Does Plant Size Matter? Differential Effects of Foreign Direct Investment on Wages and Employment in Indian Manufacturing

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This paper examines the differential effects, based on the size of the plant, of industry-level foreign direct investment (FDI) on plant-level employment and the wages of skilled and unskilled workers in India's manufacturing sector. On average, there are strong positive differential effects of increased inward-level FDI for large plants relative to small and average-sized plants in terms of employment and the average wages of both skilled and unskilled workers. Small plants experience negative effects from inward FDI, which can be explained by intra-industry reallocation of output from smaller to larger plants. After conducting a regional analysis, I find positive spillovers to small plants in Indian states that receive large and persistent flows of FDI. This suggests that a critical mass of FDI is necessary for small plants to experience positive spillover effects.

Keywords: foreign direct investment, skill, spillovers, wages, workers
JEL codes: D22, F62, J24, J31

I. Introduction

Economic theory and policy has often stressed the important role of foreign direct investment (FDI) in transforming the productive capacities of an economy and contributing to the development of human capital. It is posited that increased globalization, as measured by increased FDI, has greater beneficial effects than tariff liberalization because of the accompanying transfer of technology and skills to the domestic economy in the case of the former. Of particular concern are the effects of spillovers to other domestic players in industries that receive FDI. While most studies have focused heavily on what factors attract FDI and under what conditions one observes the spillover effects, the literature on the impacts of such FDI on employment and wages is less extensive, especially in the developing economy context and specifically in the South Asian context.

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Most developing economies' policies are aimed at encouraging more inward FDI in keeping with growth and development objectives. India has moved to a more liberalized FDI regime over the past few years, which includes allowing FDI to enter through the automatic route in most cases while also raising FDI caps for many sectors. In 2014, India launched its Make in India campaign, which aims to attract more FDI with a special thrust toward improving domestic production capabilities.

Indian policies have been successful in attracting foreign investors. According to UNCTAD (2015), FDI in India reached $34 billion in 2014, making it one of the top 10 global destinations for FDI inflows. However, little is known about how this influx has affected wages and employment. An important goal of the Make in India campaign, which is aligned with India's National Manufacturing Policy, is to increase employment in the manufacturing sector in absolute terms. The National Skill Development Corporation was set up to provide skills to India's labor force, an acknowledgment that the development of an economy is contingent on the growth and development of its human capital. Most studies on FDI in India are focused on the determinants of inward FDI and are either industry-level studies or case studies. While the former studies do not take into account important within-industry plant heterogeneity when estimating the effects of FDI, the latter may be informative but not statistically robust or generalizable.

This paper focuses on the effects of industry-level FDI on plant-level employment and the wages of both skilled and unskilled workers in India's manufacturing sector. It investigates whether FDI increases plant-level employment and average wages, and more importantly, whether the change in demand for workers due to increased FDI inflows is skill biased or not. According to traditional theory, foreign ownership provides host economies with access to knowledge, which, if absorbed by domestic workers, enhances the domestic human capital stock, making it permanently more productive. This impact spills over to domestic firms through the training of suppliers, imitation, and labor mobility, while workers migrate from multinational firms to domestic firms and transfer their know-how to domestic workers through various channels of formal and informal interaction (Aitken and Harrison 1999, Poole 2013). An improvement in the quality of workers should lead to an increase in average wages for workers in both domestic and foreign firms. Further, if there are complementarities between foreign inputs accompanied with foreign investment and workers' skills, an increase in FDI should also lead to an increase in demand for skilled workers and increase the skill composition at foreign plants while putting upward pressure on the wage–skill premium. However, spillovers to domestic plants might not occur if inflows of FDI are neither large nor persistent enough to transform the workforce at recipient firms or create a large enough supply of skilled workers who can then migrate to smaller domestic firms. In such cases, we would see greater poaching of skilled workers from domestic firms by foreign firms as opposed to an increase in the supply of skilled workers.

This paper estimates the aforementioned relationship in India by using plant-level data available from the Annual Survey of Industries (ASI) conducted by the Ministry of Statistics and Programme Implementation, and industry-level FDI data from the Department of Industrial Policy and Promotion under the Ministry of Commerce and Industry, for the years 2000–2006. The main finding is that with increased inflows of industry-level FDI, large plants experience a greater increase in the employment of and average wages paid out to both skilled and unskilled workers relative to small and average-sized plants. The effects are negative for small plants as far as the employment of production workers is concerned, which suggests that there are greater market reallocation effects away from small plants with increased industry-level FDI, causing them to reduce production and employment. Moreover, there are negative effects for average-sized and small plants even in terms of average wages paid out to skilled and unskilled workers, suggesting that there is poaching of higher-quality production and skilled workers by large plants as industry-level FDI increases. I also find that the differential increase in the employment of production workers at large plants is biased toward male workers as industry-level FDI increases. When considering the differential impact on regions, however, I find that states that are the biggest winners in terms of FDI inflows, both in terms of the quantity and persistence of flows, experience strong spillover effects in the wage–skill premium and skill composition; that is, big and small plants alike experience an increase in relative wages as industry-level FDI increases, as well as a higher composition of skilled workers. This could be because for an industry to experience positive horizontal spillovers in wages, a critical mass of FDI should be realized and the inflows should persist over a period of time. Only then do we observe the greater training, mobility, and imitation that contributes to an expanded pool of skilled workers in an industry such that plants can benefit from increased supply and the enhanced skill composition of the workforce. For instance, Poole (2013) highlights that higher-skilled former multinational enterprise workers are better able to transfer technology, while higher-skilled incumbent workers are better able to absorb the transferred technology. Based on this mode, workers at multinational enterprises are expected to experience an increase in their skills only after a certain period of working and training. Furthermore, incumbents are expected to increase their level of skills only when there is a substantial share of multinational enterprise workers at their firms. Moreover, regions with high levels of FDI might even have better backward and forward linkages, allowing FDI to flow over a sustained period of time.

This paper is divided into nine sections. Section II reviews the literature on the impact of FDI on employment and wages, and the evidence of spillovers. Section III presents evidence on regional inequalities in inward FDI in India. The empirical model is discussed in section IV. A description of the data and measurement of the variables used in the empirical model can be found in section V. Section VI discusses the estimation results while robustness checks are presented in section

VII. A regional analysis of the differential impact of FDI is presented in section VIII. Section IX concludes.

II. Related Literature and Motivation

In the literature investigating the impacts of FDI, there has been a recent shift toward plant-level analysis as opposed to industry- or sector-level analysis. Following Melitz (2003), studies take into account firm and plant heterogeneity within industries, which is crucial to understanding the effects of FDI. Earlier studies investigating the role of FDI on labor focused mainly on the impact of FDI on labor productivity and whether there were any spillover effects to domestic plants. Blomstrom and Persson (1983) find that an increase in the foreign share in an industry is correlated with an increase in labor productivity, even at domestically owned plants within the same industry. This study, however, does not control for fixed differences in productivity across industries, which may be a source of endogeneity bias. Aitken and Harrison (1999) control for industry-level fixed effects in their study on Venezuela and distinguish between own plant effects and spillover effects of FDI by considering both plant- and industry-level FDI. They find that while own plant FDI has a positive effect on plant-level productivity, the spillover effects of FDI are negative, owing mainly to the market reallocation effect. This paper follows a similar approach in methodology but mainly considers employment, skill composition, and wages as outcomes of interest.

