Determinants of Manufacturing FDI in India: A Sectoral Analysis

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Abstract

A panel data analysis has been carried out to find out the determinants of manufacturing sector FDI in India. The data used for analysis have been collected from Annual Survey of Industries and matched with FDI data from Department of Industrial Promotion and Policy (DIPP, GOI) and firm-level data from PROWESS database (CMIE). Appropriate price deflators were used to account for movement of prices for the variables used over time. This data set was collected from Department of Economic Affairs (GOI). Eleven sectors at three-digit NIC level (2004) were used for the study which spanned across 2003-04 to 2009-10. The concordance between FDI figures and NIC 2008 sectors were done by NCAER in their study on FDI in 2009. We have used the concordance between NIC 2004 and NIC 2008 to use the FDI data for our purpose. The various theories of industry-level FDI explain the motives in terms of market-seeking, asset exploiting, strategic asset exploiting and technology sourcing, among others. In case of India FDI flows picked up after the significant dose of liberalization happened in early 1990s. The flows became significantly higher in the year 2000 and thereafter specifically in services sectors. Manufacturing FDI poured in significantly in drugs and pharmaceuticals, chemicals (excluding fertilizers) and automobiles. Much of the FDI were domestic market driven, cost-efficiency seeking and export-oriented. We have used appropriate variables from past studies and according to theoretical conjectures to find out the driving forces behind manufacturing FDI in India. Our results show that manufacturing FDI in India is significantly negatively affected by tariffs, import-intensity and R&D intensity, whereas it is significantly positively impacted by concentration of market power. FDI inflows has been higher in those sectors where market imperfections gives an opportunity to exploit ownership advantages of FDI making companies to increase their margins and hence profits. The negative relationship between tariffs and FDI shows that FDI has been efficiency-seeking. Further, FDI flows have been lower in high cost sectors more dependent on imports. High-tech firms are generally less dependent on FDI.

1. Introduction

1.1 According to AT Kearney's 2007 Global Services Location Index INDIA ranks second in the world in terms of financial attractiveness, people and skills availability and business environment. Until recently, country's financial stability in the current environment of financial turbulence and a possible unwinding of macro imbalances sent clear message

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to the prospective foreign investors about India's position as an expanding investment destination. "India's external sector has displayed considerable strength and resilience since the reforms in 1991- despite several domestic as well as global political events and supply shocks in food and fuel.....we partner with the global economy fully on the trade and current account while there is progressive liberalization of the capital account, consistent with the progress in reforms in the real, fiscal and financial sectors", observed Dr Y.V.Reddy, Governor of India's central banking authorities, Reserve Bank of India (RBI) at the World Leaders Forum in New York in April, 2012. "The strong macroeconomic fundamentals, growing size of the economy and improving investment climate had attracted global corporation to invest in India. A major outcome of the economic reforms process aimed at opening up the economy and embracing globalization has led to tremendous increase in Foreign Direct Investment inflows into India.

1.2 The National Manufacturing Policy (NMP) ratified by the Union Cabinet in 2011 seeks to achieve a 25% share for the manufacturing sector by 2022. It aims at additional 100 million employment in manufacturing sector by 2022[2]. The government wants to achieve this without subsidies through fiscal incentives. The basic thrust would be on providing an enabling environment to tap potential in private sector, young population and entrepreneurial skills[3]. The ambitious target set by the government cannot only be achieved by tapping savings from within the country. The Planning Commission estimates that to achieve a rate of growth of 9.5% during the Twelfth Plan period the investment rate has to increase to 41.4% if the inflation rate stays in 5 to 5.5% range[4]. To achieve this rate of investment, private sources have to take a lead of which a major portion has to come from foreign sources (Assocham, 2012).

1.3 The major benefits of Foreign Direct Investment (FDI) in case of India have been identified as filling the gap between investment funds required and domestic sources of funds. Technology transfer leading to knowledge diffusion and spillover effects on domestic firms. Transfer of superior organizational and management practices through links between the foreign investing company and the domestic firm (DIPP, 2004). The flow of funds to country depends on economic, political and social factors.

