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WORKING PAPER NO. 153

IMPACT OF LIBERALISATION ON WAGES AND EMPLOYMENT IN INDIAN MANUFACTURING INDUSTRIES

Rashmi Banga

FEBRUARY 2005

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Contents

FOREWORD ..... **I**

ABSTRACT ..... **II**

1 INTRODUCTION **1**

2 THEORETICAL FRAMEWORK AND REVIEW OF LITERATURE **2**

2.1 IMPACT ON WAGES 3
2.2 IMPACT ON EMPLOYMENT 5

3 TRENDS IN FDI AND TRADE FLOWS IN INDIAN MANUFACTURING SECTOR **7**

4 TRENDS IN WAGES AND EMPLOYMENT IN INDIAN MANUFACTURING SECTOR **10**

5 EMPIRICAL METHODOLOGY **12**

5.1 WAGE-RATE EQUATION 12
5.2 LABOUR DEMAND EQUATION 13
5.3 DYNAMIC PANEL DATA ESTIMATION 15

6 DATABASE CONSTRUCTION AND SAMPLE CHARACTERISTICS **15**

7 EMPIRICAL RESULTS **17**

8 CONCLUSIONS AND POLICY IMPLICATIONS **21**

REFERENCES **25**

APPENDIX **29**

TABLES

Table 1: Trends in India's FDI and Trade Flows: 1990-91 to 1999-2000 8
Table 2: Trends in Technology Acquisition in Indian Manufacturing: (1990-91 to 1997-98) 10
Table 3: Trends in Employment and Wages in Indian Manufacturing 11
Table 4: Variables Definitions 17
Table 5: Impact of FDI, Trade and Technology on Wage Rate in Indian Manufacturing Industries: 18
Table 6: Impact of FDI, Trade and Technology on Employment in Indian Manufacturing Industries 20

FIGURE

Figure 1: FDI and Trade as a Percentage of GDP (1980-2000) 9

Foreword

Since 1991 the Indian government is undertaking major economic reforms in order to facilitate higher inflow of foreign direct investment (FDI) and boost trade. It is also trying to facilitate higher inflows of technology. Earlier studies done at ICRIER on the impact of reforms on the economy show that higher FDI has led to export diversification and improved productivity growth in the Indian manufacturing sector. The studies also show that FDI has led to substantial export and productivity spillovers.

However, a concern that remains in the minds of some is the effect of liberalisation on Indian labour markets and in particular, on wages and employment. Given inflexible labour laws and the influence of the government on wage movements in India, this issue assumes even greater importance. This paper empirically estimates the impact of three important components of liberalisation, i.e., FDI, trade and technology on wages and employment in the organised manufacturing sector of India in the post reforms period.

The results show that FDI, trade and technological progress have differential impact on wages and employment. While higher extent of FDI in an industry leads to higher wage rate in the industry, it has no impact on its employment. On the other hand, higher export intensity of an industry increases employment in the industry but has no effect on its wage rate. Technological progress is found to be labour saving but does not influence the wage rate. Further, the results show that domestic innovation in terms of research and development intensity has been labour utilising in nature but import of technology has unfavourably affected employment.

An immediate policy direction that emerges from the study is that to improve the employment potential of the economy trade should be encouraged and the impediments to export-oriented FDI should be removed. Also, as the economy opens up, cost adjustments become increasingly important and flexibility in labour laws is essential to facilitate such adjustments. An SEZ law with flexible labour regime will promote these objectives.

Arvind Virmani
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February 2005

Impact of Liberalisation on Wages and Employment in Indian Manufacturing Industries

Rashmi Banga*

Abstract

In an attempt to estimate the impact of liberalisation on labour markets, this paper examines the impact of foreign direct investment (FDI), trade and technology on wages and employment in Indian organised manufacturing industries in the post reforms period. To capture labour market rigidities that exist in India, i.e., lack of flexibility in wage setting and rigid hire and fire policies, the study estimates dynamic panel data (DPD) model using generalised method of moments (GMM). The analysis is undertaken for 78 three-digit level industries. The impact of technology is captured through three components, which are research and development intensity, import intensity of capital goods and import intensity of soft technology. An index for technology acquisition is also constructed using principal component analysis to estimate the impact of technological progress. The results show that FDI, trade and technological progress have differential impact on wages and employment. While higher extent of FDI in an industry leads to higher wage rate in the industry, it has no impact on its employment. On the other hand, higher export intensity of an industry increases employment in the industry but has no effect on its wage rate. Technological progress is found to be labour saving but does not influence the wage rate. Further, the results show that domestic innovation in terms of research and development intensity has been labour utilising in nature but import of technology has unfavourably affected employment. An immediate policy direction that emerges from the study is that to improve the employment potential of the economy trade should be encouraged and higher incentives should be generated for attracting FDI into export-oriented sectors. As the economy opens up, cost adjustments become increasingly important and flexibility labour laws are required to facilitate cost adjustments.

Key Words: FDI and labour markets; Trade and labour markets; Technology and Labour markets; Indian labour markets; Wages and Employment; GMM

JEL Code: F16, F14, L60, O33

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1 Introduction

As developing economies liberalise their policies in an attempt to integrate with the rest of the world, one of the critical issues that needs to be addressed by their governments is the social costs of liberalisation. A direct manifestation of these social costs is the impact of liberalisation on labour markets, which may work through its impact on wages and employment. The Economic theory suggests that three important components of liberalisation, i.e., FDI, trade and imported technology may raise labour productivity in the developing economies but these components may have differential impact on their wages and employment. Higher presence of FDI in developing countries is generally associated with lower employment but higher wages. While, higher trade has mostly been associated with higher employment but lower wages. However, given the differences in the labour laws across countries, these effects have been found to be mainly country-specific.