There are various other studies that estimate the effects of FDI on productivity and wages for developed and developing economies. Feenstra and Hanson (1995) find that during the relaxation of the FDI regime in Mexico, the offshoring of jobs that were relatively unskilled and labor intensive in the United States but relatively skill intensive in Mexico explained nearly 50% of the increase in relative wages in Mexico during the early 1980s. This effect was largely driven by FDI in maquiladoras, which are foreign-owned assembly plants in export processing zones. The other strand of literature pertains to identifying spillovers. While positive spillovers of FDI are found for the United States in terms of gains in both total factor productivity (Keller and Yeaple 2009) and wages (Aitken, Harrison, and Lipsey 1995), these spillover effects are absent for developing economies such as Mexico and Venezuela (Aitken, Harrison, and Lipsey 1995). While my study also finds negative spillovers for small plants in India, I find that regions receiving large and persistent FDI inflows actually experience positive spillovers. It is possible that high FDI regions in India mimic a developed economy environment where FDI, presumably in the presence of strong backward and forward linkages, has been able to transform domestic capability over time, resulting in increased spillovers.

More recently, Poole (2013) provides evidence of positive spillovers of FDI in Brazil by using matched employer–employee data to show that as workers migrate from multinational to domestic firms there is an increase in the wages of even

domestic workers at incumbent firms. Further, the transfer of technology is greater the higher the skill level of the worker migrating from the multinational and the higher the skill level of the worker at the incumbent firm. Average wages for incumbent workers at the domestic firm increase as the share of workers from multinationals increase at the domestic firm. In my regional analysis for India, I show similar effects for small firms in regions receiving high levels of FDI. As highlighted by the mechanism described in Poole (2013), it is likely that there is a bigger pool of skilled workers in regions that have experienced a large sustained inflow of FDI, allowing for greater instances of knowledge transfers spillover even to small firms. Another study of note is by Hijzen et al. (2013), which compares the effect of FDI on wages across developed and emerging (Brazil and Indonesia) economies. The authors find that there is a positive effect of foreign ownership on wages, which is mainly driven by the creation of new high-wage jobs.

This paper derives motivation from Das (2002), who theoretically models the effect of FDI on relative wages in developing economies. Under certain conditions in his model, FDI might actually decrease relative wages. One possible channel is a decline in demand for skilled workers as there is intra-industry substitution of output from less efficient domestic firms to more efficient (by assumption) foreign firms. The second is through influencing the occupational choices of skilled workers and crowding them out from entrepreneurial jobs to equally skilled wage-based positions at multinationals. This paper empirically finds that there is an intra-industry substitution of labor from smaller to larger plants as industry-level FDI increases. Based on the assumption that size may be a proxy for efficiency and the likelihood of receiving FDI, I believe that this result corroborates with what Das (2002) predicts will happen in the case of a technological gap. If there is an intra-industry substitution of output from small plants to large plants, we must also expect intra-industry substitution of labor, with employment declining at small plants and increasing at large plants. While Das (2002) makes a prediction about what would happen to relative wages on average, this paper considers the differential effects on average wages for both skilled and unskilled workers. The main finding is that while average wages of both skilled and unskilled workers increase differentially for large plants, small plants actually experience a decline. Assuming that the technology gap between foreign plants and domestic plants still exists, this result is in line with the expectation of the model. In fact, in Indian states that are (historically) the largest recipients of FDI, this differential is likely to be smaller. I find that there are positive spillovers to both small and large plants alike.

III. Inward Foreign Direct Investment in India

Most of the literature on FDI for India has focused on the determinants of FDI inflows. There are also a few studies that focus on the impact of FDI on various

industry- or firm-level outcomes. FDI has increased in India since the liberalization of previous restrictions on FDI in the 1990s and it is now one of the major recipients of FDI among emerging economies (UNCTAD 2015). In addition to liberalization at the national level, state-level policy reforms have also increased the ease of doing business to make it more attractive for foreign investors to operate in India.

In a study that investigates the role of state-level policies that affect inward FDI, Banga (2003) finds that there is a differential effect of state-level policies on sources of FDI. While the removal of restrictions shifts FDI from developed economies to developing economies, fiscal incentives are more effective for attracting FDI to developing economies. In addition, bilateral investment treaties play an important role in attracting FDI from developed to developing economies. Aggarwal (2005) investigates the role of labor market institutions in attracting FDI, distinguishing between domestic-market-seeking and export-oriented FDI to find that while rigid labor market institutions discourage both kinds of FDI, the effect is more pronounced in domestic-market-seeking FDI. Mukherjee (2011) shows that FDI in India is highly concentrated regionally and examines the state-level factors that play an important role. Market size, agglomeration effects, and the size of the manufacturing and services base in a state have a positive and significant effect on FDI inflows. On the other hand, she finds that taxation policies and labor costs have a significant negative impact on FDI inflows. Morris (2004) echoes the findings that FDI is strongly concentrated regionally and further examines the determinants of FDI inflows, specifically for Gujarat.

These studies highlight the regional concentration of FDI and the importance of state-level policies that affect taxes, infrastructure, and labor market institutions, all of which are instrumental in determining the level of FDI inflows. In keeping with these findings, I will control for these effects while empirically estimating the relationship between industry-level FDI and plant-level outcomes. Further, this study will investigate how the estimated relationship varies for each region. I will divide the states into three groups according to the amount of FDI received: (i) the top third, (ii) the middle third, and (iii) the bottom third.

IV. Empirical Estimation

In the estimation exercise, I want to distinguish between the effects of industry-level inward FDI on employment and wages for large, average-sized, and small plants. For the baseline specification, I will use the log of total sales by the plant as a measure of size. Data on whether a plant is the recipient of FDI is not available from the ASI. However, there are certain benefits of not using plant-level FDI for the estimations. Plant-level FDI will generate various endogeneity bias concerns when studying its impact on plant-level variables. We can assume that FDI mainly goes to the large plants. I provide empirical evidence using Prowess data to show this in section V. Prowess data is not suitable for the main analysis

because it does not have information on the outcome variables of interest, such as employment and the wages of skilled and unskilled employees. Additionally, large firms that do not receive FDI are most likely the competitors of firms that do receive FDI and must adjust their technology and management systems to remain competitive. These firms are also more capable of making such adjustments than smaller firms in the same industry. Using Prowess data, I will further alleviate concerns regarding endogeneity by showing in section V that there are not a few focal firms in an industry receiving all of the FDI. I use the following specification for my estimation:

$$\ln y_{it} = \alpha_i + \alpha_{rt} + \alpha_j + \beta 1 \ln FDI_{jt} + \beta 2 \ln FDI_{jt} \times \ln size_{it} + \beta 3 \ln size_{it} + \beta 4 \ln X_{it} + \varepsilon_{it} \quad (1)$$

where y_{it} is the dependent variable at the plant level varying across time t, a_i controls for the plant fixed effects, a_{rt} *is* the region-time fixed effects, and a_j represents the industry fixed effects. The variable $\ln FDI_{jt}$ is total FDI in industry j, $\ln size_{it}$ is the log of measures of plant-level size captured by fixed assets, and $\ln X_{it}$ is a vector other plant-level controls.