1.4 The literature on determinants of FDI can be classified into firm-level, industry-level, macro-level partial equilibrium and general equilibrium approaches. A survey of all such studies can be found in Blonigen (2005). At the firm-level most important determinant of establishing cross-border facilities is the profit motive where the surplus is higher from internalizing the processes than from sourcing it from outside the firm (Rugman 1980, Dunning 2001). Though it is recognized that firm-level decisions are inherently unobservable and hence proxies like R&D intensity and advertisement intensity are used to understand the motives behind FDI. At the industry-level the motives are derived from that at the firm-level. Karpaty and Poldahl (2006) survey the theories behind firm and

[2] The Hindu, 26th October 2011

[3] Union Commerce Minister, Mr. Anand Sharma

[4] Approach Paper of Twelfth Plan, Planning Commission, Government of India.

industry-level determinants of FDI. They categorize the theories into asset exploiting, vertical and horizontal integration, strategic asset seeking and technology-sourcing types. Asset exploiting type has already been explained under firm-level determinants. Horizontal FDI (Markusen 1984) happens when trade costs are high whereas vertical FDI (Venables et al 2005 and Dunning 1993) happens when the relative endowments of factors differ across countries and the MNE feels the urge to fragment the production process according to the locational advantages. Strategic asset seeking motive is found in oligopolistic markets for motives such as confronting the rival in their home market to create concentration of market power [5](Dunning 1993). In case of technology-sourcing motive the firm invests or acquires to gain knowledge about superior technology in the acquired firm (Kuemmerle, 1999; Griffith et al, 2003). Partial equilibrium macro-level studies consider market size, growth in market size, exchange rate, taxes, government policies towards FDI, trade barriers and quality of institutions as major determinants of FDI flows (Blonigen 2005). In the general equilibrium framework initially simple motives like horizontal and vertical integration (Markesen 1984 and Helpman 1984) have been modeled. Later studies concentrated on more complicated motives from using the host country as an 'export platform' (Eckholm, Forslid, and Markusen, 2003, and Bergstrand and Egger, 2004) to using a number of locations as processors of intermediate goods which is shipped back to the parent country in more finished form (Baltagi, Egger and Pfaffermayr, 2004).

1.5 In this study we would concentrate on industry-level determinants of FDI inflows. Specifically we try to find out the determinants of manufacturing FDI in India. In the opening paragraphs we have discussed the importance of FDI and specifically FDI in manufacturing sector for India. The study considers eleven manufacturing sectors selected on the basis of their share of cumulative FDI received (<0.5) from the year 2000 to 2012. Various industry-level determinants of FDI have been used to find out the driving factors behind such flows into manufacturing sector in India. The period of analysis depending on data availability (as discussed later) is 2003-04 to 2009-10. The rest of the paper is organized as follows: section 2 gives a brief description of FDI flows in India. Section 3 deals in the appropriate theories in the Indian context and selection of variables for the study. Section 4 discusses the data issues and sources. Section 5 specifies the empirical model for our study. Section 6 analyses the results and their implications. Section 7 concludes our study.

2. FDI in India

2.1 FDI policy in India has become increasingly liberal over the past half a century. In the first phase between 1969 and 1991 MRTP and FERA Acts restricted the operation of foreign firms in terms of size, type of products, equity participation etc. In the second phase during 1991 to 2000 FDI policy was substantially liberalized by allowing 51% foreign participation through automatic route in 35 high priority industries. During this period the Foreign Investment Promotion Board (FIPB) was constituted to consider FDI

[5] Caterpillar an earth moving Machinery Company entering Japan to confront its potential rival Komatsu which helped it sustain its market power for considerable amount of time. It delayed Komatsu's growth by ten years.

under the government route. The third phase 2001 to present the FDI policy has been substantially liberalized with a negative list approach with all other activities permitted through the automatic route and substantial relaxation in terms of equity caps have also been made (ASSOCHAM 2012).

2.2 Figure 1 show that for most of the sectors foreign technological collaboration through automatic route has surpassed that through approval route. This shows the impact of FDI policy liberalization on technology collaborations. The number of investment proposals across states show that Chattisgarh have received the maximum proposals in terms of magnitude, Rs. 1045645 crores between 1991 to 2010 which is around 13.72% of that received by all the states (DIPP, 2011). Almost 70% of the investments are in electricity and around 26% is in manufacturing (IBEF, 2010). This flows have been aided by enabling policy at the state-level and commensurate investment in infrastructure. Chattisgarh is closely followed by Orissa and Gujarat. In Orissa the major investments have happened in coal, thermal power and cement[6]. Gujarat on the other hand attracts most of the FDI in oil and gas, food processing, infrastructure and gems and jewelry among others[7]. Thus most of the FDI in high inflows recipient states have exploited the natural resource bases available in those locations. The pie chart (Figure - 2) gives an overall view about regional distribution of foreign investment proposals.

