CHAPTER 5

FDI AND EMPLOYMENT: A FIRM-LEVEL EXPLORATION

5.1 Introduction

This chapter explores into the impact of FDI on labour market outcomes, employment in specific. In comparison to the impact of FDI on export performance and technology choice in the host economy, the relationship between FDI flows and labour market in recipient countries is a relatively new area of research in developing countries although its crucial connections with economic growth are already well established (Greenaway and Nelson, 2001). The impact of global integration on labour market in terms of wages and employment is also being studied separately (Wood, 1994).

The literature suggests that inflows of FDI and MNE operations generate employment (Fu and Balasubramanyam, 2005; Craigwell 2006; Waldkrich, 2008; Liu, 2012). Literature further provides evidence of foreign investment impacting on demand for skill in the recipient countries (Berman et al. 1994, 1998; Head and Ries, 2002, Pavcnik, 2003, Blomstrom, Kokko and Zejan, 1994) as well as on welfare and occupational choice (Dasgupta, 2012). Acharyya and Kar (2014) analyse skill formation following FDI, where FDI is positively associated with growth only when human capital is sufficiently above a critical level to absorb technological diffusions (Borensztein et al. 1998; Xu, 2000; Yussof and Ismail, 2002). Rise in employment is also on account of increased exports with quantum FDI inflows (Gera and Masse, 1996; Hill and Athukorola, 1998; Lall, 2002; Ghose, 2000; Goldar, 2002) which works through heterogeneous skills of workers (Yeaple, 2005). As foreign firms are endowed with skill-
based sophisticated technology, it is likely that this has a negative impact on overall employment (Nickel and Bell, 1996; Vivarelli and Pianta, 2000; Driffield and Taylor, 2000). Thus, labour market impact of FDI in host economies is of critical importance for labour surplus market economies including India.

With wide ranging economic reforms in India since the 1990s, including reforms in FDI policies, impact on labour market, particularly on employment and wages, has emerged to be a crucial issue. This issue, however, has not been adequately explored at the firm-level in the Indian context. As discussed in Chapter 2, despite a downturn since 2006, there has been a rise in employment across sectors in Indian manufacturing post-2000. As discussed in the preceding chapters, with increasing MNE operations in India, there has been a rise in export and foreign technology intensities across sectors in Indian manufacturing. The impact of FDI, exports and imported technology on labour market outcomes deserves adequate attention.

In specific, this chapter investigates into the impact of FDI on firm-level employment across manufacturing industries in India. In this chapter, post-2000 period has been chosen for analysis on account of quantum rise in export and technological intensities in conjunction with a sharp rise in FDI particularly in India after 2000, as observed in earlier chapters. In the (econometric) analysis that follows, the study controls for factors including technology, productivity and foreign ownership in determining firm-level labour demand in Indian manufacturing enterprises. It is in this aspect where the study in particular, contributes to the existing literature. This analysis however, does not look into important issues including firm-level wage determination and wage inequality in the emerging market economies.
The chapter is organized as follows. The following section delineates the theoretical and the estimable models to study the impact of FDI on firm-level employment, Section 5.3 briefs on the method and the dataset used. Section 5.4 presents the empirical results along with their possible interpretation. The last section summarizes the main findings of this chapter.

5.2 The Models

The effect of foreign direct investment on total employment works through two different channels. On one hand, with an inward investment, an increase in output can lead to an increase in labour demand, while on the other, capital-intensive technology introduced by FDI through MNE operations may reduce employment potentials. However, sector-biased technical progress increases demand and returns to skilled labour (Gottschalk and Smeeding 1997, Schmitt 1995, Taylor 1999). This leads to a decline in the demand for unskilled labour (Machin and Van Reneen 1998, Berman and Machin 2000, Hanson 2001). Thus, it is important to understand the impact of technology acquisition on net employment, evidence of which suggests ambiguity in the outcome (Krugman 2000, Xu 2001).