The various outcomes of interest are at the plant level and include total employment, employment of skilled workers (comprising managerial and supervisory staff and other skilled employees), employment of production (unskilled) workers, skill composition, total wages, total average wages, and relative wages. Consider the impact of an increase in industry-level FDI. The interaction term in the specification considers the level of FDI in the industry and the plant size. As highlighted above, it is assumed that larger firms are either direct beneficiaries of FDI or are competing firms that imitate technologies and adjust to increase their competitiveness. Therefore, we can expect an increase in production with an increase in industry-level FDI at larger plants, which also has a positive impact on total employment. Further, given technology transfers and complementarities between superior technology and quality (proxied by the skills of workers), we can assume that bigger firms will also experience an increase in relative demand for skilled workers. Therefore, for all the outcome variables, we should expect $\beta_2 > 0$. Even in cases where size does not act as a proxy for the presence of foreign equity and technology in a plant, we can expect the biggest plants to respond most aggressively to an increase in FDI in the industry by upgrading their own technology and worker skills (e.g., increasing wages to retain workers) such that $\beta_2 > 0$. β_1 in equation (1) captures the spillover effects and the impact of FDI on small plants in the industry. If the spread of technological know-how due to the presence of foreign investors leads to an industrywide increase in economic activity, and if this know-how is transferred to workers on a persistent basis, leading to an increase in skill of the workforce in general, we should expect $\beta_1 > 0$ for all outcome variables

as well. However, if there is a greater market contraction effect on smaller domestic firms and there is no transfer of technology, but rather a poaching of skilled workers from domestic plants to large plants that receive FDI, we should expect $\beta_1 < 0$ for the outcome variables.

There is a concern that in regions receiving high levels of FDI, even small plants are recipients of inward FDI and so a positive β_1 does not capture spillovers but rather the effects of plant-level FDI. In section V, I show that, even in high FDI regions, it is plants that are much larger than the average or median size that receive FDI rather than FDI being more evenly distributed across firms of different size. Therefore, even in these regions, β_1 continues to capture spillover effects.

To control for within-industry plant heterogeneity and unobservable time-invariant characteristics that may influence the relationship that I am trying to estimate, the specification includes plant fixed effects. As stressed by Aitken and Harrison (1999) and Keller and Yeaple (2009), various time-invariant unobservable industry characteristics can cause FDI to flow into certain industries rather than others. To make sure these do not affect my estimation, I control for industry fixed effects. Finally, while year fixed effects would control for any economywide policy that affects all plants equally, from Banga (2003), Morris (2004), Aggarwal (2005), and Mukherjee (2011), we know that there are important regional variations in the distribution of FDI and that state policy plays a crucial role in attracting FDI. The estimation therefore controls for state-year fixed effects, which control for any unobservable changes that were made at the state level that would affect inward FDI and the outcome variable. The standard errors in the estimation are robust and have been clustered at the industry-year level.

V. Data and Measurement

The main data used to measure the variables in the above specification are the plant-level data from the ASI released by the Ministry of Commerce and Industry. The survey is the most comprehensive data set of India's manufacturing sector and has recently been made available as a panel. This data set is better suited to my analysis than the other commonly used Prowess data set because it contains detailed information on employment and wages of skilled and unskilled workers that the latter is unable to provide. The data include information on various plant characteristics such as fixed assets, working capital, total sales, employment, location, and wages for all categories of workers and employees at the five-digit National Industrial Classification (NIC) industry level.

For this study, I have used a strongly balanced panel of 5,425 plants. A strongly balanced panel is considered because the ASI is a combination of a survey and census; thus, if some plants are missing for a few years, we cannot infer the exit or entry of those plants. Instead, it is more likely that these firms were not surveyed in those years. Outcome variables of interest have been used or calculated from the

Table 1. **Summary Statistics**

	Mean	Standard Deviation
Log(Fixed capital)	18.96	(1.86)
Log(Working capital)	16.32	(2.80)
Log(Production workers)	4.87	(1.68)
Log(Total employment)	5.13	(1.67)
Log(Skilled workers)	3.51	(1.65)
Log(Male workers)	4.40	(1.75)
Log(Female workers)	3.27	(1.74)
Log(Managerial workers)	2.68	(1.61)
Log(Other workers)	3.00	(1.58)
Log(Total sales)	18.53	(2.50)
Skill composition	0.24	(0.16)
Observations	36,875	

Source: Author's compilation.

data set. For instance, skill composition has been calculated as a ratio of skilled employees (supervisory and managerial staff as well as other professionals such as engineers, accountants, and designers) to total workers. Relative average wages have been calculated by taking a ratio of the average wages paid out to a skilled employee to the average wages paid out to a production worker. The estimations use the natural logs of all variables except skill composition, which is a ratio. Summary statistics for these variables are reported in Table 1. A list of all the variables used as well as their definitions and units of measurement are provided in the Appendix (Table A1).

In section IV, it was assumed that larger firms were more likely to receive FDI. Using Prowess, which includes data on foreign ownership, it was demonstrated that firms receiving FDI are, on average, much bigger in terms of total sales, fixed assets, and total wages. (As mentioned earlier, Prowess data do not contain information on employment.) Table 2 shows the size distribution of firms receiving FDI from the Prowess data set in the first column, followed by all firms in the Prowess data set and all plants in the ASI data set in the second and third columns, respectively. This is presented for all plants followed by regions receiving low, medium, and high levels of FDI. Firms that receive FDI have a much higher mean and median than the grouping of all firms in the Prowess data set. These findings hold for the entire sample when considered separately for low-FDI, medium-FDI, and high-FDI regions. This analysis adds credibility to using size as a proxy for receiving FDI.

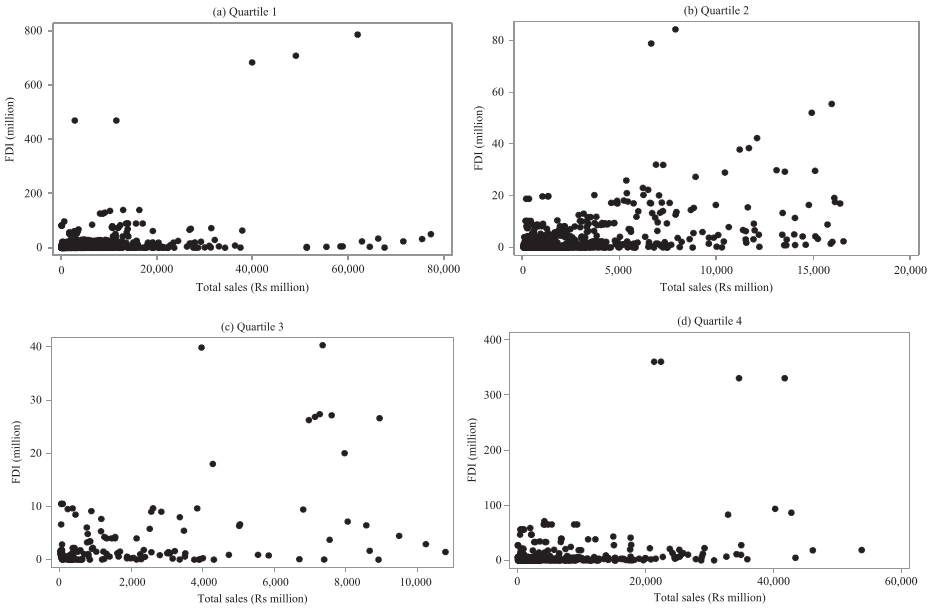
Using Prowess data, I also show the distribution of FDI across firms of different size, which is measured as total sales. This shows that there are not just a handful of focal firms receiving FDI in order to allay endogeneity concerns with the use of industry-level FDI. Figure 1 shows the distribution for the four industry quartiles, with quartile 1 receiving the smallest amount of FDI and quartile 4 receiving the largest.

