	0.106
Working in a large plant (>20 workers)	0.237	0.182	0.086	0.052
Rural	0.554	0.486	0.609	0.465
Full time employment	0.949	0.903	0.965	0.962
Married	0.756	0.726	0.764	0.762
Owns land	0.902	0.910	0.948	0.902

Source: Indian Labour Force Survey, 55th (1999–2000), 61st (2004–2005), 66th (2009–2010) and 68th (2011–2012).

Table A **Fel! Ingen text med angivet format i dokumentet.**.2. Excluded industries

Industry	Share of workers	Share of women
Crop and animal production, hunting and related service activities	52.25	35.1
Forestry and logging	0.33	34.8
Fishing and aquaculture	0.35	11.3
Mining and quarrying	0.66	14.9
Electricity, gas, steam and air conditioning supply	0.26	6.8
Water collection, treatment and supply	0.06	4.7
Sewerage; waste collection, treatment and disposal activities; materials recovery; remediation activities and other waste management services	0.13	33.8
Public administration and defence; compulsory social security	2.33	34.7
Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	0.57	68.0
Activities of extraterritorial organizations and bodies	0	21.1

Note: Each column shows the percentage for the whole economy.
Source: Indian Labour Force Survey, 55th (1999–2000), 61st (2004–2005), 66th (2009–2010) and 68th (2011–2012).

TABLE A FEL! INGEN TEXT MED ANGIVET FORMAT I DOKUMENTET..3. MAJOR OCCUPATIONS

Division	Description
1	Administrators, Managers
2	Professionals, Associate Professionals
3	Clerks and Related
4	Sales and Service Workers
5	Skilled Agriculture and Fishery workers
6	Craftsmen, Machine Operators
7	Labourers, Unskilled Workers

Source: http://econdse.org/deepti-miscellaneous/.