Further, with the growing literature on firm heterogeneity, it is evident that technology decisions are taken at the firm-level rather than at the industry level. Hence, the issue of impact on firm-level employment as a result of technology decisions by firms becomes very pertinent. Further, with inflow of FDI and MNE operations in the country, ownership patterns of firms assume importance while studying the firm-level employment patterns. Unfortunately, these issues remain largely unaddressed in the
literature. This calls for an analysis of the effects of MNE ownership and technological acquisition on employment at the firm-level in India. This study attempts to fill in this gap in the existing literature by understanding the effect of ownership and technology acquisition on firm-level Indian manufacturing. In what follows is a brief delineation of the theoretical and the estimable models.

5.2.1 The Theoretical Model

Consider a Cobb-Douglas production function of a firm as:

\[ Q = AL^\alpha K^\beta \]  

(5.1)

where \( \alpha \) and \( \beta \) are positive parameters, with \( \alpha + \beta = 1 \).

With cost minimization of the firm the objective function is:

\[ \text{Min } C = w * L(Q) + r * K(Q); \text{ subject to } Q = AL^\alpha K^\beta \]  

(5.2)

where,  
\( C = \text{Cost} \)  
\( Q = \text{Output} \)  
\( L = \text{Labour} \)  
\( K = \text{Capital}; w \) and \( r \) are the input prices for \( L \) and \( K \) respectively.

Considering \( MP_L/MP_K = w/r \), we have:

\[ (\alpha/\beta)(Q/L) * K/Q = w/r \]  

(5.3)

or, \( \alpha/\beta * K/L = w/r \)

or, \( K = (\beta/\alpha)(w/r) * L \)

Substituting in (5.1) we have:

\[ Q = AL\alpha((\beta/\alpha)(w/r)L)\beta \]  

or, \( Q = A L\alpha + \beta ((\beta/\alpha)(w/r))\beta \)

Taking logarithm, we have:

\[ \log Q = \log A + (\alpha + \beta) \log L + \beta \log (\beta/\alpha) + \beta \log (w/r) \]  

or, \( \log Q = \log A + (\alpha + \beta) \log L + \beta (\log \beta - \log \alpha) + \beta (\log w - \log r) \)

or, \( \log L = \log Q/(\alpha + \beta) - \log A/(\alpha + \beta) - \beta (\log \beta - \log \alpha)/(\alpha + \beta) - \beta (\log w - \log r)/(\alpha + \beta) \)  

(5.4)
The labour demand function thus can be written as: \( L^* = f(Q, A, w, r) \). In Equation (5.4) ‘A’ stands for the productivity implying a parametric shift in this production function. The study also incorporates technology acquisition in the labour demand function. In this analysis labour productivity is used instead of total factor productivity.\(^1\)

However, a firm’s ideal labour demand is different from its actual labour demand due to presence of rigidities and frictions in the labour market. Following Hasan, Mitra and Ramaswamy (2007), let us introduce labour market frictions in the framework. Let the actual labour demand in log terms be denoted by \( L_A \) and the ideal demand be denoted by \( L^* \). We introduce a lagged expression by \( L_A^{-1} \). Let \( 0 < \lambda < 1 \) denote the extent of labour market frictions. Then we can write the actual labour demand as a weighted average of the ideal labour demand and lagged level of employment, the relative weight of lagged employment being an increasing function of labour market rigidity. Hence the actual labour demand function is written as:

\[
L^A = \lambda L_A^{-1} + (1 - \lambda)L^*
\]  

(5.5)

This model is a partial adjustment model, \((1-\lambda)\) being the speed of adjustment. The model is suggestive of the fact that only a part of the gap between desired and actual employment is met in every period and the proportion of the gap increases with labour market flexibility. Inserting the ideal labour demand function into the actual labour demand function we have the dynamic labour demand function\(^2\) as:

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\(^1\) For estimation of firm-level total factor productivity, see Olley and Pakes (1996), Levinsohn and Petrin (2003).