Table 2. **Regional Heterogeneity in Inward Foreign Direct Investment Flows**

	All Plants			Low-FDI Region			Medium-FDI Region			High-FDI Region		
	Prowess FDI	**Prowess All**	**ASI All**	**Prowess FDI**	**Prowess All**	**ASI All**	**Prowess FDI**	**Prowess All**	**ASI All**	**Prowess FDI**	**Prowess All**	**ASI All**
					Total sales (Rs million)							
Observations	4,114	36,160	29,267	151	1,887	5,590	706	7,079	6,571	2,949	24,981	15,808
Mean	1,212.77	518.63	446.10	948.59	385.10	219.53	1,370.24	578.11	450.35	1,222.63	515.22	559.68
Median	841.20	192.00	179.13	891.60	133.60	64.17	1,036.30	231.00	148.85	847.70	191.10	314.10
Standard Deviation	1,151.42	784.97	638.99	899.87	615.58	438.38	1,199.86	817.71	671.64	1,143.83	786.35	673.89
					Total wages (Rs million)							
Observations	4,246	36,789	32,922	144	1,853	6,118	766	7,304	7,196	3,012	25,372	18,039
Mean	63.27	25.46	25.74	47.52	23.29	12.97	64.00	24.31	23.33	65.69	26.47	33.17
Median	42.45	8.20	12.79	24.30	7.90	3.62	42.20	7.40	10.12	45.65	8.80	21.46
Standard Deviation	60.49	40.85	33.04	56.60	37.51	23.19	60.38	39.97	32.23	60.85	41.81	35.05
					Fixed assets (Rs million)							
Observations	4,172	40,345	20,387	142	2,084	3,196	695	8,049	4,524	3,017	27,658	12,500
Mean	761.10	278.84	359.82	847.57	242.11	191.82	768.80	266.70	369.38	772.97	284.63	403.67
Median	535.90	98.80	159.79	500.05	79.20	62.30	587.80	92.90	127.39	548.50	101.40	219.48
Standard Deviation	702.10	450.10	493.92	818.65	419.53	361.75	684.84	442.82	533.47	703.20	452.49	500.83

ASI = Annual Survey of Industries, FDI = foreign direct investment, Rs = Indian rupee.
Source: Author's calculations.

Figure 1. **Distribution of Foreign Direct Investment by Firm Size for Industry Quartiles**



FDI = foreign direct investment, Rs = Indian rupee.
Source: Centre for Monitoring Indian Economy. Prowess database. https://www.cmie.com/kommon/bin/sr.php?kall=wcontact&page=prowess.

The industry-level FDI data used in this study are from the Department of Industrial Policy and Promotion of the Ministry of Commerce and Industry (National Council of Applied Economic Research 2009). The report compiles statistics released by the Reserve Bank of India for 2000–2006. Using the concordance between the Department of Industrial Policy and Promotion's sector-level codes and the three-digit level NIC 2004 provided in the 2009 report, as well as concordance tables for three-digit NIC codes for 1998–2004 from the Ministry of Commerce and Industry website, inward FDI flows are reported at the NIC 1998 three-digit level. There are a total of 75 industries considered in the data for the manufacturing sector, with significant variation across industries.

Section VIII of this paper studies the relationship between industry-level FDI and various plant-level employment and wage outcomes for India's regions. Based on the combined FDI and plant-level data, Indian states have been divided into three groups according to the amount of FDI received: (i) the top third, (ii) the middle third, and (iii) the bottom third. The states in group (i) are Andhra Pradesh, Gujarat, Haryana, Karnataka, Maharashtra, Tamil Nadu, Uttar Pradesh, and West Bengal. The states in group (ii) are Dadar and Nagar Haveli, Delhi, Goa, Jharkhand, Madhya Pradesh, Odisha, Punjab, Rajasthan, and Uttaranchal. The states in group (iii) are Assam, Bihar, Chandigarh, Chhattisgarh, Daman and

Diu, Himachal Pradesh, Kerala, Pondicherry, and others.[1] The states that did not receive FDI are not included in the analysis for this section. As mentioned above, Banga (2003), Aggarwal (2005), and Mukherjee (2011) provide evidence on how FDI inflows are spatially distributed. Section VIII of this study delves into the consequences that these regional disparities in FDI inflows have on employment and the wages of skilled and unskilled workers.

VI. Results and Discussion

The specification in section IV has been estimated for various outcome variables. Table 3 shows how alternate specifications, especially in terms of various fixed effects, affect the coefficient of interest. The dependent variable in Table 3 is total employment at the plant level. Model 1 only considers the level of FDI (firm size is proxied by total sales) and it also includes various plant-level controls such as total fixed capital and working capital. Model 1 only controls for plant fixed effects and year fixed effects. The effect of aggregate industry-level FDI on plant-level total employment is negative, but it is not statistically significant.

Model 2 introduces the interaction term between FDI and plant-level total sales, which is the measure of size being used in this estimation. If we only consider in the interaction term the levels of FDI and total sales, which are two continuous variables, the coefficient is not very informative. It will give the differential effect of FDI on plants that have nonzero total sales relative to plants that have zero total sales. To make this more informative, total sales has been centered around the mean, so we can compare the effect of FDI on plants that are of average size relative to plants that are of below-average size. We find that the coefficient on the interaction term is positive and significant. This implies that for plants that are larger than the average plant in the sample, an increase in industry-level FDI leads to a bigger increase in total employment relative to plants that are smaller than average. These plants are either receiving FDI or are large enough to compete with plants benefiting from FDI, and they are expanding production activity and total employment more than small plants in the same industry. β_1 in this model is negative but insignificant, which can be interpreted as either a lack of industry-level spillovers in terms of employment or simply as small plants not gaining from the increased levels of FDI in their industry. The coefficient β_2 varies from 0.002 to about 0.003. While this may not seem economically significant, many industries have seen large percentage increases in FDI. Also, this effect will be bigger the larger the plant is relative to an average-sized plant. In addition, it will vary from industry to industry and region to region. The variations across industries and regions are explored in section VII.

Model 3 includes industry fixed effects, which control for any fixed differences across industries that may lead to a higher inflow of FDI and affect

[1] Pondicherry was renamed Puducherry in 2006.

Table 3. **Foreign Direct Investment and Total Employment**

	(1) Log(Total employment)	(2) Log(Total employment)	(3) Log(Total employment)	(4) Log(Total employment)	(5) Log(Total employment)	(6) Log(Total employment)	(7) Log(Total employment)
Log(FDI)	−0.00150	−0.00275	−0.00398	−0.00398	0.104	−0.00391*	0.0739
	(0.00208)	(0.00235)	(0.00256)	(0.00256)	(-)	(0.00227)	(-)
Log(FDI) × Log(Total sales)		0.00210*	0.00240**	0.00240**	0.00298**	0.00255**	0.00337**
		(0.00114)	(0.00117)	(0.00117)	(0.00141)	(0.00117)	(0.00141)
Log(Total sales)	0.203***	0.169***	0.163***	0.163***	0.155***	0.161***	0.148***
	(0.0113)	(0.0205)	(0.0208)	(0.0208)	(0.0241)	(0.0206)	(0.0240)
Constant	2.862***	2.896***	3.045***	3.045***	2.232	2.887***	2.370
	(0.222)	(0.222)	(0.263)	(0.263)	(-)	(0.213)	(-)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year FE	No	No	No	No	Yes	No	Yes
State-year FE	No	No	No	No	No	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	No	No	No
Industry FE	No	No	Yes	Yes	No	No	No
State FE	No	No	No	Yes	No	No	No
Observations	23,559	23,559	23,559	23,559	23,559	23,559	23,559
Adjusted R^2	0.200	0.201	0.203	0.203	0.215	0.209	0.223

FDI = foreign direct investment, FE = fixed effects.