FIGURE A FEL! INGEN TEXT MED ANGIVET FORMAT I DOKUMENTET..1. STRUCTURAL SHIFTS IN EMPLOYMENT, MEN

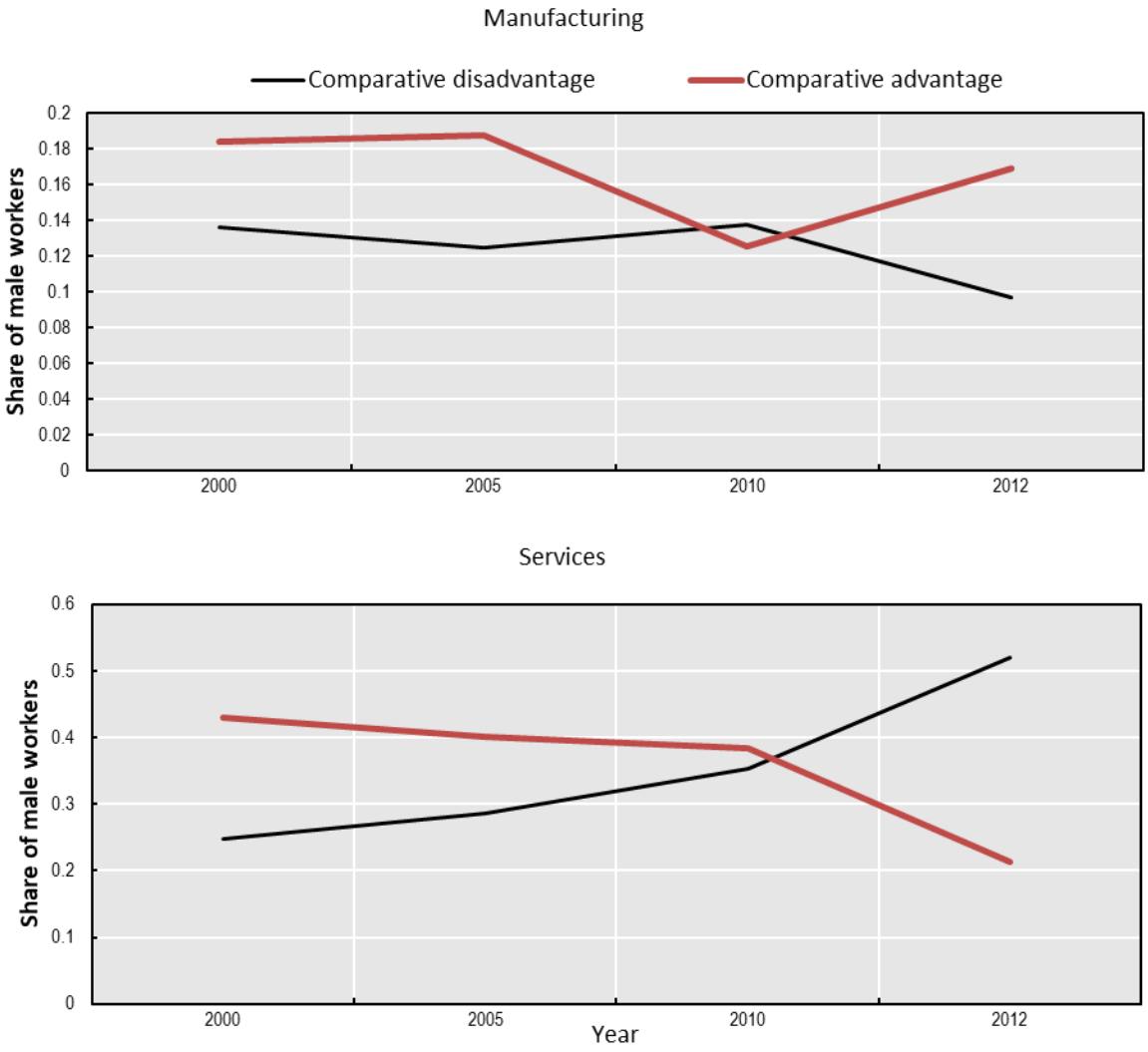
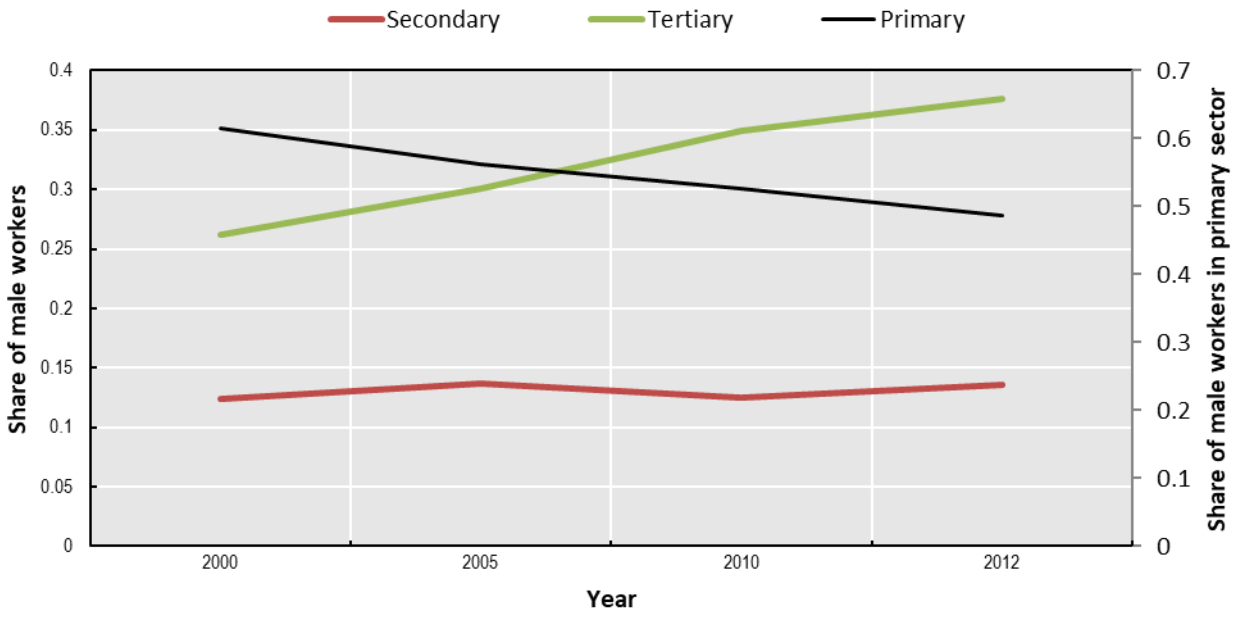


FIGURE A FEL! INGEN TEXT MED ANGIVET FORMAT I DOKUMENTET..2. STRUCTURAL SHIFTS IN EMPLOYMENT, MEN



Note: Shares calculated using survey weights.
Source: Indian Labour Force Survey, 2000, 2005, 2010, 2012.