\(^2\) An alternative labour demand function using monopolistic competition is estimated by Haouas and Yagoubi (2004) and Hasan, Mitra and Ramaswamy (2007).
$$L^A = \lambda L^A_{t-1} + (1 - \lambda) \{ \log Q/(\alpha + \beta) - \log A/(\alpha + \beta) - \beta(\log \beta - \log \alpha)/(\alpha + \beta) - \beta(\log w - \log r)/(\alpha + \beta) \}$$

(5.6)

5.2.2 The Estimable model

The impact of FDI on aggregate employment in Indian manufacturing industries can be analyzed using a dynamic labour demand function. A lagged employment term is introduced in dynamic labour demand function as employment slowly adjusts to the changes in wages and output. With FDI inflows, the MNEs operate in the host economy and can have substantial effect on labour demand. Further, this opens up the possibility to import foreign technology as well as develop local research and development. Hence, in this model we have controlled for ownership and technology. Further, as labour demand is derived demand it is output constrained. Following Hasan, et al. (2007), the labour demand function is derived as follows:

$$L_{it} = f(L_{it-1}, w_{it}, r_{it}, Pdvtivity_{it}, Q_{it}, Tech_{it}, own)$$

(5.7)

where

$L_{it} =$ employment level of $i^{th}$ firm in $t^{th}$ time period

$w_{it} =$ average wage rate in $i^{th}$ industry in $t^{th}$ time period

$r_{it} =$ real user cost of capital in $i^{th}$ firm in $t^{th}$ time period

$Pdvtivity_{it} =$Labour productivity of the $i^{th}$ firm in $t^{th}$ time period

$Tech_{it} =$ Technology intensity (domestic and imported) of the $i^{th}$ firm in $t^{th}$ time period

$Q_{it} =$ Total sales of the $i^{th}$ firm in $t^{th}$ time period

Own= Ownership

With linearization, the estimable labour demand equation is expressed as:

$$LogL_{it} = a_1 + b_0 LogL_{it-1} + b_1 Logw_{it} + b_2 Logr_{it} + b_3 LogPdvtivity_{it} + b_4 LogQ_{it} + b_5 LogTech_{it} + b_6 Own + \varepsilon_{it}$$

(5.8)
where $b_{i} \geq 0$. Here, the variable ‘own’ is denoted by a dummy, which takes the value 1 for foreign ownership and 0 for domestic ownership.

5.3 Estimation Method and Data Description

This section of the chapter delineates the estimation methodology and data description used for the analysis of impact of FDI and technology acquisition on firm-level employment. In order to understand the impact of FDI and foreign ownership on firm-level employment in Indian manufacturing, we use the Hausman-Taylor estimation method. As discussed earlier, the Hausman-Taylor estimator generates coefficients of time-invariant regressors, which in this case is ownership. This is the relationship of interest in this chapter. On account of lack of exact data on production and non-production workers, labour demand elasticities are estimated for total labour employed in the sector. Productivity and lagged labour demand are considered to be endogenously determined within the system.

Firm-level data are obtained from the Prowess Database published by the Centre for Monitoring Indian Economy (CMIE) for the period 2001-2010. Like in earlier chapters, the sectors included in this analysis are chemicals, machinery, transport equipment, food and beverage, textiles and basic metals. A total of 868 observations for the chemicals industry, 532 observations for the machinery industry, 266 observations for the transport equipments industry, 146 observations for the food & beverages industry, 368 observations for the textiles and garments industry and 98 observations for the basic metal industry are obtained after sifting for possible erroneous observations. The final set

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3 For variable construction, see Appendix I.

4 A detailed discussion on Hausman-Taylor Estimation Method is given in Appendix 3.3 to Chapter 3.
of observations includes both domestic and foreign owned firms. Panel structures for each of the six industries are constructed over a period of ten years.

Prowess database does not provide data on number of employees. However, information on wages and salaries of a firm is available. We make use of the Annual Survey of Industries (ASI) database to construct the employment variable. For this purpose, 2-digit National Industrial Classification (NIC) 1998, 2004 and 2008 is considered (See Appendix I for Concordance). See Appendix I for details on the construction of the ‘employment’ variable.