Notes: All models include plant fixed effects. Standard errors are in parentheses and are clustered at the three-digit NIC industry-year level. Log(Total sales) has been centered around its mean. (-) indicates that the standard error could not be calculated because of the fixed effects. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Source: Author's calculations.

plant-level employment. Model 4 includes state fixed effects in addition to industry fixed effects, which further controls for any fixed differences across states that may be affecting the relationship between inward FDI and plant-level employment. It may be possible, however, that the differences across industries vary over time and β_1 may pick up these changes that are affecting the dependent variable. To control for this, Model 5 includes industry-year fixed effects, which allows us to estimate only the differential effects across big and small plants of industry-level FDI changes. Similarly, differences across states vary across time, especially with respect to state-level policies. As has been highlighted by Banga (2003), Morris (2004), Aggarwal (2005), and Mukherjee (2011), these policies play a very important role in affecting FDI inflows. Therefore, Model 6 controls for state-year fixed effects. Model 7 controls for both industry-year fixed effects and state-year fixed effects. The main coefficient of interest β_2 continues to be positive and statistically significant across all models. The magnitude also roughly remains the same, though it is largest in Model 7, where we include the most controls. Ideally, we would like to use the specification in Model 7 as the baseline because it includes both state-year fixed effects and industry-year fixed effects, but because β_1 is of interest to us in order to estimate the spillover effects to small plants, we use state-year fixed effects and industry fixed effects in all the following estimations. While not presented in Table 3, I also estimated models that include industry-region-year fixed effects to better account for the endogeneity of FDI. Again, the coefficient of the interaction term is what will be better identified rather than the spillover effects (β_1). The estimation results reveal that the coefficient on the interaction term is robust to this specification.[2]

The specification used in all models in Table 4 includes firm fixed effects, industry fixed effects, and state-year fixed effects. The outcome variables all pertain to employment, starting with total employment at the plant level in Model 1. The effects are not different from those discussed in Table 3, wherein we find evidence of a relative increase in total employment at large plants, possibly those that benefit from increased industry-level FDI, and no evidence of spillovers to small plants. Similar effects are found for employment of skilled workers and production workers in Models 3 and 4. Both models show that big plants differentially employ more skilled workers and production workers relative to small plants as industry-level FDI increases. However, Model 3 shows evidence of negative spillovers of production workers to small plants. This can be interpreted as the market contraction effect for small firms in favor of large firms due to FDI. As industry-level FDI increases, small plants, which are likely not receiving this FDI nor are productive enough to compete with plants with a foreign presence, experience a decline in market share. Therefore, as their market share and production declines, they experience lower derived demand and less employment

[2]The results are available from the author upon request.

Table 4. **Foreign Direct Investment and Skilled Workers**

	(1) Log(Total Employment)	(2) Log(Skilled Workers)	(3) Log(Production Workers)	(4) Skill Composition	(5) Log(Managerial Employees)	(6) Log(Other Employees)	(7) Composition of Other Employees
Log(FDI)	−0.00561**	−0.00268	−0.00712***	0.000765	−0.000351	−0.00461	−0.000232
	(0.00244)	(0.00250)	(0.00260)	(0.000535)	(0.00299)	(0.00326)	(0.00246)
Log(FDI) × Log(Total sales)	0.00295**	0.00272***	0.00259***	0.0000785	0.00222*	0.00559***	0.00193**
	(0.00119)	(0.00103)	(0.000942)	(0.000197)	(0.00126)	(0.00120)	(0.000785)
Log(Total sales)	0.154***	0.0872***	0.147***	−0.0132***	0.0993***	0.0339	−0.0363***
	(0.0207)	(0.0179)	(0.0201)	(0.00361)	(0.0220)	(0.0207)	(0.0139)
Constant	3.141***	0.546	2.556***	0.337***	−0.231	1.005*	−0.511
	(0.259)	(0.489)	(0.284)	(0.0763)	(0.390)	(0.593)	(0.310)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	23,559	23,486	23,503	23,506	23,378	22,837	22,706
Adjusted R^2	0.211	0.119	0.152	0.018	0.069	0.060	0.005

FDI = foreign direct investment, FE = fixed effects.

Notes: All models include plant fixed effects. Standard errors are in parentheses and are clustered at the three-digit NIC industry-year level. Log(Total sales) has been centered around its mean. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Source: Author's calculations.

of production workers. In terms of the composition, however, Model 4 shows that there are no differential effects in terms of bias toward skilled workers. At least compositionally, there is no evidence of complementarities between skilled workers and sophisticated technology that is embodied in FDI, either in terms of differential effects or in terms of spillovers. Models 5 and 6 analyze how the two subcategories of skilled workers (managerial and supervisory staff and other technically skilled employees) are affected by industry-level FDI. The estimations reveal that the differential effects are much larger in the case of other technically skilled employees compared with supervisory and managerial staff. This indicates that there are bigger complementarities between technical skills and FDI than managerial skills and FDI. Alternatively, it could mean that although plants would like to adjust their organizational structures and hire more and better managers as FDI increases, they are unable to do so because of systemic lags in adjustment or rigidities in organizational structures. This could be further exacerbated by the fact that there are supply-side constraints as far as hiring managers is concerned.

Table 5 studies the relationship between wages of various worker categories and industry-level inward FDI. Model 1 examines how the total wage bill at the plant level changes with industry-level FDI. Not only do big plants pay out higher total wages than small plants, there are negative spillovers to small plants as industry-level FDI increases. Total wages, however, capture both changes in employment and average wages, and may be a reflection of the employment effects observed in Table 4. Model 2, therefore, considers the average wages paid out to workers and whether the positive differential effect for big plants as well as the negative spillover effects to small plants still persist. The dependent variables in Models 3 and 4 are the average wages paid out to skilled workers and production workers, respectively. Again, big plants differentially pay higher average wages to both skilled workers and production workers relative to small plants, while small plants experience negative spillovers as industry-level FDI increases. This implies there is no evidence of the transfer of technology or skills to workers or an upskilling of the labor pool. Bigger plants that are either recipients of FDI or are more aggressively able to compete with plants with FDI poach these workers to stay competitive in the market. There is, however, no differential increase in relative wages or the wage–skill premium. This could be because foreign firms pay efficiency wages to both production and nonproduction workers to elicit more effort. The increase in wages to both categories is perhaps proportional, which is why it does not reflect in the measure of the wage–skill premium. Additionally, the measure of skill here does not include education; therefore, it is possible that more educated workers in each of these categories are experiencing a bigger increase in wages than those with less education and training. Unfortunately, I am unable to capture this because of a lack of data. Skilled employees are further classified into two subcategories—(i) managerial and supervisory staff, and (ii) other skilled employees such as engineers and accountants—in Models 6 and 7, respectively.

Table 5. **Foreign Direct Investment and Wages**

	(1) Log(Wages)	(2) Log(Average wage)	(3) Log(Skilled average wage)	(4) Log(Production average wage)	(5) Log(Relative wages)	(6) Log(Managerial average wage)	(7) Log(Other skilled average wage)
Log(FDI)	−0.0103***	−0.00470**	−0.00493**	−0.00393**	−0.00110	−0.00836***	−0.00628**
	(0.00306)	(0.00188)	(0.00215)	(0.00179)	(0.00195)	(0.00249)	(0.00255)
Log(FDI) × Log(Total sales)	0.00533***	0.00232***	0.00287***	0.00182***	0.00103	0.00378***	0.00254**
	(0.00125)	(0.000677)	(0.000866)	(0.000668)	(0.000820)	(0.00109)	(0.00101)
Log(Total sales)	0.167***	0.0139	0.0283*	0.0377***	−0.00948	0.00819	0.0342*
	(0.0241)	(0.0111)	(0.0153)	(0.0116)	(0.0149)	(0.0185)	(0.0177)
Constant	13.77***	10.64***	11.31***	10.35***	0.921**	11.35***	10.50***
	(0.358)	(0.253)	(0.394)	(0.176)	(0.359)	(0.427)	(0.469)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	23,557	23,557	23,462	23,501	23,457	23,370	22,834
Adjusted R^2	0.337	0.261	0.237	0.193	0.032	0.176	0.147

FDI = foreign direct investment, FE = fixed effects.