In particular, for the Indian economy we find that one of the unique characteristics of the Indian labour markets is its dualistic nature where a large unorganised sector coexists with the organised sector. There are many regulations in India that apply only to the "organised sector"[1] and some of these regulations are considered to be especially constraining to the employers leading to rigidities in labour markets. Three such types of regulations are: first, fairly stringent rules exist that relate to firing workers and also of closing down of enterprises, along with the requirements of reasonable compensation for retrenchment; second, laws governing the use of temporary or casual labour enforce permanence of contract after a specified time of employment; and third, minimum wage legislation exists, which raises the cost of hiring workers and leads to downward inflexibility in wages.

The neo-liberal argument regarding these regulations is that these rules put undue pressure on larger employers and prevent smaller firms from expanding even when the economics of their situation demand it. This creates a dualistic set-up in which the

[1] The "organised sector" in India is defined by the size of establishment in terms of number of workers.

organised or formal sector necessarily remains limited in terms of aggregate employment and the unorganised sector (small-scale) with low investment. Given this lack of flexibility in operations of labour markets, implications of liberalisation on wages and employment may alter for the Indian economy.

The present study contributes to the literature by estimating the impact of FDI, trade and technology on wages and employment in the organised Indian manufacturing sector in the post reforms period[2]. The analysis is undertaken for 78 three-digit level industries and in an attempt to take account of unique characteristics of Indian labour markets, dynamic panel data estimations are carried out using generalised method of moments (GMM). Though there exists many studies for Indian manufacturing sector that estimate the wages and employment (mainly employment elasiticities), in the pre and post liberalisation periods, the impact of components of liberalisation, i.e., FDI, trade and technology has not yet been estimated. Moreover, most of the studies do not take into account labour market rigidities in their estimations.

The study is structured as follows: Section 2 provides the theoretical framework and a brief review of earlier studies. Section 3 examines the trends in FDI, trade and technology flows in the Indian manufacturing sector in the pre and post reform period. Section 4 examines the trends in employment and wages in Indian manufacturing sector. The empirical methodology used in the study is discussed in section 5 and section 6 discusses the data set and construction of variables. Section 7 presents the empirical results. Finally, section 8 concludes the study and highlights major policy implications of the study.

2 Theoretical Framework and Review of Literature

According to the economic theory FDI, trade and technology are three important mutually inter-related components of liberalization that can impact labour markets. We

[2] Since 1991, India has undertaken a major economic reforms program under which significant and far-reaching changes have been made in industrial and trade policy to encourage FDI flows and trade. Incentives have also been given to encourage higher imports of technology.

discuss the theoretical arguments put forward along with the empirical evidence on the impact of the three components of liberalisation on wages and employment.

2.1 Impact on Wages

A fairly recent stream of literature has emerged, which suggests that FDI has a positive effect on wages in the industries of the host country. It has been argued that foreign firms pay more to their labour as compared to domestic firms in developing countries for reasons unrelated to productivity of labour. One explanation given for this is the "efficiency wage hypothesis"[3] which states that if work effort depends positively on the wage level, a profit maximising firm would find it profitable to pay above the market clearing level. Other related versions that explains higher wages given by foreign firms for similar work and skills are:

a) Higher wage payments reduce shirking by increasing the cost of losing the job (Solow 1979; Shapiro and Stiglitz 1984).
b) Higher wage payments reduce labour turnover costs (Salop 1979).
c) Offering higher wages increase the quality of job applicants, and thus raise the average quality of a worker that the firm hires (Weiss 1991).
d) Higher wages build loyalty among workers and hence improves a worker's efforts (Akerlof 1982).

Alternatively, the wage-bargaining models suggest that multinational status may also impact on wages if it affects the relative bargaining power of the firm and the union. A company with plants in several countries may credibly threaten to shelve expansion plans or choose another market for additions to capacity in the face of excessive wage demands (Cowling and Sugden 1987, Huizinga 1990). A multi country production structure may also impact on the wage outcome if it improves the fallback position of the firm in the event of a strike. For example, it may be able to temporarily switch production from one country to another. Finally, ownership status can also affect labour relations within a company, which may impact the level of negotiated wages. Carmichael (1992) argues

[3] See Akerlof and Yellen (1986)

that US multinationals in U.K attempts to buy industrial relations peace with higher wages.

The proposition that 'foreign firms pay more for reasons unrelated to labour productivity' has been empirically tested by many studies but the results arrived at are ambiguous. Aitken, Hrrison and Lipsey (1996) use estalishment level cross-sections for Mexico, the USA and Venezuela and find positive effect of FDI on wages in domestic firms in US but negative effects in other two countries. Canyon et al (1999) find wage and productivity differential of 5%. Girma et al (1999) find wage and productivity differential of 5%. Griffith and Simpson (2003) present estimates for the U.K., finding in all specifications positive premier for foreign firms. Lipsey and Sjoholm (2001) study the Indonesian case and find a premium of 12% for blue-collar workers and 22% for white-collar workers. Te Velde and Morrissey (2003) examine the cases for five African countries and again find that foreign firms pay higher wages (the premia range between 8% and 23%). Similar results are documented for Ghana by Gorg et al (2002).

However, there are studies that argue that the entire increase in wages in foreign firms can be explained by higher productivity of labour (e.g., Conyon et al 1999, Driffield 1996). According to Lipsey (1994) average compensation per worker is generally higher in foreign-owned than domestically owned establishments but this is due to their higher capital-labour ratios. If we control for size, the effect of foreign ownership disappears, but this is not so for non-manufacturing industries. Driffield (1996) finds that foreign firms pay wages above the industry average of around 7% in U.K., partly owing to productivity differentials. Grima et al (1999) find no statistically significant effect for any impact on domestic wages. These studies argue that multinationals affect through productivity channel since in perfectly competitive labour markets, workers are paid their marginal product and if labour productivity decreases/increases due to presence of FDI, so does wages paid to workers. Thus, both the theoretical and empirical debates on whether FDI raises wages in the host country, irrespective of productivity increases still remains inconclusive.

