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FOREIGN INVESTMENT AND GENDER EQUALITY IN INDIA: COMPETITIVE PRESSURES OR TECHNOLOGY TRANSFER?

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Abstract

This paper examines the relationship between foreign direct investment (FDI) inflows into a large, emerging economy and advances in gender equality. Several studies have examined how competitive FDI pressures might lower gender inequality by reducing an employer's ability to practice taste-based discrimination. Other studies examine how FDI-induced technology transfer reduces gender employment and gender wage gaps in developing countries. To the best of our knowledge, we are the first to consider the possibility that foreign investment both places strong competitive pressures on domestic industries and also allows for technology adoption. These ideas are particularly important in service-oriented sectors, where the highest values of foreign investments flow and the largest shares of women are employed. We expect increased competition associated with foreign investment to reduce gender inequality in occupations that suffer most from discrimination, while technology transfer serves to further reduce gender gaps in occupations for which automation reduces the demand for tasks. We use worker-level data from India to examine the differential effects on women relative to men of horizontal (measuring competition) and vertical (measuring technology transfer) FDI across occupational categories. Our findings suggest that competitive pressures associated with horizontal FDI narrow the gender employment gap in nonroutine cognitive occupations, while the technology transfer associated with vertical FDI supports increases in the relative demand for women in routinemanual occupations.

Keywords: foreign direct investment, gender, competition, technology, occupations, tasks

JEL Classification: F21, F66, J16, J24

Contents

1.	INTRODUCTION				
2.	BACKGROUND LITERATURE				
3.	DATA	AND DESCRIPTIVE STATISTICS	.4		
	3.1 3.2	Foreign Direct Investment Data Worker-Level Data	.4 .6		
4.	ESTIM	IATION STRATEGY	.8		
5.	MAIN	RESULTS	.9		
6.	CONC	LUSION	11		
REFERENCES12					
APPEI	APPENDIX				

1. INTRODUCTION

Many developing countries rely on inward foreign direct investment (FDI) as an important driver of economic growth. Existing research supports the idea that FDI has benefits beyond foreign capital in the form of technology and knowledge transfers from advanced economies (e.g., Blomstrom and Persson 1983 Aizenman and Marion 2004; Javorcik 2004; Javorcik and Spatareanu 2008; Blalock and Gertler (2008), and Newman et al. 2015). However, as various studies have documented, the gains from FDI inflows are not evenly distributed; that is, FDI liberalization creates winners and losers within recipient countries, across industries, firms, and workers (see, for example, Aitken, Harrison, and Lipsey 1995; Feenstra and Hanson 1995; Aitken and Harrison 1999; Keller and Yeaple 2009; Sharma 2018). More recently, the literature on spillovers from foreign investment has also considered the role of FDI in spreading gender equality internationally, offering mixed evidence (see Meng 2004; Chen et al. 2013; Heyman, Svaleryd, and Vlachos 2013; Davis and Poole 2020, 2023; Pham, Poole, and Santos-Paulino 2020; Sharma 2020; Tang and Zhang 2021; UNCTAD 2021).

In this paper, we examine the effect of foreign direct investment inflows into a large, emerging economy on gender equality. Several studies have examined how competitive pressures of foreign direct investment might lower gender inequality by reducing an employer's ability to practice taste-based discrimination, as modeled by Becker (1957). Other studies examine how globalization-induced technology transfer impacts gender employment and gender wage gaps in developing countries.¹ To the best of our knowledge, we are the first to consider the possibility that foreign investment both places strong competitive pressures on domestic industries and also allows for technology adoption. As each of these channels has distinct implications for the gender wage and employment gap, our work highlights the multitude of ways in which foreign investment impacts gender equality in the labor markets of recipient economies. These ideas are particularly important in service-oriented sectors, where the highest values of foreign investments flow and the largest shares of women are employed. Few papers have been able to capture the effects of globalization on gender inequality in the service economy; we, therefore, see this as an important contribution of our work to this literature.