Notes: All models include plant fixed effects. Standard errors are in parentheses and are clustered at the three-digit NIC industry-year level. Log(Total sales) has been centered around its mean. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Source: Author's calculations.

The differential effects are also strong for these categories and there are negative spillovers for the average-sized plant.

Putting the results from the employment and wage effects together, we find that large plants experience an expansion in employment of both skilled and unskilled workers relative to small plants as industry-level FDI increases, along with a relative increase in the total wage bill and average wages paid out to skilled and unskilled workers. There is no evidence of positive spillovers in terms of wages or employment to average-sized and small plants. Based on the coefficient of log(FDI), which measures the effect of industry-level FDI on averaged-sized to small plants, one can infer that there is no evidence of positive spillovers in terms of wages or employment. In fact, there seem to be negative spillovers to small plants as far as wages of skilled and unskilled workers are concerned, pointing toward the fact that there is probably more poaching than training with increased industry-level FDI. Further, there are negative spillovers to small plants as far as employment of production workers is concerned, likely due to decreased market share from the market reallocation effect of greater industry-level FDI. There also seem to be no relative adjustments in terms of skill composition at large plants as FDI increases; neither is there a relative increase in the demand for skilled workers as reflected by the insignificant effects on the wage–skill premium. It is possible, however, that to find stronger effects on spillovers in terms of wage–skill premium or skill composition, we should consider the lagged effects of FDI. I consider this in section VII, which also serves as a robustness check for the results. It could be the case that a critical mass of FDI needs to be achieved before spillover effects are observed. This question will be revisited in section VIII, where I compare regions receiving low, average, and large inflows of FDI.

In the concluding part of this section, I investigate how the employment and wages of male and female production workers are affected by industry-level inward FDI. There is a different perception about the skills and commitment of male and female production workers, as theorized by Yahmed (2012), such that employers discriminate against female workers. This discrimination is exacerbated as plants globalize and become quality conscious. I find that this holds in the context of FDI in India's manufacturing sector. Table 6 shows that, with an increase in industry-level FDI, large plants differentially increase the employment and average wages paid out to male workers, while the employment of female workers remains unaffected. This leads to a slightly statistically significant lower wage for women at large plants relative to small plants.

VII. Robustness Checks

This section addresses the various endogeneity concerns that can arise when estimating the specification in section IV. It is an extension of Table 3, which shows that the estimation is robust to various other specifications. First, I show that the

Table 6. **Foreign Direct Investment and Wages of Male and Female Workers**

	(1) Log(Male workers)	(2) Log(Male average wage)	(3) Log(Female worker)	(4) Log(Female average wage)	(5) Log(Gender relative wages)	(6) Female composition
Log(FDI)	−0.0112***	−0.00439**	−0.00298	−0.00323	0.00600	0.00212*
	(0.00306)	(0.00200)	(0.00640)	(0.00419)	(0.00378)	(0.00128)
Log(FDI) × Log(Total sales)	0.00245***	0.00215***	0.000709	0.00153	−0.00258*	0.000195
	(0.000907)	(0.000660)	(0.00189)	(0.00193)	(0.00148)	(0.000376)
Log(Total sales)	0.117***	0.0422***	0.0718*	0.0373	0.0305	−0.00584
	(0.0182)	(0.0119)	(0.0394)	(0.0315)	(0.0256)	(0.00690)
Constant	2.809***	10.20**	1.575***	10.54***	0.281	0.285**
	(0.326)	(0.191)	(0.540)	(0.292)	(0.330)	(0.110)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
State-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	23,155	23,152	7,954	7,940	7,888	7,966
Adjusted R^2	0.129	0.224	0.057	0.142	0.011	0.036

FDI = foreign direct investment, FE = fixed effects.

Notes: All models include plant fixed effects. Standard errors are in parentheses and are clustered at the three-digit NIC industry-year level. Log(Total sales) has been centered around its mean. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Source: Author's calculations.

Table 7. **Robustness Checks**

	(1) Log(Total employment)	(2) Log(Total employment)	(3) Log(Total employment)	(4) Log(Total employment)
Lagged Log(FDI)	−0.00348	−0.00685***		−0.00582**
	(0.00216)	(0.00218)		(0.00267)
Log(FDI) × Log(Total fixed capital)	0.00210***			
	(0.000767)			
Log(Total sales)	0.203***	0.141***		
	(0.0114)	(0.0224)		
Lag(Log(FDI)) × Log(Total sales)		0.00360***		
		(0.00128)		
Log(Total fixed capital)	0.0985***	0.151***	0.200***	0.197***
	(0.0168)	(0.0142)	(0.0186)	(0.0190)
Log(FDI)			−0.00676**	
			(0.00317)	
Log(FDI) × Lag(Log(Total sales))			0.00369***	
			(0.00126)	
Lag(Log(Total sales))			0.0876***	0.0901***
			(0.0232)	(0.0257)
Lag(Log(FDI)) × Lag(Log(Total sales))				0.00345**
				(0.00151)
Constant	1.834***	3.165***	0.0234	2.246***
	(0.275)	(0.310)	(0.350)	(0.398)
Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
State-year FE	Yes	Yes	Yes	Yes
Observations	23,559	20,024	20,262	19,960
Adjusted R^2	0.211	0.198	0.118	0.113

FDI = foreign direct investment, FE = fixed effects.
Notes: All models include plant fixed effects. Standard errors are in parentheses and are clustered at the three-digit NIC industry-year level. Log(Total sales) has been centered around its mean. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.
Source: Author's calculations.

estimation is robust to different measures of size. Model 1 in Table 7 considers fixed assets as a measure of size instead of total sales. The estimation results are not affected by this change. Another important concern is the endogeneity of FDI inflows. As mentioned in section IV, one can expect FDI to flow into productive industries, which may lead to an endogeneity bias in the estimates. A few ways in which we control for that in Table 3 is by including industry fixed effects and by showing that the estimation is robust when industry-year fixed effects are included.

I further show that the estimation is robust by considering lagged FDI in Model 2. The differential effect is positive, significant, and of a greater magnitude, showing that the effects of FDI only increase over time. Another important endogeneity bias that the specification possibly suffers from is the reverse causality that may exist between size and the various outcome variables. Bigger plants may employ more workers, pay higher wages, and have a higher skill composition. In

Model 3 of Table 7, I use lagged total sales and find that the main result still holds. Model 4 of Table 6 considers the lagged effects of both FDI and total sales, and finds that the results are robust to this specification as well.

VIII. Regional Heterogeneity

While the estimation exercise so far has estimated the effect of FDI on plant-level employment and wages, it is important to understand how these effects differ across regions. Banga (2003), Aggarwal (2005), and Mukherjee (2011) highlight the regional FDI disparities in India that are driven by differences in state policies, infrastructure, and labor market institutions. Based on a ranking of the states in these studies and data from the Department of Industrial Policy and Promotion, I have divided the states into three groups according to the amount of FDI received: (i) the top third, (ii) the middle third, and (iii) the bottom third.

I estimate the relationship for each of these regions and the models now contain only plant fixed effects, industry fixed effects, and year fixed effects. The outcome variables considered are total employment, skill composition, and relative wages (wage–skill premium). The results are shown in Table 8.