TABLE A FEL! INGEN TEXT MED ANGIVET FORMAT I DOKUMENTET..4. OAXACA-BLINDER DECOMPOSITION–WAGES

Note: Fixed effects include: industry, year, occupations, state, household size, and land ownership. Robust standard errors in parentheses *** p<0.01, ** p<0.05,

	Manufacturing						Services					
	Comparative advantage			Comparative disadvantage			Comparative advantage			Comparative disadvantage		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	Endowments	Coefficients	Interaction	Endowments	Coefficients	Interaction	Endowments	Coefficients	Interaction	Endowments	Coefficients	Interaction
Age	0.0134	0.786***	0.00960	-0.0317***	0.0551	-0.00193	0.0329*	0.632	0.0278	-0.00517	1.072***	-0.00928
	(0.00877)	(0.216)	(0.00661)	(0.00805)	(0.174)	(0.00608)	(0.0186)	(0.392)	(0.0185)	(0.00661)	(0.295)	(0.0114)
Age (sq)	-0.00401	-0.264**	-0.00203	0.0273***	0.0594	-0.00385	-0.0105	-0.315*	-0.0239	0.00574	-0.385***	0.00985
	(0.00812)	(0.104)	(0.00418)	(0.00746)	(0.0863)	(0.00564)	(0.0138)	(0.182)	(0.0154)	(0.00580)	(0.145)	(0.00884)
No education	0.000110	0.000272	-8.24e-05	2.01e-05	2.18e-05	1.55e-05	0	0	8.98e-05	0	0	-5.56e-05
	(0.000385)	(0.000363)	(0.000293)	(8.83e-05)	(0.000114)	(8.51e-05)	(0)	(0)	(7.25e-05)	(0)	(0)	(9.15e-05)
Upper secondary education	0.0112***	-0.000563	-0.000491	0.0158***	-0.00930***	-0.00972***	-0.00314	0.00880	-0.00135	0.0332***	-0.0122**	-0.0160**
	(0.00281)	(0.00307)	(0.00268)	(0.00277)	(0.00238)	(0.00251)	(0.00206)	(0.00907)	(0.00154)	(0.00697)	(0.00502)	(0.00649)
Tertiary education	0.0460***	-0.00260	-0.00705	-0.0204***	-0.0463***	0.00951***	-0.101***	-0.0181	0.0105	0.0223***	-0.0159*	-0.00602
	(0.00754)	(0.00270)	(0.00729)	(0.00584)	(0.00646)	(0.00293)	(0.0146)	(0.0221)	(0.0129)	(0.00642)	(0.00921)	(0.00375)
Large plant (>20 workers)	-0.000305	0.0204**	-0.000104	-0.00711***	-0.00430	0.000746	-0.0307***	-0.0111	0.00317	0.0209***	-0.0157	-0.00444
	(0.00168)	(0.0101)	(0.000576)	(0.00209)	(0.00466)	(0.000833)	(0.00713)	(0.0125)	(0.00360)	(0.00481)	(0.0124)	(0.00355)
Formal employment	0.0123**	0.0435***	0.0167***	-0.00597**	0.0413***	0.0116***	-0.00857**	0.0219	-0.00169	0.0639***	-0.0246	-0.0196
	(0.00482)	(0.0138)	(0.00536)	(0.00238)	(0.00854)	(0.00273)	(0.00406)	(0.0492)	(0.00381)	(0.0136)	(0.0175)	(0.0139)
Rural	0.0127***	-0.0535***	0.0152***	0.0136***	0.0369**	-0.00383*	-0.0400***	0.0445***	0.0203***	-0.00139	-0.0520*	0.0119*
	(0.00439)	(0.0166)	(0.00480)	(0.00248)	(0.0183)	(0.00196)	(0.00804)	(0.0157)	(0.00737)	(0.00597)	(0.0271)	(0.00634)
Full time employment	0.0216***	0.103**	0.0111**	0.00244**	0.0517	0.00143	0.00184	0.288***	0.00787**	-0.00195	0.0635	0.00640
	(0.00393)	(0.0486)	(0.00529)	(0.00107)	(0.0387)	(0.00110)	(0.00267)	(0.100)	(0.00332)	(0.00491)	(0.0610)	(0.00618)
Married	0.00270	0.0450**	0.0105**	0.00234	0.0302**	0.00306*	-0.000915	0.0415*	0.0224*	-0.00291	0.0821***	0.0109***
	(0.00361)	(0.0178)	(0.00424)	(0.00144)	(0.0151)	(0.00158)	(0.0112)	(0.0215)	(0.0117)	(0.00316)	(0.0258)	(0.00386)
Total	0.294***	0.553***	-0.0168	0.0667***	0.397***	-0.0988***	-0.225***	0.282***	-0.0935**	0.211***	0.452***	0.0259
	(0.0226)	(0.0149)	(0.0194)	(0.0199)	(0.0106)	(0.0163)	(0.0479)	(0.0220)	(0.0400)	(0.0330)	(0.0201)	(0.0286)
Constant		-0.414			-0.348			-1.020**			-0.0689	
		(0.339)			(0.317)			(0.458)			(0.314)	
Observations	14,905	14,905	14,905	31,375	31,375	31,375	19,993	19,993	19,993	11,682	11,682	11,682

* p<0.1

Source: Indian Labour Force Survey, 2000, 2005, 2010, 201.