Inflows of foreign direct investment within an industry (horizontal FDI) are associated with increased competition and possible market-stealing effects (Lu, Tao, and Zhu 2017). In this paper, we proxy the competition induced by FDI with sector-level "horizontal FDI" inflows—that is, flows of FDI within an industry.² By contrast, inflows of FDI into supplier and input sectors, also known as "vertical FDI," are associated with technology transfers (see, for example, Javorcik 2004; Javorcik and Spatareanu 2008; Blalock and Gertler (2008); and Newman et al. 2015). Accordingly, we calculate an industry's "vertical FDI" as the weighted sum of FDI in the industry's input sectors (based on a core input-output matrix) to capture the potential technology adoption associated with FDI.

¹ Chen et al. (2013), Heyman, Svaleryd, and Vlachos(2013), and Meng (2004) study how competition associated with FDI can reduce discrimination. Juhn, Ujhelyi, and Villegas-Sanchez (2014) examine trade-induced technology adoption, whereas Fernandez and Kee (2020) study how FDI influences the employment of women at domestic firms linked to foreign firms via supply chains.

² While horizontal inflows of FDI may be associated with both increased competition and technology transfer (Haskel, Pereira, and Slaughter 2007; Keller and Yeaple 2009), by controlling for technology transfer by including vertical FDI, we can infer that horizontal FDI mainly captures the impact of increased competition.

We further consider the task content of occupations in our examination of the impact of competitive pressures and technology transfer associated with FDI on gender inequality. We divide workers into four main occupational categories: routine-manual, routine-cognitive, nonroutine-manual, and nonroutine-cognitive. This is motivated by recent research demonstrating that technology adoption and automation have strong worker displacement effects in routine occupations, whereas automation tends to complement employment in nonroutine occupations (Acemoglu and Autor 2011). Based on this existing evidence, we hypothesize that greater competition from FDI will reduce gender inequality across all occupational categories, as employers are forced to cut taste-based discrimination. In addition, we expect the effects of technology transfer to be greater in routine occupations, where tasks are more susceptible to automation than in nonroutine ones.

We use worker-level data from India to examine the differential effect on women relative to men of horizontal and vertical FDI across occupational categories. As hypothesized, our results indicate that the implications of competitive pressures associated with horizontal foreign investment are strongest in nonroutine, cognitive occupations.

Increased FDI reduces the share of workers in nonroutine cognitive occupations, with a stronger negative impact on men than women. Thus, women experience a significant relative increase in nonroutine, cognitive employment shares. This suggests that in the face of competition, employers retain women in nonroutine, cognitive occupations, thereby reducing gender employment gaps for these occupations. This could reflect the idea that taste-based discrimination is more pronounced in nonroutine, cognitive occupations. In stark contrast, vertical FDI-induced technology adoption has a larger impact on women in routine-manual occupations. While vertical FDI inflows have a negative but insignificant effect on the share of routine-manual workers, foreign investment relatively increases the demand for women in routine-manual occupations compared to otherwise identical men. These findings are consistent with evidence in Juhn, Ujhelyi, and Villegas-Sanchez (2014) for the case of trade-induced technological change in Mexico, whereby technology adoption automates the physical tasks typically performed by men on the factory floor, relatively increasing the demand for women.

Our findings highlight how competition and technology transfer associated with foreign investment affect gender equality across occupation groups. By providing a more disaggregated picture of the impact of foreign investment on women, this paper helps to shed light on where policy can be targeted to use investment liberalization as a gender equalizer, identifying groups of workers for whom the barriers to gender equality may be greater. The rest of the paper is organized as follows. Section 2 offers a short summary of the background literature to which we contribute. In Section 3, we describe the data and provide descriptive statistics alongside. Section 4 details our core estimation strategy to understand the relationship between foreign investment in India and gender equality, and we present the main results in Section 5. We conclude with policy implications in Section 6.