The estimates reveal that in states that receive the largest FDI, group (i), there are no differential effects of FDI between big plants and average-sized plants. There are only negative spillovers in terms of total employment to small plants owing to market reallocation effects. This is also the case in group (ii). In group (iii), however, while there are no differential effects of FDI between big and small plants, there are strong spillover effects for both kinds of plants. Models 8 and 9 show higher skill composition and higher relative wages at average-sized plants as industry-level FDI increases. Since these are regions where FDI inflows are large and persistent, there is stronger evidence of spillovers. It is possible that a certain critical mass of FDI inflows has to be achieved before skilled workers gain from the transfer of technology and knowledge induced by foreign investment. Further, the transfer takes place over time, which is why there is evidence of spillovers only in regions that have historically been and continue to be the biggest recipients of FDI inflows. There may be a concern that it is likely that average-sized plants in high-FDI regions might be recipients of FDI, in which case one cannot interpret the coefficient on log(FDI) as spillovers. Therefore, I estimated all specifications with size centered around the 25th percentile in order to measure the effects of FDI on this group of plants. While not included in this paper, I find that the results continue to be robust for this specification.[3]

This finding is further highlighted in Table 9 in which three states are considered: (i) Maharashtra, a state with a very high level of FDI; (ii) Madhya Pradesh, a state that receives an average amount of FDI; and (iii) Assam, a state

[3] The results are available from the author upon request.

Table 8. **Regional Effects of FDI**

	Low-FDI Region			Medium-FDI Region			High-FDI Region		
	(1) Log(Total employment)	(2) Skill composition	(3) Log(Relative average wages)	(4) Log(Total employment)	(5) Skill composition	(6) Log(Relative average wages)	(7) Log(Total employment)	(8) Skill composition	(9) Log(Relative average wages)
Log(FDI)	−0.0155***	0.000220	0.000325	−0.0208***	−0.00114	0.00285	−0.0265***	0.00132**	0.0210***
	(0.00488)	(0.00122)	(0.00548)	(0.00497)	(0.000895)	(0.00401)	(0.00493)	0.000564)	(0.00385)
Log(FDI) × Log(Total sales)	0.000999	0.00000979	0.00148	0.00115	0.000340	0.00206	0.00487**	−0.000286	−0.000461
	(0.00179)	(0.000392)	(0.00154)	(0.00164)	(0.000388)	(0.00165)	(0.00229)	(0.000273)	(0.00154)
Log(Total sales)	0.195***	−0.0170**	−0.0123	0.199***	−0.0213***	−0.0384	0.101***	−0.00442	0.0248
	(0.0325)	(0.00732)	(0.0266)	(0.0328)	(0.00657)	(0.0296)	(0.0355)	(0.00493)	(0.0284)
Constant	4.055***	0.170*	0.181	4.296***	0.107	0.544	4.874***	0.447***	−1.398***
	(0.388)	(0.0935)	(0.441)	(0.384)	(0.108)	(0.489)	(0.303)	(0.0815)	(0.376)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,914	3,902	3,886	5,177	5,166	5,150	14,217	14,189	14181
Adjusted R^2	0.220	0.026	0.008	0.205	0.023	0.011	0.152	0.011	0.018

FDI = foreign direct investment, FE = fixed effects.

Notes: All models include plant fixed effects. Standard errors are in parentheses and are clustered at the three-digit NIC industry-year level. Log(Total sales) has been centered around its mean. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Source: Author's calculations.

Table 9. **Foreign Direct Investment in Various Indian States**

	Maharashtra			Madhya Pradesh			Assam		
	(1) Log(Total) employment)	(2) Skill composition	(3) Log(Relative average wages)	(4) Log(Total employment)	(5) Skill composition	(6) Log(Relative average wages)	(7) Log(Total employment)	(8) Skill composition	(9) Log(Relative average wages)
Log(FDI)	−0.0291***	0.00282**	0.0164***	−0.0305***	−0.000244	0.0228**	−0.0187	0.00174	0.00179
	(0.00736)	(0.00116)	(0.00628)	(0.00710)	(0.00163)	(0.0102)	(0.0127)	(0.00446)	(0.0131)
Log(FDI) × Log(Total sales)	0.0116**	−0.000455	−0.00385	0.00132	−0.000415	0.00372	0.0162**	−0.00149	−0.00211
	(0.00473)	(0.000547)	(0.00281)	(0.00339)	(0.000700)	(0.00318)	(0.00742)	(0.00224)	(0.00650)
Log(Total sales)	0.00791	−0.00435	0.0921*	0.195***	−0.00144	−0.0624	0.0203	−0.0149	0.0643
	(0.0751)	(0.0102)	(0.0522)	(0.0568)	(0.0132)	(0.0532)	(0.133)	(0.0377)	(0.104)
Constant	5.951***	−0.247	−1.216*	3.935***	0.413**	1.922	3.485***	0.498*	3.309***
	(0.866)	(0.154)	(0.621)	(0.960)	(0.182)	(1.351)	(1.050)	(0.283)	(1.233)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,498	3,488	3,487	981	981	981	436	435	433
Adjusted R^2	0.193	0.030	0.021	0.247	0.039	0.019	0.309	0.057	0.034

FDI = foreign direct investment, FE = fixed effects.

Notes: All models include plant fixed effects. Standard errors are in parentheses and are clustered at the three-digit NIC industry-year level. Log(Total sales) has been centered around its mean. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Source: Author's calculations.

with a very low level of FDI. Maharashtra experiences an increase in both skill composition and relative wages through spillovers to even average-sized plants as industry-level FDI increases. In fact, there is no differential effect of FDI based on size. In Madhya Pradesh, these spillovers are present for relative wages but not for skill composition or total employment. In Assam, on the other hand, these spillovers are absent.

While these tables help give an aggregate sense of the relationship between FDI and various labor outcomes, I further test for whether one observes these when considering a specific industry. I chose an industry that belongs to the highest quartile in terms of inward FDI and is spread across various regions, Basic Chemicals (NIC 241). Table 10 includes four panels. The first panel shows the result for the entire industry and the next three show the results for regions receiving low, average, and high levels of FDI, respectively. All panels echo the results obtained throughout the paper, which is that while there is an intra-industry reallocation of labor from large to small plants in regions with high levels of FDI, there are also positive spillovers to small plants in terms of higher average wages for both production workers and skilled employees, as well as an increase in relative wages for skilled workers.

IX. Conclusion

In this paper, I investigate the impact of industry-level FDI on plant-level employment and wages for both skilled and unskilled workers. The expectation is that given the nature of FDI, which typically embodies superior technology, increased inflows should be accompanied by a transfer of technology to plants and workers, further enhancing the skills and wages of workers. Such a transfer is expected to have positive (spillover) effects, even to those plants that do not receive FDI through the training of workers and labor mobility, and to lead to imitation among plants within an industry.