2.2 Impact on Employment

Though the impact of FDI on wages is a well-researched area, the impact of FDI on employment in the industry is a relatively less researched area. The economic theory suggests that the impact of FDI on total employment may work through two routes. Firstly, inward investment generates a straightforward labour demand effect, stemming from an exogenous increase in output. Secondly, it is alleged that the technology introduced by FDI is highly capital intensive, and therefore may tend to reduce the employment potential of industrialisation. The idea that FDI may in fact bring in technology that is not labour augmenting, but may actually be labour saving may imply an absolute reduction in the overall employment (Nickell and Bell 1996, Pianta and Vivarelli 2000, Taylor and Driffield 2000).

A corresponding stream of literature examines the impact of increased competition, due to trade, on employment and wages. Under the Heckscher–Ohlin–Samuelson (H-O-S) framework, trade suggests a redistribution of employment from the import sector towards the export sector, i.e., according to the theory, increased imports reduce employment and increased exports increase employment. However, the impact is found to be industry-specific i.e., it has been found that exports are a dominant factor in the employment growth in high-technology and skill-intensive industries, while import penetration adversely affect employment growth in low-technology, labour-intensive industries (Gera and Massé 1996).

Ghose (2000) shows that in case of industrialised countries, growth of manufactured imports from developing countries has a small adverse effect on manufacturing employment but virtually no effect on wages. But, in case of developing countries that have emerged as important exporters of manufactures to industrialised countries a growth in trade has a large positive effect on manufacturing employment and wages.

Danthine and Hunt (1994) point out that, whilst Marshallian pressures would be expected to decrease wages, as competition in the product market increases, an increased

integration will also effectively reduce the degree of centralisation of bargaining. This can lead to either increases or decreases in union wage demands depending on the initial bargaining structure of the country concerned. Focusing on short-run effects on labour markets, Greenaway, Hine and Wright (2000) find a considerable impact of international trade on wages in the UK. Especially trade competition from (South-) East Asian Newly Industrialized Countries (NIC) appears to have increased wage inequality. However, no consensus has been reached so far regarding the impact of trade on employment and wages in developing countries.

Like FDI and trade, technological progress can also impact on labour markets in important ways. Technology acquisition may take place in an industry through higher imports of embodied and disembodied technology and larger research and development expenditures (R&D) by both domestic and foreign firms. The impact of technological progress on wages and employment has been discussed by both labour economists (who look at factor-biased technical change) and trade economists (who look at sector-biased technical change (SBTC) and price change).

Labour economists argue that SBTC increases demand and returns to skilled labour[4]. This has been supported by some of the studies in recent years that show technical progress has been skilled biased, i.e., it has led to decline in the demand for unskilled labour [Machin and Van Reenen (1998), Berman and Machin (2000), Hanson (2001)]. However, trade theorists argue that for large changes in technology the pattern of production changes and therefore the net impact on employment and wages may not be evident [Krugman (2000), Xu (2000)]. Studies therefore show that FDI, trade and technology acquisition can impact labour markets in different ways. However, the results of the studies are ambiguous and therefore it becomes important to conduct country-specific studies to estimate the extent and direction of the impact.

[4] See Gottschalk and Smeeding (1997), Schmitt (1995), Taylor (1999).

3 Trends in FDI and Trade Flows in Indian Manufacturing Sector

The economic reform programme undertaken by the Indian government in 1991 aimed at rapid and substantial integration of the Indian economy with the global economy in a harmonised manner. Accordingly, the industrial policy in the post reforms period mainly aimed at de-licensing, privatisation, FDI promotion and trade liberalisation in the manufacturing sector.

To attract FDI, the policy regime for FDI was liberalised considerably. The first step in this direction was the grant of automatic approval, or exemption from case by case approval, for equity investment of up to 51 per cent and foreign technology agreements in identified high-priority industries. Gradually, FDI has been permitted in almost all industries. Not only has the restrictions on foreign equity investments gone down, several incentives to encourage FDI in manufacturing sector have also been undertaken e.g., tax incentives, tax holidays, etc. Also, to protect the interest of foreign partner and ensure proper treatment and facilitate business operations of foreign firms, India has signed a number of bilateral investment treaties (BITs). India has also become a member of MIGA (Multilateral Investment Guarantee Agency).

Along with the efforts to improve FDI flows, trade has also been encouraged to a large extent due to substantial lowering of nominal rates of protection (NRP). The NRP fell from 90.8 per cent for the aggregate manufacturing sector in the year 1980-81 to 35 per cent in the year 1997-98, while ERP fell from 99.5 to 41 per cent during the same period [Goldar and Saleem (1992) and Nouroz (2001)]. Along with this the coverage of non-tariff barriers (NTB) has also been reduced in the post-reforms period [Pursell (1996)].

In accordance with the policy reforms, there has been a considerable and consistent improvement in FDIas well as trade flows as a proportion of GDP as shown in Table 1. Actual FDI flows rose from around USD 300 million in 1992-93 to more than USD 3 billion in 1997-98 and reached USD 3.9 billion in the year 2001-2002. FDI as a percentage of GDP increased to around 0.8 per cent in the 1997-98 but it experienced a decline thereafter till 1999-2000[5]. The post reform period also witnessed a marked

[5] One of the probable reasons for this is the Asian financial crisis that took place in the latter half of the 1990s.

acceleration in the growth of both exports and imports. During the period 1970-71 to 1979-80 export of manufactured products as a ratio of GDP grew at a rate of 3.7 per cent per annum, while in the period 1980-81 to 1989-90 it grew -0.6 per cent per annum; and in the period 1990-91 to 1998-99 the growth was around 4.6 per cent per annum [Goldar (2002)]. While imports as a ratio of GDP grew at a rate of 1.1 per cent per annum, 0.3 per cent per annum and 7.9 per cent per annum in these three periods respectively. Total exports in fact grew at a faster rate than total imports leading to a positive balance of trade for the manufacturing sector (Table1).