2. BACKGROUND LITERATURE

This study is motivated by three strands of literature. The first broad body of literature examines the impact of FDI on gender wage and employment gap. The presence of multinational enterprises or increased foreign direct investment in an industry can increase competition and can also be a channel for technology, knowledge, and cultural transfers, especially in the context of inflows of FDI from developed to

developing countries (Blomstrom and Persson 1983; Poole 2013); Hijzen et al. (2013)). Recent studies examining the impact of FDI inflows on gender inequality have found some evidence to support the hypothesis that competitive pressures associated with an increase in FDI, following Becker (1957), can make it more costly for an employer to practice taste-based discrimination (see Chen et al. 2013; Heyman, Svaleryd, and Vlachos 2013); and Meng (2004)). Studies examining the effect of cultural transfers on gender inequality also find mixed evidence, with positive effects for Chinese women but no positive effects for Brazilian (Davis and Poole 2020) or Indian women (Sharma 2020). FDI might also impact the employment of women at domestic firms that are linked to foreign firms through supply chain linkages, with evidence showing that such firms are likely to experience an increase in the employment of administrative women (Fernandez and Kee 2020). While one might expect technology transfers to benefit women given the evidence with trade liberalization in Mexico (Juhn, Ujhelyi, and Villegas-Sanchez 2014), Pham, Poole, and Santos-Paulino (2020) find for Viet Nam that higher FDI in high-tech provinces benefits men more than women. Thus, studies examining the impact of FDI on gender inequality have found mixed evidence, depending on the country and the mechanism highlighted in the analysis. We will contribute to this literature by examining both effects of FDI-competitive pressures and technology transfers for a large, emerging economy.

The second strand of literature considers the different motivations of investment by the home country, which is likely to result in different spillover effects (Aizenman and Marion 2004). One important motivation for FDI is access to host country local markets, which is associated with "market-stealing" effects or greater competition for domestic firms in industries experiencing high inflows of FDI in host countries (Lu, Tao, and Zhu 2017). On the other hand, another main motivation of FDI is gaining access to the local supply chain, which has been shown to have stronger "spillover effects" through technological and knowledge transfers (Javorcik 2004; Javorcik and Spatareanu 2008; Blalock and Gertler 2008; Newman et al. 2015). Based on this literature, this paper distinguishes between the competition effects faced by domestic industries and technology adoption effects through foreign investment in supplier industries, by separately considering sector-level FDI (also known as "horizontal FDI") and "vertical FDI," a measure obtained as a weighted sum of FDI in input industries to capture increased FDI in supply chains. Thus, the paper is better able to distinguish between the competition effects of FDI.

Additionally, we categorize workers into occupational categories based on the task content of occupations approach, which is motivated by the third main stream of literature pertinent to this study. The use of the task content of occupations framework is motivated by Acemoglu and Autor (2011), who argue that in order to understand the impact of technology on the labor force, one needs to take into account the task content of occupations. Their work contrasts with previous literature, which assumes that the skill of a worker best determines whether they will be positively or negatively impacted by technological change. They show that it is also important to take into consideration the extent of routinization of tasks that are intensively used in various occupations to be able to determine whether the occupations are more prone to automation via technological adoption. Thus, Acemoglu and Autor (2011) divide occupations based on whether occupational tasks are routine or not in nature, and whether tasks are mainly cognitive or manual in nature. Accordingly, they create four main occupational categories: nonroutine-manual, routine-manual, routine-cognitive, and nonroutine-cognitive. These categories are also created for this study. Sharma (2022) shows that within-industry changes in occupational categories are becoming increasingly important in determining changes in employment as compared to between-industry changes for India in more recent decades, suggesting that changes

in the task content of occupations is playing an important role in altering employment structures. While one can question whether the occupational classification from a developed country is applicable to a developing country, we show that when considering broad occupational categories, the data give us what we would expect. Further, this concern would be greater if we were conducting a cross-country analysis. All we need is to be able to distinguish between occupational categories within the country to give us an idea about which are relatively more routine than the others, and which require more cognitive skills than the others (Sharma 2023). The occupational classification we obtain using O*NET data suffices for our analysis.