My hypothesis is that the effects of industry-level FDI in terms of spillovers will be differential based on the size of the plant. My empirical analysis, which covers 5,425 plants in India's manufacturing sector, confirms this hypothesis. Larger plants experience a differential increase in total employment as well as average wages paid out to both skilled and unskilled workers relative to average-sized and small plants. However, small plants experience negative spillovers in terms of employment of production workers and average wages paid out to both skilled and unskilled workers. This suggests that there are strong market reallocation effects as foreign ownership of plants increases in an industry. Further, increased industry-level FDI is associated with a relative increase in demand for male blue-collar workers at large plants relative to average-sized and small plants, while the demand for female blue-collar workers remains unaffected. While there is evidence of an increase in skilled workers, there are no differential compositional changes at big

Table 10. **Region-Wise Effects of Foreign Direct Investment**

	(1) Log(Total employment)	(2) Log(Production workers)	(3) Log(Skilled workers)	(4) Skill composition	(5) Log(Average wages)	(6) Log(Average production wages)	(7) Log(Average skilled wages)	(8) Log(Relative average wages)
				All Plants				
Log(FDI)	−0.250***	−0.192***	−0.242***	−0.00726	0.295***	0.258***	0.346***	0.0881
	(0.0493)	(0.0323)	(0.0493)	(0.00613)	(0.0397)	(0.0162)	(0.0505)	(0.0523)
Log(FDI) ×	0.0241***	0.0322***	0.00568	−0.00529***	−0.0103*	0.00137	−0.0102**	−0.0115**
Log(Total sales)	(0.00585)	(0.00632)	(0.00544)	(0.00104)	(0.00516)	(0.00613)	(0.00349)	(0.00409)
Log(Total sales)	−0.0508	−0.300*	0.122	0.0852***	0.268**	0.105	0.346***	0.241**
	(0.151)	(0.124)	(0.0806)	(0.0164)	(0.101)	(0.0861)	(0.0446)	(0.0822)
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	759	757	756	757	759	757	756	756
Adjusted R^2	0.233	0.097	0.129	0.032	0.254	0.155	0.244	0.035
				Low-FDI Region				
Log(FDI)	−0.332**	−0.363**	−0.256***	0.0230	0.296**	0.423***	0.187**	−0.236***
	(0.0952)	(0.112)	(0.0428)	(0.0162)	(0.0959)	(0.0384)	(0.0646)	(0.0533)
Log(FDI) ×	0.00216	0.0129	−0.0251**	−0.00732	−0.00937	0.0124	−0.00862	−0.0210
Log(Total sales)	(0.0137)	(0.0193)	(0.00995)	(0.00397)	(0.00482)	(0.0132)	(0.00957)	(0.0172)
Log(Total sales)	0.348	0.221	0.689**	0.0888	0.239**	−0.135	0.227	0.362
	(0.192)	(0.302)	(0.200)	(0.0777)	(0.0660)	(0.212)	(0.154)	(0.284)
Observations	90	90	89	90	90	90	89	89
Adjusted R^2	0.516	0.457	0.480	0.137	0.631	0.397	0.702	0.643

Continued.

Table 10. *Continued.*

	(1) Log(Total employment)	(2) Log(Production workers)	(3) Log(Skilled workers)	(4) Skill composition	(5) Log(Average wages)	(6) Log(Average production wages)	(7) Log(Average skilled wages)	(8) Log(Relative average wages)
Medium-FDI Region								
Log(FDI)	−0.279**	−0.193**	−0.117	0.0112	0.198***	0.188***	0.302***	0.115
	(0.0758)	(0.0775)	(0.0799)	(0.0151)	(0.0528)	(0.0305)	(0.0627)	(0.0601)
Log(FDI) ×	0.0148	0.0223	−0.0505***	−0.0137**	0.0180	0.0164	0.0301	0.0137
Log(Total sales)	(0.0130)	(0.0182)	(0.0131)	(0.00395)	(0.0200)	(0.0141)	(0.0204)	(0.0158)
Log(Total sales)	0.351	0.0766	1.262***	0.234**	−0.118	−0.254	−0.298	−0.0437
	(0.239)	(0.320)	(0.258)	(0.0713)	(0.353)	(0.246)	(0.365)	(0.256)
Observations	115	114	114	114	115	114	114	114
Adjusted R^2	0.476	0.279	0.210	0.031	0.350	0.142	0.311	0.023
High-FDI Region								
Log(FDI)	−0.260***	−0.170***	−0.266***	−0.0159*	0.348***	0.237***	0.406***	0.169***
	(0.0352)	(0.0369)	(0.0141)	(0.00747)	(0.0337)	(0.0331)	(0.0299)	(0.0161)
Log(FDI) ×	0.0277**	0.0474***	0.0356**	−0.00266	0.000198	−0.0108	−0.00730	0.00352
Log(Total sales)	(0.0100)	(0.00825)	(0.00983)	(0.00252)	(0.00845)	(0.00602)	(0.00826)	(0.00831)
Log(Total sales)	−0.218	−0.780***	−0.571***	0.0460	0.0559	0.400**	0.343	−0.0567
	(0.292)	(0.166)	(0.154)	(0.0383)	(0.210)	(0.111)	(0.230)	(0.177)
Observations	552	551	551	551	552	551	551	551
Adjusted R^2	0.170	0.061	0.133	0.029	0.213	0.137	0.219	0.011

FDI = foreign direct investment, FE = fixed effects.

Notes: All models include plant fixed effects. Standard errors are in parentheses and are clustered at the three-digit NIC industry-year level. Log(Total sales) has been centered around its mean. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Source: Author's calculations.

plants; neither is there evidence of an increase in the relative wage–skill premium at large plants. While this may suggest that an increase in industry-level FDI in India is not skill biased in its demand for workers nor does it contribute to an increasing pool of skilled workers, analysis at the regional level provides a better picture of the actual effects. Analyzing the effects of industry-level FDI on different regions reveals that even average and small-sized plants in regions that receive the largest inflows of FDI experience an increase in both the wage–skill premium and the skill composition of workers. This indicates that perhaps a critical mass of FDI is required to influence the demand for skilled workers at plants and to contribute to the pool of skilled workers in an industry.

The above findings are important for understanding the effects of a liberalized FDI policy. If the inflows of FDI into an industry are low and not sustained over time, we should expect to observe greater intra-industry reallocation of output from domestic firms to multinational firms. This is associated with the poaching of high-quality workers from small and averaged-sized plants as opposed to the transformation of the workforce through the provision of better skills. The current Make in India campaign should ensure that conditions in the domestic economy not only attract FDI, but also that these inflows persist over a period of time to benefit the workforce at the industry level.

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Appendix

Table A1. **Glossary**

Variable	Description	Unit
Fixed capital	Total value of fixed assets	Rs
Working capital	Current assets minus current liabilities	Rs
Production workers	Unskilled workers	-
Skilled workers	Technical, supervisory, and managerial employees	-
Total employment	Total number of people employed	-
Male workers	Male workers	-
Female workers	Female workers	-
Managerial workers	Workers in managerial and supervisory roles	-
Other workers	Nonmanagerial, nonsupervisory, or nontechnically skilled employees	-
Total sales	Gross sale value	Rs
Skill composition	Ratio of skilled workers to production workers	-
Other skilled composition	Ratio of technically skilled workers to managerial and supervisory workers	-
Foreign direct investment	Total foreign direct investment received	Rs
Wages	Total amount paid out in wages by the plant	Rs
Average wage	Total wages / Total employment	Rs

Continued.

Table A1. *Continued.*

Variable	Description	Unit
Skilled average wage	Total amount paid out in wages to skilled employees / Number of skilled employees	Rs
Production average wage	Total amount paid out in wages to production workers / Number of production workers	Rs
Relative wages	Ratio of total wages paid to skilled workers to those paid to production workers	Rs
Relative average wages	Ratio of skilled average wages to production average wages	Rs
Managerial average wage	Total amount paid in wages to managerial workers / Number of managerial and supervisory workers	Rs
Other skilled average wage	Total amount paid in wages to technically skilled employees / Number of technically skilled employees	Rs
Male average wage	Total amount paid out in wages to males / Number of male workers	Rs
Female average wage	Total amount paid out in wages to females / Number of female workers	Rs
Gender relative wages	Ratio of female average wage to male average wage	-
Female composition	Ratio of female workers to male workers	-
Lagged Log(FDI)	Log of foreign direct investment of the previous year	-
Lag(Log(Total sales))	Log of total sales of the previous year	-

FDI = foreign direct investment, Rs = Indian rupee.
Source: Author's compilation.