5.4 The Empirical Results

The Hausman-Taylor estimation results of equation (5.8) showing the effect of FDI on firm-level employment are presented in Table 5.1. The Wald statistic justifies the overall significance of the model. The estimation coefficients signify elasticity of labour demand with respect to each independent variable. The results show that foreign ownership, measured in terms of a dummy variable, does not have any positive impact on firm-level employment across Indian manufacturing sectors. This result is in conformity with the findings of Banga (2005) that suggests that FDI does not have any significant role in generating employment in Indian manufacturing. The only exception to this pattern is food and beverages. This can be largely on account of growing exports in this sector during post-reforms. Further, the composition of food and beverages in the export basket has changed from the traditional food items to more value-added items like marine products, processed and packaged food etc. during this period, which is suggestive of the possibility of employment expansion through diversification in this sector. Foreign
ownership, thus, plays an important role in determining firm-level employment in this sector.

The lagged endogenous variable has significant positive impact on employment for all industries excepting chemicals and machinery industries. Hence there is evidence of path dependence in the case of employment for most manufacturing industries. It is important to note that path dependence in employment can be observed mostly in case of low and medium technology industries. Average wage has the expected result of a significant negative impact on the demand for firm-level labour for machinery, transport equipment, food and beverages, basic metals and textile industries. This implies that in these industries an increase in average wage leads to the displacement of firm-level labour. Interestingly this is not the case for chemicals where a significant positive relationship is found between average wage and labour demand. Purohit (1989) finds that the ratio of wage to the value of output is the lowest for certain industries including chemicals and engineering. Such low ratio is possibly because of low average wage rates and/or high average productivity of workers. Figure 5.1 suggests that the average wage rate in the chemical industry is the lowest followed by machinery and food and beverages. Hence, it is expected that these industries would also have high average firm-level labour productivity in the firms. This is suggestive of a favourable situation for the demand for labour. It is quite possible that under such circumstance, the entrepreneurs in the presence of growing output hire more labour and are likely to pay higher average wages. Hence, it is expected that the firms in such industry groups expand and thereby increase their demand for labour.
The user cost of capital has no statistically significant impact on demand for labour in most industries. The exceptions are chemicals and textiles, where a negative and significant relationship is found. This implies that capital and labour are complements for each other in these industries. With the phasing out of the Multi-Fibre Agreement (MFA) since 1995 the textile industry was exposed to international competition. Relaxation of restrictions on foreign technology and equipments were aimed at making the industry more efficient to face such international competition. However, this did not have an adverse effect on the firm level labour demand of the industry.

Table 5.1 also shows that technology acquisition by firms displaces labour significantly in the low technology textiles industry. This is in conformity with the findings of Das and Kalita. (2009) who find that labour intensity declined for the labour
intensive industries during post reforms. With import liberalization in the early 1990s, Indian manufacturers acquired imported technology and adapted them in their production processes particularly in textiles and metals industries with a view to technology upgradation. Such technology acquisition gave these industries competitive edge both in terms of prices as well as in scale. This perhaps, has a negative impact on employment in textiles, despite growth and export growth. For other industries however, no significant effect on employment is noticed.