We believe that conducting this analysis for a large, emerging economy like India provides us with important insights into the relationship between foreign investment flows and gender equality. India experienced large inflows of foreign direct investment in the period we examine, and in fact, by 2014 it had become one of the top 10 destinations for FDI inflows (UNCTAD 2015). Several studies have examined the impact these inflows have had on the economy and found that the gains are unevenly distributed across firms, industries, regions, and workers (Banga 2003; Aggarwal 2005; Mukherjee 2011; Sharma 2018). While Sharma (2020) examines the impact of FDI inflows on gender inequality and finds that it mainly benefits unskilled women, the study is not able to differentiate between competition and technology transfer effects, and does not distinguish between workers based on the routinization of their occupations. Further, given that the female labor force participation rate in the period under analysis mainly decreased from 2004-05 at about 30% to about 27% in 2012 (International Labour Organization. 2024) and continued to decline, it will be interesting to examine what role FDI played in the employment of women. Did it contribute to this decline, or was it able to create some job opportunities for women in a climate where they experienced challenges to their participation in the labor force? Examining the relationship between foreign direct investment and gender inequality in this economic context will provide interesting insights for policymakers in developing countries seeking to reduce gender disparities in their labor markets.

3. DATA AND DESCRIPTIVE STATISTICS

We use two main sources of data to examine the effects of FDI on different worker groups. The first is sector-level FDI data on inflows from the Department of Industrial Policy and Promotion, and the second is household-level data from the employment-unemployment rounds of the National Sample Survey of workers.

3.1 Foreign Direct Investment Data

We obtain sector-level inflows of foreign direct investment from the Department of Industrial Policy and Promotion (DIPP). We use information from the years 2004, 2007, and 2011. FDI is reported as a flow variable for the calendar year. We use the following formula to calculate vertical FDI:

Vertical FDI_{jt} =
$$\Sigma_k(s_{jk} * Horizontal FDI_{kt})$$
.

Here, s_{jk} is the share of inputs used by sector k from sector j. The shares have been calculated using information from the input-output table from the Asian Development Bank for the year 2007. Thus, vertical FDI for a sector is the weighted sum of horizontal FDI, or simply, sector-level FDI inflows of its input sectors. To use sector-level data from DIPP with sector-level data from ADBI, we create a concordance between the

two. The final data have 28 sectors for which we have data for both horizontal FDI and vertical FDI.

Figure 1 shows the trends in average horizontal FDI inflows and vertical FDI inflows for the period of analysis. We can see that both inflows increased over time, with sector-level horizontal FDI experiencing an increase in inflows from 2004 to 2011 of 675% and sector-level vertical FDI experiencing a 756% increase for the same period. Summary statistics for horizontal FDI and vertical FDI are also presented in the Appendix (Table A.1). Further, Figure 2 shows that the correlation between the change in sector-level FDI and vertical FDI from 2004 to 2011 is very low, with a correlation coefficient of 0.261. Thus, we can include both simultaneously in our empirical analysis.





Note: FDI data are from the Department of Industrial Policy and Promotion for the years 2004, 2007, and 2011. Source: Authors' own calculations.



Figure 2: Correlation Between FDI and Vertical FDI

Note: FDI data are from the Department of Industrial Policy and Promotion for the years 2004, 2007, and 2011. Source: Authors' own calculations.

3.2 Worker-Level Data

Worker-level data are from the National Sample Survey (NSS) of India from the employment-unemployment rounds for the years 2004–2005, 2007–2008, and 2011–2012. They contain information on worker-level characteristics such as the industry of employment, occupation code, gender, and age of the workers. The data are available as a repeated cross section of households, and each worker is given a sample weight. The industry is reported at the five-digit level as National Industrial Classification (NIC) 98 for 2004–05, NIC 2004 for 2007–08, and NIC 2008 for 2011–2012. We create a concordance between these industries and the sectors from ADBI to obtain a total of 28 sectors.