Table 1: Trends in India's FDI and Trade Flows: 1990-91 to 1999-2000

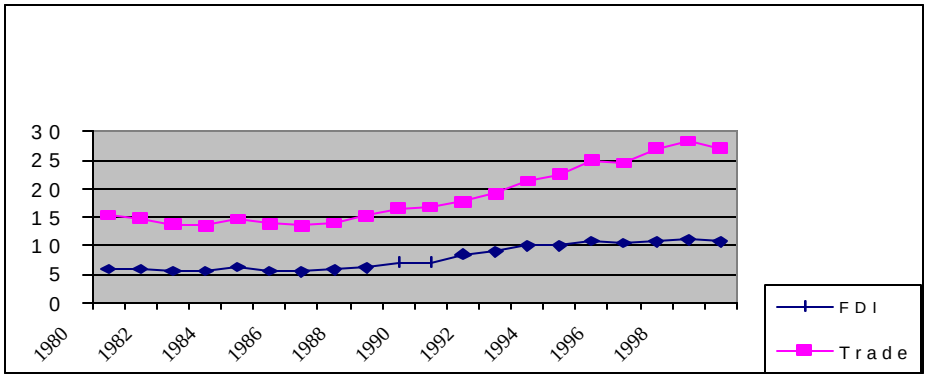
Year	FDI as a Percentage of GDP	Trade as a Percentage of GDP	Exports as a ratio of manufacturing output	Imports as a ratio of manufacturing output
1990-91	0.05	16.88	0.13	0.11
1991-92	0.02	17.7	0.17	0.10
1992-93	0.10	19.12	0.20	0.13
1993-94	0.20	21.25	0.19	0.13
1994-95	0.30	22.52	0.18	0.14
1995-96	0.60	24.97	0.18	0.15
1996-97	0.63	24.54	0.19	0.15
1997-98	0.87	27.08	0.18	0.14
1998-99	0.62	28.4	0.18	0.13
1999-00	0.48	27.12	0.17	0.14

Source: The Handbook of Statistics on Indian Economy (DGCI&S), Statistics of Foreign Trade of India (Annual Number, 2001-2002) and Industrial Statistics Database 2000 (UNIDO).

However, it is interesting to note that as the Indian economy became more open and receptive to the world, growth of trade has been much faster than that of FDI (figure 1). The ratio of FDI inflows to the annual rate of capital formation in manufacturing remained as low as around 5 percent during the period 1992-93 to 1998-99. FDI as a

percentage of GDP not only remained lower than that of trade throughout the period 1980 to 2000, but the gap between them widened overtime.

Figure 1: FDI and Trade as a Percentage of GDP (1980-2000)



Apart from the growth in FDI and trade, liberalised regime has also affected the level of technology acquisition in the manufacturing sector by encouraging technology imports. Three main sources of technological advancement in manufacturing sector include import of embodied technology (e.g., capital goods), import of dis-embodied technology (through royalty payments, technical fees and lump-sum payments) and in-house research and development (R&D). In the post reforms period, the import of capital goods has been on an average 2.4 per cent of the total imports and this has not increased much overtime as seen in Table 2. One for the reasons of this could be domestic machinery replacing imported machinery in the process of import substitution.

The in-house R&D efforts by industrial firms have also been relatively low in India though they have shown a tendency to improve consistently overtime. R&D intensity increased to 3.3 percent in 1996-97 from 0.5 in 1990-91. The top one-tenth industrial companies spent on an average about 8 percent of their sales on R&D during 1996-99.

Table 2: Trends in Technology Acquisition in Indian Manufacturing: (1990-91 to 1997-98)

Year	Import of Capital Goods as a Percentage of Total Imports	R&D Expenditures as a Percentage of Total Sales	Import of Technology as a Percentage of Total Sales
1990-91	2.4	0.5	0.7
1991-92	2.1	0.9	0.9
1992-93	2.0	1.6	1.5
1993-94	2.6	1.6	2.5
1994-95	2.6	1.9	3.1
1995-96	2.8	2.5	4.4
1996-97	2.5	3.3	4.8

Source: The Handbook of Statistics on Indian Economy, DGCI&S and Author's estimation from Prowess (C.M.I.E.). Note: Import of technology includes import of embodied as well as dis-embodied technology.

But a considerable volume of technology has entered Indian industry through the route of technology imports i.e., purchase of technology. Imports of technology increased from 0.7 per cent of total sales in 1990-91 to around 5.0 per cent in 1996-97 (Table 2). In absolute terms, the payment for royalty and technical fees increased from USD 25.1 million in 1985 to USD 200.8 million in 1998. However, it is still much lower than those found in other developing countries (e.g., a comparative figure for Malaysia is USD 2392 million, USD 1002 million for Indonesia, USD 420 million for China and USD 804 for Thailand)

4 Trends in Wages and Employment in Indian Manufacturing Sector

Studies with respect to estimates of wages and employment in the Indian manufacturing sector in the pre and post liberalisation period have arrived at ambiguous results. Results of the two recent studies that examine the trends in Indian employment and wages are reported in Table 3.

Tendulkar (2003) analyses the experience of the organised manufacturing sector with regards to industrial growth over three distinct policy regimes i.e., 1973-74 to 1980-81, 1980-81 to 1990-91 and 1990-91 to 1997-98. The period 1973-74 to 1980-81 was marked by restrictive industrial and trade policies and according to the study the exponential growth rate of output during this period was 4.65 per cent and employment grew by 3.83

per cent. Product wage per worker increased at 3.2 per cent and implicit growth of productivity per worker grew at a negligible 0.8 per cent.

Table 3: **Trends in Employment and Wages in Indian Manufacturing**

Tendulkar (2003)	**GR of Output**	**GR of Employment**
1973-74 to 1980-81	4.65	3.83
1980-81 to 1990-91	7.1	Jobless Growth
1990-91 to 1997-98	9.0	2.9
Goldar (2002)	**GR of Real Wages**	**Employment Elasticity**
1973-74 to 1989-90	3.29	0.26
1990-91 to 1997-98	1.16	0.33

The second period of 1980s was a period of hesitant liberalisation of certain trade and industrial policies combined with an aggregate demand push provided by rising fiscal deficits and good agricultural harvests. This period witnessed a growth rate of manufacturing output of 7.1 per cent per annum. However, there was a virtual stagnation in the manufacturing employment as a result of which the decade was termed as, "the decade of jobless growth". Real product wage grew by 4.5 per cent compared to implicit growth of 7.3 per cent in productivity per worker. It is in this background of jobless growth that stabilising and structural reforms were undertaken in 1991.