2.3 Sector-wise bulk of the FDI proposals in the same period has come to electrical equipments and metallurgical industries. The pie chart (figure-2) shows the sector-wise distribution of FDI proposals.

2.4 In terms of business environment India still has a long way to go compared to China since on many aspects of 'Doing Business'[8] we lack behind China and our rankings are also worsening over time (Table 1).

2.5 Registering property, dealing with construction permits and trading across borders have become more difficult in India. Recent rulings in case of 2G spectrum case and policy paralysis in case of FDI in multi-retail have not helped the Indian cause either. Thus FDI flows in the future would among other things depend on clarity regarding policy and safeguard of foreign assets in our country.

3. Framework of the Study

3.1 In this study we would be considering demand side or internal factors which determine FDI inflows into a country. Cross country studies have concentrated on location-specific factors related to market-size, growth, low cost resources, exchange rate movements, tax policy, tariffs, quality of institutions etc. Industry-level studies on the other hand have considered intra-firm exports as an indicator for vertical integration;

[6] http://www.teamorissa.org/Investment%20Proposals%20Cleared%20till%2036th%20SLSWCA%20(%20as%20of%2031%20Dec%202010)_new.pdf

[7] http://business.mapsofindia.com/fdi-india/states/gujarat-economy.html

[8] Doing Business Reports, The World Bank, Washington D.C.

tariffs and growth in sales as indicators of market seeking FDI; R&D, sales promotion and productivity as indicators of asset exploiting motive; firm size, export share and market share as indicators of strategic asset exploiting motive; and R&D and productivity as indicators for technology sourcing motives (Karpaty and Poldahl (2006)).

3.2 Karpaty and Poldahl (2006) is one of the most comprehensive studies on determinants of FDI at the industry-level in case of Sweden. They find technology, skill intensity, export intensity, and dummy for differentiated product industry positively affects industry-level FDI whereas size has a significant negative impact on such flows. Bellak et. al. (2008) studies the US, six European Union countries and four Central and Eastern European countries (CEEC) over the period 1995-2003. They use a dynamic panel data model to segregate economy-wide and industry-level effects. In case of CEEC countries R&D intensity closes the gap between potential and actual FDI whereas for US-EU countries it is labour cost decrease due to increase in productivity and taxes that helps to close this gap.

3.3 Banga (2003) studies the impact of policies by the governments in developing countries on FDI inflows. The author finds that tariff reductions attract FDI from developing countries whereas removal of restrictions on their operations increases flows from developed countries. Bera and Gupta (2009) studies FDI inflows into Indian industrial sectors originating from developing and developed countries. Authors try to find whether the determinants of FDI flows are different for FDI coming from developed compared to that coming from developing countries. FDI inflows from both sets of countries are found to be positively related to market size, export orientation and negatively related to import intensity. FDI from developing countries are attracted towards more growing sectors in India, while no such evidence is found for such flows from developed countries. Behera and Parida (2011) (and Behera et al 2012) study the technology spillover effects of FDI in Indian manufacturing industries. The authors find that spillovers are higher for industries like food products, textiles, chemicals etc. Labour productivity and market size are found to be major determinants of FDI inflows into the Indian manufacturing sectors.

3.4 For our purpose we have considered net value added of the industry as the size variable, growth of value of output as the growth indicator, applied tariff (MFN), export intensity, import intensity, skill labour intensity and market concentration as determinants of FDI flows across manufacturing sectors in India.

4. Data and Sources

4.1 The data used for analysis have been collected from Annual Survey of Industries and matched with FDI data from Department of Industrial Promotion and Policy (DIPP, GOI) and firm-level data from PROWESS database (CMIE). Appropriate price deflators were used to account for movement of prices for the variables used over time. This data was collected from Department of Economic Affairs (GOI) (Table 3). Eleven sectors at three-digit NIC level (2004) were used for the study which spanned across 2003-04 to 2009-10. The concordance between FDI figures and NIC 2008 sectors were done by NCAER in their study on FDI in 2009. We have used the concordance between NIC 2004 and NIC 2008 to use the FDI data for our purpose. Table 2 depicts the matching of sectors

used in the study. The sectors have been chosen according to share of total FDI between the years 2000 and 2012. The manufacturing sectors with more than 0.50 share have been chosen for the study.