We merge into these data occupational categories that are created from the US Department of Labor data on occupations (O*NET) for 2016. The creation of occupational categories is motivated by Acemoglu and Autor (2011). We employ the set of descriptors for each occupation used by their study to classify workers into either routine-manual, routine-cognitive, nonroutine-manual, or nonroutine-cognitive occupations. We standardize the raw "importance" scores for each of the selected task descriptors (based on Acemoglu and Autor 2011) in each occupational category for all occupations in the O*NET dataset. We then sum the scores for the task descriptors in each occupational category and standardize the sum for all occupations. This results in a standardized score for each occupational category for every occupation. We use the highest standardized score across the four occupational categories to classify each occupation into either routine-manual, routine-cognitive, nonroutine-manual, or nonroutine-cognitive. To merge these categories into the worker-level data, we use a concordance between the National Classification of Occupations codes and O*NET occupation codes at the three-digit level of disaggregation.

A similar classification exercise is used by Sharma (2023), and to understand how occupations are classified into the four main occupational categories, one can refer to Table A.3. in the paper, which presents occupations at the one-digit level of classification and the percentage of three-digit occupations within that category classified as either routine-manual, nonroutine-manual, routine-cognitive, or nonroutine-cognitive. The classification matches our expectations-for instance, most professional jobs are classified as nonroutine-cognitive, whereas most elementary occupations are classified as nonroutine-manual. Thus, despite the fact that the O*NET data are from the US, the broad categorization of the occupational categories is in line with expectations. Further, Figure 3 shows the shares of men and women employed in each occupational category and reflects what we would expect for a developing country like India, i.e., most workers (male and female) are employed in nonroutine-manual occupations, followed by routine-manual ones. Routine-cognitive and nonroutinecognitive occupations had the lowest and roughly comparable shares over the years for both male and female workers. Figure 4 shows the share of female workers in each occupational category. The gender-employment gap is lowest in nonroutine-manual occupations, followed by nonroutine-cognitive ones. This is followed by routine occupations, with the gender-employment gap being higher for routine-manual than for routine-cognitive occupations. The trends, however, suggest that over time, the share of female workers in nonroutine-manual occupations has declined.



Figure 3: Worker-Level Data: Share of Employment by Occupation Type

Note: Worker-level data are from the National Sample Survey for the years 2004–2005, 2007–2008, and 2011–2012. Source: Authors' own calculations.



Figure 4: Share of Female Workers in Each Occupational Category

Note: Worker-level data are from the National Sample Survey for the years 2004–2005, 2007–2008, and 2011–2012. Source: Authors' own calculations.

For empirical estimation, we create cohorts from these worker-level data.³ The cohorts are created using four main variables, namely age, gender, sector of employment, and state-region of the worker. We consider four main age groups < 18; 19–34 (early career); 35–49 (peak career); and 50+ (late career). There are a total of 28 sectors and

³ Before the cohorts are created, we drop 1% of the top and bottom wage outliers and 1% of the top and bottom sample weight outliers. If no industry or occupation type is reported, the observation is dropped from the analysis.

88 state-regions in the data. We first drop 1% of the top and bottom outliers in terms of employment per cohort and create a balanced panel of 12,279 cohorts. Of these, 76% of the cohorts are male and 24% are female. Table 1 provides these summary statistics of these cohort-level data and shows the share of routine-manual, routine-cognitive, nonroutine-manual, and nonroutine-cognitive workers in male and female cohorts. For both male and female workers, the highest average share of employment is in nonroutine-manual occupations followed by routine-manual ones. For male workers, the average share of routine-cognitive employment is higher than that of nonroutine-cognitive employment is slightly higher than that of routine-cognitive employment.