In the post reforms period, it was expected that the opening of the economy would not only lead to a higher output growth due to better allocation of resources, but increase in trade will restructure production towards more labour-intensive avenues, thereby generating substantial increases in employment. The industrial output grew at around 9 per cent in this period, employment (number of workers) grew by 2.9 per cent, with moderate product wage growth of 2.6 per cent. Goldar (2000) finds acceleration in employment growth in this period both at the aggregate manufacturing level and for most two-digit industries.

According to Goldar (2002) the employment elasticity for aggregate manufacturing increased from 0.26 in the pre reform period (1973-74 to 1989-90) to 0.33 in the post reform period (1990-91 to 1997-98). He also finds a significant increase in the employment elasticity in the export-oriented industries group. However, in the import-competing industries he finds a fall in the employment elasticity from 0.425 in the pre-reforms period to 0.264 in the post-reforms period.

As regards the trend in real wages, Goldar (2002) shows that the growth in real wages has slowed down appreciably in the post-reforms period. At the aggregate level the growth rate of real wages per worker is found to have declined from 3.29 per cent per annum during the period 1973-74 to 1989-90 and to 1.16 per cent per annum during the period 1990-91 to 1997-98. But, with respect to wages in the organised sector in India, it should be pointed out that till date government interventions play a key role in determining wages in organized sector in India. The basic framework for government interventions in the wage determination process was set out in The Report of the Committee on Fair Wages, 1948. Following the recommendations of this Report, the government designed fairly elaborate methods of intervention into the wage determination process. These included setting of minimum wage norms, direct determination of wages in public enterprises, indirect influence on wage determination in private enterprises through the establishment of Wage Boards, setting of norms for wage differentials and establishment of rules of indexation and bonus payment. Norms are also set for social security benefits to employees though these are generally less binding.

5 Empirical Methodology

5.1 Wage-Rate Equation

Keeping in mind the unique characteristics of Indian labour markets and the increasingly important role played by the government in the wage-setting we arrive at the wage equation. We assume that labour is available in perfectly elastic supply at any given wage rate. In this case, wages will be fixed exogeneously depending on the minimum wages

fixed by the government and the bargaining power of labour unions. Following Greenway et al (2000) we adopt a dynamic specification in order to allow for the possibility of sticky wage adjustment through time:

$$\text{Ln } W_{it} = \beta_1 \ln W_{i,\,t-1} + \beta_0 X_{it} + \lambda_i + u_{it}$$

Where, W_{it} = wage rate for industry i at time t

X = explanatory variables, λ_i = industry specific fixed effects

X denotes a vector of variables that are treated as being important in wage-setting process. For our purpose, the key influences are apart from labour productivity (LP); size of the industry (SIZE) and the growth of employment (GRO) within the industry, both of which reflect the relative bargaining power of unions and capture the dynamic monopsony effects (Nickell and Wadhwani 1990) and; foreign competition captured through extent of FDI, exports (EXPORTS) and imports, (captured by effective rate of protection, ERP) and technological progress (TECH). The outside opportunities available to labour, which depend on unemployment rate and the alternative wage available, are assumed to be identical across industries and are captured by the time-specific fixed effects. The equation to be estimated is therefore as follows:

$$Ln(w/p)_{it} = F\,[\,Ln\,(w/p)_{it-1}, Ln\,LP_{it}, Ln\,SIZE_{it}, Ln\,GRO_{it}, Ln\,FDI_{it}, Ln\,EXPORTS_{it}, Ln\,ERP_{it}, Ln\,TECH_{it}, Fixed\ Effects] \quad \ldots\ldots(1)$$

5.2 Labour demand Equation

To identify the factors that may affect employment in an industry we derive labour demand equation. For this purpose, we assume two inputs constant elasticity of substitution (CES) production function, which allows for non-constant returns to scale provided the function remains homogenous of degree μ i.e.,

$$Q = \chi\,[\,s(k)^{-\rho} + (1-s)\,(Le^{\lambda t})^{-\rho}]^{-\mu/\rho} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(a)$$

Where $\chi > 0$ & $0 < s < 1$

Q is the output, k is the capital, s is the share parameter and ρ determines the degree of substitutability of the inputs. The elasticity of substitution can take any non-negative constant value (including unity as in the Cobb-Douglas case) & technical progress is labour augmenting at rate of λ. χ is the efficiency parameter as it changes output in the same proportion for any given set of input levels and the parameter s can be interpreted as a distribution parameter since it determines the distribution of income through the factor payments.

To examine the factors that affect the demand for labour and consequently the employment in an industry we use marginal productivity theory, and equate marginal product of labour (MP_L) to the real wage (W/P) (first order conditions, assuming mark – up is constant). Taking logs and rearranging (a) we get:

$$Ln(L) = \ln(Q) - \frac{1}{(1+e)}\ln\left(\frac{w}{p}\right) - \frac{r}{(1+r)}\,l_t + \left[\frac{1}{(1+e)}\right]\ln\left[1-\left(\frac{s}{b}\right)\right] - \frac{r}{(1+r)}\ln(c)$$

$$= \ln(Q) - s\ln\left(\frac{w}{p}\right) - (1-s)\,l_t + \left[s\ln(1-\left(\frac{s}{b}\right) - (1-s)\ln(c)\right] \text{.....} \ (b)$$

$$where\ \ s = \frac{1}{(1+r)}$$

λ_t is taken as exogenous technical change which may occur through different channels e.g., FDI, trade and technology and affect the demand for labour, i.e.,

$\lambda_t = f\,(\lambda_1 \text{ Time} + \lambda_2 \text{ FDI} + \lambda_3 \text{ EXPORTS} + \lambda_4 \text{ Imports} + \lambda_5 \text{TECH})$…..(c)

Allowing for persistence in labour demand and adding fixed effects we have

$$\text{Ln (L)}_{it} = \alpha + \beta_0 \ln(L)_{it-1} + \beta_1 \ln(Q)_{it} + \beta_2 \ln(W/P)_{it} - \beta_3 \text{ Time} + \beta_4 \text{ FDI}_{it} + \beta_5 \text{ EXPORTS}_{it} + \beta_6 \text{ IMPORTS}_{it} + \beta_7 \text{ TECH}_{it} + \alpha_i + e_{it}$$

Thus, demand for labour is a function of:

L_{it} = F [L_{it-1}, Q_{it}, $(w/p)_{it}$, FDI_{it}, $EXPORTS_{it}$, $IMPORTS_{it}$, $TECH_{it}$, Time, Fixed Effects]……(2).