Table 5.1: Determinants of Firm-level Employment: Hausman-Taylor Estimation

<table>
<thead>
<tr>
<th></th>
<th>Chemical</th>
<th>Machinery</th>
<th>Transport</th>
<th>Food and Beverage</th>
<th>Textile</th>
<th>Basic Metal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Own (Time invariant exogenous variable)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Own</td>
<td>.057</td>
<td>.15</td>
<td>.03</td>
<td><strong>1.83</strong>*</td>
<td>.36</td>
<td>-.37</td>
</tr>
<tr>
<td></td>
<td>(0.54)</td>
<td>(1.04)</td>
<td>(0.63)</td>
<td>(1.71)</td>
<td>(1.25)</td>
<td>(-0.89)</td>
</tr>
<tr>
<td>logq</td>
<td>.93*</td>
<td>.73*</td>
<td>.98*</td>
<td>.61*</td>
<td>1.03*</td>
<td>.90*</td>
</tr>
<tr>
<td></td>
<td>(62.92)</td>
<td>(31.51)</td>
<td>(88.83)</td>
<td>(6.71)</td>
<td>(32.04)</td>
<td>(18.39)</td>
</tr>
<tr>
<td>logw</td>
<td>.00001*</td>
<td>-.16*</td>
<td>-.97*</td>
<td>-.62*</td>
<td>-.96*</td>
<td>-.70*</td>
</tr>
<tr>
<td></td>
<td>(29.95)</td>
<td>(-3.87)</td>
<td>(-59.79)</td>
<td>(-3.08)</td>
<td>(-13.28)</td>
<td>(-3.72)</td>
</tr>
<tr>
<td>logr</td>
<td>-.304*</td>
<td>-.24</td>
<td>-.16</td>
<td>.35</td>
<td>-1.97*</td>
<td>.13</td>
</tr>
<tr>
<td></td>
<td>(-58.19)</td>
<td>(-1.62)</td>
<td>(-0.91)</td>
<td>(0.57)</td>
<td>(-18.71)</td>
<td>(0.59)</td>
</tr>
<tr>
<td>logtech</td>
<td>.011</td>
<td>-.008</td>
<td>.003</td>
<td>-.014</td>
<td>-.02**</td>
<td>-.003</td>
</tr>
<tr>
<td></td>
<td>(1.42)</td>
<td>(-0.83)</td>
<td>(1.03)</td>
<td>(-0.70)</td>
<td>(-2.39)</td>
<td>(-0.25)</td>
</tr>
<tr>
<td>logL_{t-1}</td>
<td>.012</td>
<td>.037</td>
<td><strong>.02</strong></td>
<td><strong>.07</strong></td>
<td><strong>.17</strong></td>
<td><strong>.03</strong>*</td>
</tr>
<tr>
<td>(Endogenous)</td>
<td>(1.60)</td>
<td>(2.19)</td>
<td>(2.46)</td>
<td>(2.16)</td>
<td>(8.82)</td>
<td>(1.69)</td>
</tr>
<tr>
<td>logPdtivity</td>
<td>-.88*</td>
<td>-.69*</td>
<td>-.96*</td>
<td>.024</td>
<td>-.79*</td>
<td>-.80*</td>
</tr>
<tr>
<td>(Endogenous)</td>
<td>(-38.67)</td>
<td>(-23.08)</td>
<td>(-46.88)</td>
<td>(1.20)</td>
<td>(20.51)</td>
<td>(-14.96)</td>
</tr>
<tr>
<td>Wald Chi Square</td>
<td>183.37*</td>
<td>1788.81**</td>
<td>2307.19*</td>
<td>130.80*</td>
<td>1298.04*</td>
<td>1097.34*</td>
</tr>
<tr>
<td>Number of</td>
<td>868</td>
<td>532</td>
<td>266</td>
<td>146</td>
<td>368</td>
<td>98</td>
</tr>
<tr>
<td>observations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: 1. z values are provided in parentheses
2. * denotes 1% level of significance, ** denotes 5% level of significance, *** denotes 10% level of significance.
3. L_{t-1} denotes labour with one year lag.
Another important factor that determines firm-level employment significantly across sectors is firm level output. Estimation results suggest that as the output of firms expands, the demand for labour rises significantly across all sectors. Importantly, labour productivity has implications for labour market outcomes in Indian manufacturing. Increase in productivity significantly displaces labour across all major sectors barring food and beverages. This is an expected result as with increase in productivity, an increase in wage is expected. The firms thus are likely to employ less labour.