	Average Share of Employment for Male Cohorts	Average Share of Employment for Female Cohorts
Routine-manual	0.246 (0.366)	0.176 (0.354)
Routine-cognitive	0.130 (0.259)	0.077 (0.229)
Nonroutine-manual	0.531 (0.403)	0.657 (0.411)
Nonroutine-cognitive	0.093 (0.207)	0.090 (0.207)
Total number of cohorts: 11,377	Total number of male cohorts: 8,743	Total number of female cohorts: 2,634

Note: Worker-level data are from the National Sample Survey for the years 2004–2005, 2007–2008, and 2011–2012. Standard errors reported in parentheses. For both male and female cohorts, the share of employment across all categories varies from 0 to 1.

Source: Authors' own calculations.

4. ESTIMATION STRATEGY

We use the following specification to estimate the competition and technology transfer effects:

$$y_{it} = \beta_0 + \beta_1 HFDI_{jt} + \beta_2 VFDI_{jt} + \beta_3 HFDI_{jt}^* Female_i + \beta_4 VFDI_{jt}^* Female_i + \theta_i + \theta_t + \epsilon_{it}.$$

 y_{it} denotes the cohort-level shares of employment of various worker categories. As previously mentioned, competition effects of FDI are measured by sector-level inflows of horizontal FDI: *HFDI*_j. Technology transfer effects are measured by sector-level inflows of vertical FDI: *VFDI*_{jt}. *Female*_i is a categorical variable taking the value of 1 if the cohort is female. β_3 and β_4 capture the interaction effects between female workers and horizontal FDI, and female workers and vertical FDI, respectively. The specification controls for cohort fixed effects, θ_i , and year fixed effects, θ_t . Standard errors are robust and clustered at the sector level.

 β_1 and β_2 in this specification capture the impact of the competition effects and technology transfer effects of FDI, respectively. Positive values of each coefficient would suggest that the competition effect and technology transfer effects of FDI positively impact the employment of male workers. We expect β_3 and β_4 to be positive and significant, i.e., we expect the competition effect and technology transfer effect of FDI to increase the demand for female workers relative to male workers. More specifically, we expect β_3 to be positive and significant in occupations where taste-based discrimination is highest. Since in routine occupations female and male workers are considered to be more on a par with one another (Sharma 2023), we can

expect this to be stronger for nonroutine occupations. Given that the largest share of nonroutine occupations will be agricultural, where women are likely self-employed, we expect employer's taste-based discrimination to be highest in nonroutine-cognitive occupations. Also, since women have a comparative advantage in cognitive tasks, we expect competition effects to favor female workers in these cognitive occupations. Further, if indeed foreign direct investment-induced technology adoption reduces physically straining tasks and complements the skills of female workers on the factory floor, we expect β_4 to be positive and significant for female workers in routine-manual occupations. On the other hand, if the effect of automation is mostly displacing workers, both cognitive and manual, while increasing firm-level productivity, we can expect an employer to practice taste-based discrimination when deciding whom to displace, in which case the coefficient could be negative and significant.

5. MAIN RESULTS

Estimation results are presented in Table 2. We consider two main panels, Panel A and Panel B. Panel A considers routine occupations, with Columns 1 and 2 showing the impact of horizontal FDI and vertical FDI on the share of workers in routine-manual occupations, and Columns 3 and 4 showing the impact on the share of workers in routine-cognitive occupations. Panel B shows these effects for nonroutine occupations, with Columns 1 and 2 considering the impact on the share of workers in nonroutine-manual occupations, while Columns 3 and 4 consider the share of workers in nonroutine-cognitive occupations.