However, in the empirical framework along with the above factors we need to include other potential demand shifters, which also control for industry-specific effects. This is justified by arguing that merely including the factors derived from theory may not capture other influences, which could effect an industry's demand function [Driffield and Taylor (2000)]. We therefore control for inter-industry variations by including capital-labour ratios.

5.3 Dynamic Panel Data Estimation

For the purpose of estimating the impact of FDI and trade on wage rate and employment we need to take into account rigidities in the Indian labour market. We therefore construct dynamic panel data (DPD) models, which are estimated using Generalised Method of Moments (GMM) following Arellano and Bond (1991). GMM has become an important tool in empirical analyses of panels with a large number of individual units and relatively short time series. This model can be written as

$y_{it} = á y_{i,t-1} + ç_i + í_{it}$

where i=1,…,N; t=2,…,T; $T \geq 3$ and $á < 1$

For such models the within group estimator (for the fixed effects models) and the GLS estimator (for the random effects model) are not applicable. Therefore GMM estimator is applied. Adopting standard assumptions concerning the error components and initial conditions (i.e. error terms are not autocorrelated) Arellano and Bond (1991) propose moment conditions[6]. The validity of moment conditions implied by DPD models is commonly tested using conventional GMM test of overidentifying restrictions associated with Sargan (1958).

6 Database Construction and Sample Characteristics

No single source of data exists for the Indian economy that provides data required by this study. The study therefore draws data from two different sources, i.e., The *Annual Survey of industries* (ASI), which is published by the Central Statistical Organisation, Government of India and *Prowess*, Centre for Monitoring Indian Economy Pvt. Ltd

(CMIE) that contains database on over seven thousand registered companies. ASI provides a reasonably comprehensive and reliable disaggregated estimates for the manufacturing industries. It covers all the production units registered under the Factories Act, 1948[7], 'large ones' on a census basis (with definition of 'large' changing over time) and the remaining on a sample basis.

A concordance matrix has been constructed wherein industries in Prowess are matched to three digit level industries in ASI. Data is constructed for 78 industries at three-digit level of industrial classification (National industrial Classification) for the period 1991-92 to 1997-98[8]. Data for most of the variables are drawn from ASI while data on foreign direct investment, exports and technology for the matched industries is obtained from Prowess (C.M.I.E).

The share of foreign companies in total sales of the industries has been taken as the indicator of the level of FDI. Export intensity is measured by the ratio of exports to sales. To estimate the impact of imports we use Effective Rate of Protection (ERP) at the industry level. ERP series used has taken from a study by National Council for Applied and Economic Research (India).

To measure the impact of technology, an index of technology acquisition has been constructed using data on R&D expenditure, payment of royalty and technical fees for technology imports, and capital goods imports. The construction of the index has been done in two steps. First, the relevant ratios (e.g. R&D expenditure to sales) have been constructed for the 78 major industry groups from firm level data taken from the Prowess database of the CMIE. Next, applying the principal component analysis and taking the first principal component, the index has been formed. The index combines the three

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[6] For details see Blundell and Bond (1998) pp: 118

[7] The Factories Act, it may be noted, applies to those units employing 10 or more workers and using power / 20 or more workers not using power.

[8] The period chosen has been constrained by the availability of comparable data since 1998 onwards. The reason being ASI changed its industrial classification from 1998-99.

technology related variables using factor loadings as weights. All data are converted into natural logarithms.

Table 4 defines variables used in the empirical analysis. Appendix tables (Table A.1 and Table A.2) report the means, standard deviations and correlation coefficients of the variables. And Table A.3 reports the average wage rate in different industries in Indian manufacturing sector.

Table 4: Variables Definitions

Variable	Abbreviation	Definition
Output	Y	Total industry sales by value
Wage rate	WR	Real wages per worker
Capital Labour ratio	K/L	Total capital employed / total number of persons employed.
Labour productivity	LP	Gross value added / number of persons employed
Foreign Direct Investment	FDI	Sales of foreign firms / total industry sales
Export Intensity	EXP	Exports/Sales
Import Liberalisation	ERP	Effective rate of protection
R&D Intensity	R&D	R&D/Sales
Royalty Expenditures	ROY	Royalty expenditures/Sales
Import of capital goods	IMPK	Import of capital goods/sales
Technology Acquisition Index	TECH	Index constructed using R&D intensity, IMPK and ROY.

7 Empirical Results

Table 5 presents the results of the DPD (dynamic panel data) estimation of wage equation i.e., equations (1). Since wages and employment in Indian industries are characterised by downward rigidities (as discussed earlier), we use Generalised Method of Moments (GMM-IV) one step estimators, following Arellano and Bond (1991)[9]. The dependent

[9] The coefficients and standard errors reported are those of the one-step estimation since, as Arellano and Bond (1991) argue, inference based on standard errors obtained from the two-step estimates can be unreliable. The Sargan test of over identifying restrictions and the test for second order autocorrelation are, however, based on two-step estimates (see Arellano and Bond 1991).

variable is Log of wage rate. All estimates are based upon heteroscedastic robust standard errors. Consistency of the GMM estimates requires that there is no second order correlation of the residuals of the first-differenced equation. Our results of the AR(2) test on the residuals as developed by Arellano and Bond (1991) do not allow us to reject the hypothesis of the validity of instruments used. We estimate two specifications i.e., with different channels of technology acquisition and with the technology acquisition index. We also use industry dummies at two-digit level to control for industry-specific effects.