On the whole, the results show that ownership does not have any significant impact on firm-level employment across sectors in Indian manufacturing, except food and beverages. Barring chemicals and machinery, evidence of significant path dependence is noticed in case of employment. Increase in average wage is expectedly found to have negative impact on firm-level labour demand. However, chemical industry is an exception to this finding. The user cost of capital also has a significant negative impact on labour demand in chemicals and textiles industries implying complementarity between labour and capital in these sectors. Technology acquisition displaces labour only in the low technology textile industry. Employment significantly increases with output but is displaced with increase in productivity across sectors.

5.5 Summary of Findings

In this chapter, impact of FDI on labour market outcome in terms of firm-level labour demand in Indian manufacturing is studied in the post reforms period. Chapter 2 established that the average employment in Indian manufacturing as a whole shows an increasing trend since 2001 particularly in conjunction with rising FDI across sectors.
However, there are variations across sectors. Such stylized facts led to inquire into, in particular, the impact of FDI on firm-level employment. Here FDI is accounted for in terms of foreign ownership. The Hausman-Taylor estimation technique is used for empirical estimation.

MNE operations, along with technology acquisition, have implications for labour demand. Foreign ownership however does not play any significant role in determining firm-level labour demand in Indian manufacturing. The only exception is the food and beverage industry. Estimation results suggest path dependence of employment for most manufacturing industries. An increase in the average wage leads to significant displacement of firm-level labour across all sectors barring chemicals. This is an interesting result which is suggestive of expansion in this sector leading to higher employment generation. The user cost of capital has differential impact on labour demand across sectors. The results suggest that capital and labour are complementary factors in textiles and chemicals. Though an increase in output significantly increases labour demand, technology acquisition by such firms does not have any impact on labour for most sectors. However, for textile industry, technology acquisition is labour displacing. Importantly, productivity has significant impact on employment across sectors. Increase in productivity is found to displace labour across sectors.
### Table 5.A1: Average Wage across Sectors, 2001-2010
(Figures in Rupees Crores)

<table>
<thead>
<tr>
<th>Year</th>
<th>Chemical</th>
<th>Machinery</th>
<th>Transport Equipment</th>
<th>Food &amp; Beverages</th>
<th>Textiles</th>
<th>Basic Metals</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>0.93</td>
<td>1.01</td>
<td>1.02</td>
<td>0.44</td>
<td>0.60</td>
<td>1.05</td>
</tr>
<tr>
<td>2002</td>
<td>1.00</td>
<td>1.02</td>
<td>1.11</td>
<td>0.45</td>
<td>0.53</td>
<td>1.18</td>
</tr>
<tr>
<td>2003</td>
<td>1.08</td>
<td>1.10</td>
<td>1.19</td>
<td>0.46</td>
<td>0.54</td>
<td>1.32</td>
</tr>
<tr>
<td>2004</td>
<td>1.13</td>
<td>1.01</td>
<td>1.23</td>
<td>0.47</td>
<td>0.56</td>
<td>1.23</td>
</tr>
<tr>
<td>2005</td>
<td>1.21</td>
<td>1.25</td>
<td>1.28</td>
<td>0.52</td>
<td>0.59</td>
<td>1.26</td>
</tr>
<tr>
<td>2006</td>
<td>1.32</td>
<td>1.35</td>
<td>1.35</td>
<td>0.56</td>
<td>0.52</td>
<td>1.31</td>
</tr>
<tr>
<td>2007</td>
<td>1.44</td>
<td>1.53</td>
<td>1.71</td>
<td>0.65</td>
<td>0.69</td>
<td>1.64</td>
</tr>
<tr>
<td>2008</td>
<td>1.11</td>
<td>1.66</td>
<td>1.58</td>
<td>0.73</td>
<td>0.74</td>
<td>1.76</td>
</tr>
<tr>
<td>2009</td>
<td>1.83</td>
<td>2.23</td>
<td>1.76</td>
<td>0.82</td>
<td>0.82</td>
<td>1.66</td>
</tr>
<tr>
<td>2010</td>
<td>2.06</td>
<td>2.24</td>
<td>5.81</td>
<td>0.95</td>
<td>0.96</td>
<td>2.02</td>
</tr>
</tbody>
</table>

Note: Calculations based on ASI Database.