Starting with Panel A, in Columns 1 and 2 we consider the share of routine-manual workers. Horizontal FDI (capturing competition effects) is associated with a positive but insignificant impact on the share of routine-manual workers, with no significant differential effects between female and male workers. Vertical FDI (measuring technological transfer effects), on the other hand, has a negative but insignificant impact on the share of routine manual workers. However, women experience a significant relative increase in their employment shares. This suggests that mechanization or automation induced by foreign direct investment in supplier industries allows more female workers to work in occupations intensive in routine-manual tasks, even though it might have an overall displacement effect. Similar effects are also found in Mexico by Juhn, Uihelyi, and Villegas-Sanchez (2014) when examining the impact of trade liberalization, where the mechanism highlighted is that trade-induced technology adoption reduces the demand for physically demanding tasks and thus increases the demand for female workers. The results suggest that a 100% rise in vertical FDI increases the relative cohort-level demand for female workers in routine-manual occupations by 1.9%. Columns 3 and 4 show the effects for routine-cognitive workers. We find that competition induced by horizontal FDI has a positive impact on routinecognitive workers; however, this is not highly significant, and there is no differential impact on female workers. Point estimates suggest that vertical FDI has a positive impact on routine-cognitive workers on average, though again the effect is not significant. The differential impact on female workers, however, is negative but not highly significant. This suggests that there is a slight preference for male workers in occupations that require educated workers performing routine tasks. If women specialize in cognitive tasks, it is possible that automation of such tasks could work to their disadvantage.

Panel A								
Share of routine-manual workers Share of routine-cognitive workers								
	(1)	(2)	(3)	(4)				
Horizontal FDI	0.002 (0.007)	0.004 (0.007)	0.003* (0.002)	0.002 (0.002)				
Female*Horizontal		-0.007 (0.006)		0.006 (0.004)				
Vertical FDI	-0.021 (0.021)	-0.026 (0.022)	0.006 (0.007)	0.010 (0.008)				
Female*Vertical		0.019** (0.007)		-0.014* (0.007)				
Cohort FE	Yes	Yes	Yes	Yes				
Year FE	Yes	Yes	Yes	Yes				
Observations	11,377	11,377	11,377	11,377				
Adjusted R ²	0.007	0.008	0.001	0.001				
Panel B								
Share of nonroutine-manual workers Share of nonroutine-cognitive workers								
	(1)	(2)	(3)	(4)				
Horizontal FDI	-0.0002 (0.005)	0.001 (0.005)	-0.005* (0.003)	-0.006** (0.003)				
Female*Horizontal		-0.004 (0.007)		0.005** (0.003)				
Vertical FDI	-0.009 (0.018)	-0.006 (0.017)	0.023 (0.018)	0.022 (0.017)				
Female*Vertical		-0.003 (0.006)		-0.002 (0.006)				
Cohort FE	Yes	Yes	Yes	Yes				
Year FE	Yes	Yes	Yes	Yes				
Observations	11,377	11,377	11,377	11,377				
Adjusted R ²	0.011	0.011	0.022	0.022				

Table 2: Estimation Results

Note: All dependent variables are shares in total cohort-level employment. Horizontal FDI and vertical FDI are in logs. All columns include cohort fixed effects and year fixed effects. All standard errors are robust and clustered at the sector level. Standard errors in parentheses. *p < 0.10, **p < 0.05, ***p < 0.01.

We now turn to examining these effects for nonroutine workers in Panel B. When considering the share of nonroutine-manual workers in Columns 1 and 2 we find no significant effects. However, the point estimates suggest that horizontal FDI and vertical FDI both negatively impact average cohort-level employment for these workers and have a negative differential effect for female workers. In Columns 3 and 4 we consider the share of nonroutine-cognitive workers. Increased competition measured as horizontal inflows of FDI has a negative impact on the employment of workers, marginally significant at 10%. This suggests that competition induced by FDI could negatively impact professionals, managers, and other high-skilled workers in nonroutine jobs. One explanation could be that top management is brought in from the home country by multinationals to head country operations. Additionally, competition from MNEs might cause firms that are top-heavy (which is typical of many public sector enterprises in the services sector in India) to adjust by reducing the number of workers in these roles. However, when we consider the differential effects of FDI between women and men, we find that these negative effects are mainly concentrated for men while women experience an increase in relative demand. This provides support for Becker's (1957) hypothesis that increased competition can reduce gender inequality in labor markets by reducing taste-based discrimination. In fact, this also suggests that such discrimination is likely higher in nonroutine occupations. Our results suggest that a 100% increase in FDI inflows raises the relative demand for women by 0.5%. When considering technology transfer associated with vertical FDI, the point estimates suggest a positive impact on overall employment with a negative differential effect on women; however, these effects are not significant.