Table 5: Impact of FDI, Trade and Technology on Wage Rate in Indian Manufacturing Industries:

Dependent Variable: *Log Wage Rate*		
	Coefficient (t-value) (1)	Coefficient (t-value) (2)
Log wage rate Lagged	0.12** (2.25)	0.13** (2.49)
Log Output	-0.01(-1.15)	-0.01 (1.24)
Log LP	0.07** (2.56)	0.06** (1.93)
GRO	0.05 (1.46)	0.08 (1.47)
Log FDI	0.06* (1.91)	0.07**(2.42)
Log TECH	0.001 (0.30)	-
Log EXP	-0.01 (-1.71)	-0.01 (-1.17)
Log ERP	-0.007 (-0.15)	-0.003 (-0.39)
Log R&D	-	0.001 (1.23)
Log IMPK	-	-0.005 (-1.14)
Log ROY	-	-0.003 (-0.62)
Industry Dummies	Yes	Yes
Constant	0.09** (3.45)	0.09** (3.45)
Sargan test Chi2	7.92	4.32
Auto correlation (z)	-1.30	-1.21

Note: 1. ** indicates significance at 1%, * indicates significance at 5%, # indicates significance at 10%.
2. The predicted values of wage rate arrived from the wage equation is used as an instruments for wage rate in the employment equation.
3. FDI, Exports, ERP and technology variables have lagged values.
4. The estimations are carried out for 78 industries for the period 1991-92 to 1997-98

The result shows that after controlling for size of the industry (log output) and labour productivity, the presence of FDI in an industry raises the wage rate of the industry. In other words, irrespective of labour productivity higher presence of foreign firms in an industry leads to a higher wage rate. This result supports the argument that foreign firms

pay more. The empirical literature also provides strong evidence in this regard. Faggio (2001) finds that in Poland, Bulgaria and Romania, despite different economic conditions and levels of development, higher levels of FDI are associated with higher manufacturing wages. While, Grima et al (1999) find that foreign firms pay higher wages even after controlling for the sectors in which they are located and the size of the affiliates.

We find that lagged wages have a significant positive influence on the wage rate of an industry, which is probably due to the downward stickiness in wage rates in Indian manufacturing. Higher growth rate of employment in an industry, which indicates higher bargaining power of labour unions, tends to be positively associated with the wage rate but does not turnout to be significant. As expected, labour productivity favourably influences wage rate. Though the results show that FDI has a strong positive impact on wage rate in an industry, the impact of exports, imports or any component of technological progress do not seem to have any significant impact on the wage rates. This is in accordance with unique characteristics of the Indian labour markets where the government plays an important role in determination of wage rate in the organised sector (as discussed earlier).

The impact on employment is reported Table 6. To account for the endogeneity problem between estimating employment and wages, in the employment equation we instrument wages with predicted values of wages that we arrive at while estimating the wage equation.

The results show that the size of the industry and capital- labour ratios are significant with the expected signs. However, we find that lagged FDI does not have a significant impact on employment. This shows that FDI in India has not contributed to employment in the industry. Some of the studies have pointed out that if foreign firms are involved in export-oriented industries in developing countries they are expected to yield a favourable labour market outcome as their choice of technology and wage policy tend to be much in line with the comparative advantage in international production of the given host country. But in India, we find that FDI has not entered export-oriented industries but has mainly

entered capital-intensive industries[10] like chemicals, automobiles, pharmaceuticals, etc and therefore this may be a plausible reason why it does not have an employment enhancing effect.

Table 6: Impact of FDI, Trade and Technology on Employment in Indian Manufacturing Industries

Dependent Variable: *Log Employment*		
	Coefficient (t-value) (3)	Coefficient (t-value) (4)
Log Employment Lagged	0.26 (1.11)	0.23 (1.20)
Log wage rate (Predicted)	-0.01 (-1.16)	-0.006* (-1.65)
Log Output	0.28***(6.23)	0.28*** (6.15)
Log K/L	-0.11**(-2.43)	-0.09**(-2.13)
Log FDI	0.02 (0.89)	0.02 (0.64)
Log EXP	0.01*** (2.83)	0.02***(3.21)
Log TECH	-0.01** (-2.04)	-
ERP	-0.001 (-0.91)	-0.005 (-0.56)
Log R&D	-	0.003** (2.13)
Log IMPK	-	-0.01** (-2.24)
Time	0.02*** (2.38)	0.03*** (3.48)
Log ROY	-	-0.01**(-2.16)
Industry Dummies	Yes	Yes
Constant	0.01 (0.58)	0.008 (0.06)
Sargan test Chi2	7.17	5.65
Auto correlation (z)	0.42	0.78

Note: 1. ** indicates significance at 1%, * indicates significance at 5%, # indicates significance at 10%.
2. The predicted values of wage rate arrived from the wage equation is used as an instruments for wage rate in the employment equation.
5. FDI, Exports, ERP and technology variables have lagged values.
6. The estimations are carried out for 78 industries for the period 1991-92 to 1997-98

Though FDI is not found to have a favourable effect on employment of the industry, we find that export-orientation of an industry positively influences its employment. This is consistent with the inference drawn from Heckscher-Ohlin model, since in India exports generally take place from industries that are labour intensive therefore higher exports are

[10] See Banga 2003

expected to lead to higher employment. The results are also consistent with Goldar (2002) who finds higher employment elasticity of demand in export oriented industries in the post reforms period.

Further, we find that the extent of technology acquisition in an industry has a negative impact on its employment. But, though import of capital goods and royalty payments of an industry is found to negatively influence employment, R&D intensity is found to be positively associated with employment. From this one can infer that innovations with respect to technology are perhaps labour utilising but the import of technology in an industry is labour substituting. On the whole, technological progress is found to have a negative impact on employment as seen by the sign of technology acquisition index

Apart from these variables we find that the wage rate in the industry is negatively associated with employment, however its effect does not seem to be very significant[11]. This is not surprising since in labour surplus economies like India for any given wages in an industry there is an unlimited supply of labour and there exists under-utilised capacity due to inadequate effective demand.

8 Conclusions and Policy Implications

The paper estimates the impact of three important components of liberalisation, i.e., FDI, trade and technology on wages and employment in the Indian manufacturing industries in the post reforms period. The analysis is carried out for 78 three digit level industries and in order to capture labour market rigidities, dynamic panel data estimations are carried out using Generalised Method of Moments (GMM).

The cross-industry analysis shows that FDI, trade and technology have differential impacts on wages and employment. Higher FDI in an industry does not lead to a higher employment levels but has a significant positive impact on the wage rate of the industry. On the other hand, higher exports in an industry improve its employment levels though have little impact on the wage rate. While, higher extent of technology acquisition in an

industry is found to have an unfavourable impact on the employment levels and no impact on wages. The results are arrived at by controlling for industry-specific effects.

Two points stand out from the above results. First, given the labour market rigidities, different components of liberalisation like FDI and trade will have different costs and benefits associated with them. In particular, we find that in the Indian manufacturing industries FDI has not led to an increase in employment but has increased the wages, while trade has favourably affected the employment but has no impact on the wages. One of the plausible reasons for this could be that though FDI has led to export diversification in Indian industry (Banga 2003), it has not yet entered export-intensive industries that are labour intensive in nature. Second, technological acquisition has been capital-biased, as it has a negative impact on employment though it has not affected wages in the industry. In the context of the above-arrived results it can be said that FDI and trade are not so much a threat to employment levels as is the accompanied technological progress.

However, before deriving implications from the above results for the wage and employment policy in India, it is important to keep in mind that the organised sector in Indian manufacturing employs just a fraction of total labour force and it is the informal sector with low investment that employs majority of labour force. However, this fact by itself, does not render efforts to sustain employment and wages in the organised sector as irrelevant for if these are not sustained in the organised sector, employment and wage conditions in the informal sector may worsen. Also real wages in the organised sector is one of the determinants of aggregate demand in the economy.

The above results have strong implications for the wage policy in India. Keeping in mind that the government plays the most influential role in wage determination in the organised manufacturing sector, trends in wages and employment show that wage movements in this sector seems to have discouraged employment growth by encouraging growth of capital intensity. The above results bring to the fore the issue of wage flexibility in the organised sector. As the economy opens up, cost adjustments become increasingly important and wage flexibility clearly facilitate cost adjustments. This

[11] Since the equation includes output also as an explanatory variable the resulting coefficient of real wage rate variable should be interpretted as "constant output own wage elasticity of demand for labour"

implies that to become more competitive both in the domestic as well as international markets appropriate linkages are needed between wages and productivity in an industry.

With regards to the employment level, one of the implications of the study is, in order to improve the employment level in the organised sector efforts are needed to attract FDI in the export-oriented industries. This will also help in improving the skills of the workers in this low-skilled sector. FDI can be encouraged in this sector by reducing the relative cost of production of foreign firms in this sector. Provision of better infrastructure like cheap electricity and better transport & communication can go a long way to reduce cost of production for foreign firms and this may put India into their value-chain of production. However, one of the obstacles in attracting FDI in the export sector is the rigid labour laws that do not allow employment-wage rate relationship to work in the Indian organised sector. With relaxed labour laws and higher education and training of labour in India, higher FDI is expected to flow into the export sector.

In conclusion, it can be said that different components of liberalisation may have differential effects and they may not necessarily lead to higher social costs. In order to minimise the social costs involved, developing countries like India need to undertake labour market reforms and remove artificial rigidities that exist in their labour markets.

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Appendix

Table A.1: Descriptive Statistics

Variables	Observation	Mean	Std. Dev.	Min	Max
R&D	468	0.0005	0.00007	0.001	0.2
IMPK	468	0.01	0.00001	0.03	0.68
ROY	468	0.002	0.00001	0.004	0.07
NOW	468	53938	207	73035	515134
LP	468	2.37	-1.87	2.87	31.37
WR	468	0.32	0.06	0.15	1.18
Output	468	517042.8	331	768600.4	7232473
K/L	468	5.30	0.0006	12.87	121.78
TECH	468	0.17	0.21	0.0001	2.46

Table A.2: Correlation Matrix

	FDI	R&D	IMPK	ROY	EXP	NOW	LP	K/L	TECH
FDI	1.00								
R&D	0.26	1.00							
IMPK	0.18	0.11	1.00						
ROY	0.08	0.25	0.20	1.00					
EXP	0.20	0.25	0.20	0.03	1.00				
NOW	-0.006	0.02	0.07	0.13	0.19	1.00			
LP	0.07	0.11	-0.01	0.06	0.22	0.14	1.00		
K/L	0.15	0.12	-0.04	0.13	0.02	-0.37	0.24	1.00	
TECH	0.12	0.35	0.33	0.58	0.15	-0.05	0.08	0.09	1.00

Table A.3: Average Wage Rate in Indian Manufacturing Industries: 1991-92 to 1997-98

	WR (Rs.) pm
Food Products	2570
Manufacture of other food products	1980
Beverages	2310
Cotton text	1920
Wool, Silk and Manmade Fibres	2480
Jute and other Vegetable Fibre Text	1120
Manufacture of Text Products	2160
Manufacture of Wooden industrial goods	1610
Manufacture of paper and paper products	3150
Manufacture of Leather and Leather Products	1890
Manufacture of Basic Chemicals and Chemical prds	3520
Manufacture of Rubber, Plastic, Petroleum and Coal Prods	3110
Manufacture of Non-Metallic Mineral Products	2540
Basic Metals and Alloys Industries	3100
Manufacture of Metal Products and Parts, Except Mach	2860
Manufactur of Machinery and Equipment other than Equip	4360
Manufacture of Electrical machinery and Equipment	3590
Manufacture of Transport equipment and Parts	3800
Other Manufacturing Industries	2790

Source: Annual Survey of Industries, Different Years.