In summary, when examining the impact of competition and technology adoption associated with FDI on groups of workers categorized based on the task content of their occupations, we find that technology adoption associated with FDI can reduce gender-employment gaps in routine-manual occupations, whereas increased competition via FDI can reduce gender-employment gaps in nonroutine-cognitive occupations.

6. CONCLUSION

In this paper, we examine how competitive pressures and technology adoption induced by foreign direct investment impact gender inequality across four main occupational categories classified on the basis of their task content. Our findings show that the impact of competitive pressures of foreign direct investment is mostly felt by workers in nonroutine-cognitive occupations. On average, competitive pressures of FDI reduce the demand for nonroutine-cognitive workers; however, they reduce genderemployment gaps by impacting women less than men. This suggests that in the face of competitive pressures, employers are likely unable to practice taste-based discrimination, and thus they retain their more productive female workers while letting go of unproductive male workers. It also suggests that taste-based discrimination is likely stronger in nonroutine occupations. Additionally, we find that the technology transfer associated with sector-level vertical FDI inflows increases the relative demand for female workers in routine-manual occupations even though it has overall negative but insignificant displacement effects. This lends support to the hypothesis that technology adoption likely automates physically strenuous tasks, which are typically harder for female workers to perform. Thus, technology transfers through foreign direct investment have a gender equalizing impact on routine-manual occupations.

By differentiating between occupational categories, our work helps highlight where there is the biggest potential for reduction in gender disparities in labor markets. The idea that the competitive pressures associated with a globalizing and liberalizing economy, coinciding and even causing much labor displacement in the developing world, may also reduce gender inequality is a welcome finding for economic policy. Labor market policies that seek to reduce gender gaps will need to take this into account and focus on reducing barriers to female labor force participation across all occupational categories. Promoting FDI inflows in industries that are intensive in routine manual occupations is likely to increase the participation of female workers if the FDI is associated with technology adoption that reduces the demand for physically demanding tasks on the factory floor. However, policies will have to account for the fact that automation of these tasks might also reduce the demand for workers in general. Further, promoting FDI inflows into sectors that increase the demand for nonroutine-cognitive occupations can also reduce gender-employment gaps through increased competitive pressures based on our findings. One implication of this finding is that there is a lot of scope for reducing taste-based discrimination in such occupations, so the government needs to increase efforts to enforce laws that prevent gender discrimination in the workplace. In future work, we hope to build on this analysis and examine how labor market institutions might modulate these effects. We hope this work encourages scholars to investigate the various mechanisms (such as marriage and fertility) through which investment liberalization might impact gender disparities in the labor market.

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APPENDIX

	Horizontal FDI (in thousands of INR)			Vertical FDI (in thousands of INR)		
Year	Average (Standard Deviation)	Min	Мах	Average (Standard Deviation)	Min	Мах
2004	4,935,348.041	0	44,658,328.69	2,265,091.215	321,077.4413	7,700,633.43
	(9,280,450.457)			1,729,986.181		
2007	21,156,865.12	100	179,416,616.2	6,825,966.655	2,121,798.584	14,925,914.96
	39,358,088.12			3,261,814.858		
2011	38,259,112.7	0	205,321,112.1	19,404,879.86	3,726,905.362	60,246,297.4
	60,668,497.26			13,374,092.05		

Table A.1: Summary Statistics for Horizontal FDI and Vertical FDI

Note: FDI data are from the Department of Industrial Policy and Promotion for the years 2004, 2007, and 2011. Source: Authors' own calculations.