4.2 Variables like net value added, value of output and skill-intensity have been obtained from Annual Survey of industries (ASI) various issues. Export-intensity, import-intensity and market concentration[9] have been calculated from firm-level data aggregated to the industry-level from PROWESS database. Tariff data across sectors for the study period have been obtained from Planning Commission, Data Hand Book (DHB). DHB gives yearly tariff data across broad categories like intermediate goods, capital goods, consumer goods and mining. We have taken simple average MFN (Most Favored Nation) applied tariffs in these categories for our purpose.

5. Empirical Methodology

5.1 The following empirical model was used for our study:

$$l(fdi)_{it} = \beta_0 + \beta_1 l(nva)_{it} + \beta_2 l(gr\_vao)_{it} + \beta_3 l(tar)_{it} + \beta_4 l(ex\_sal)_{it} + \beta_5 l(imp\_sal)_{it} + \beta_6 l(lab\ int)_{it} + \beta_7 hhi_{it} + \varepsilon \quad (1)$$

where $(fdi)_{it}$ is the inflow of FDI into the ith sector at the tth time period;

nva_{it} is the net value added by the ith sector at the tth time period;

gr_vao_{it} is the annual growth of the value of output of ith sector at the tth time period;

tar_{it} is the average MFN applied tariff rate imposed for i^{th} sector at the tth time period;

ex_sal_{it} is the export intensity for i^{th} sector at the tth time period, calculated as the ratio of value of export to the net value added.

imp_sal_{it} is the import intensity for i^{th} sector at the tth time period, calculated as the ratio of value of import to the net value added.

$lab\,\mathrm{int}_{it}$ is the labour intensity of the ith sector at the tth time period, calculated as the ratio of skilled wage to the total emoluments.

hhi_{it} is the measure of competition among the firms in terms of Herfindahl-Hirschman Index (HHI) of the ith sector at the tth time period.

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[9] Herfindahl Index (HHI) has been calculated from firm-level data in each of the industry categories.

$HHI = \sum_i S_i^2$, where S_i is the share of the ith firm.

First we use a pooled OLS regression estimation method flowed by the panel data estimation. The panel data methodology can be presented briefly considering the following model.

$$y_{it} = \alpha + \beta\, x_{it} + v_i + \varepsilon_{it} \tag{2}$$

where y is the dependent and x is the set of explanatory variables for the ith cross section unit in t^{th} time period. v_i is the unit-specific residual; it differs between units, but for any particular unit, its value is constant. The variable v_i captures all unobserved, time constant factors that affect Y_{it}. ε_{it} is the usual residual with the usual properties (mean zero, uncorrelated with itself, uncorrelated with x, uncorrelated with v, and homoskedastic). Here the error part is correlated with the explanatory variables and OLS regression is not possible. Time demeaning of the variables removes the unobserved factors as below.

$$\left(y_{it} - \overline{y_i}\right) = \beta\left(x_{it} - \overline{x_i}\right) + \left(\varepsilon_{it} - \overline{\varepsilon_i}\right) \tag{3}$$

$$Y_{it} = \beta X_{it} + u_{it} \tag{4}$$

In this case OLS regression method can be used for fixed effect estimation.

5.2 For random effects the unobserved factor v_i is uncorrelated with other explanatory variables that are independent of all explanatory variables and in all time periods. This results in violating the assumption of non autocorrelation and homoscedasticity of the disturbance term. Generalised least square estimation in this case provides estimates of random effects.

5.3 Before doing the formal panel data estimation stationarity of the variables were examined through unit roots test by applying Levin-Lin-Chu (2002) procedure considering the restriction that all panels share a common autoregressive parameter. For this test panels need to be balanced. Consider a simple panel data with first order autoregressive component as

$$y_{it} = \rho_i y_{it\text{-}1} + z_{it}^{'}\gamma_i + \varepsilon_{it}$$

Where y_{it} is the panel variable of interest and z_{it} can represent panel specific intercept and trend or nothing. ρ and γ are the parameters of the process. Now panel unit-root tests are used to test the null hypothesis $H_0 : \rho_i = 1 \forall i$ against the alternative hypothesis $H_a : \rho_i < 1$. In case of Levin-Lin-Chu test we consider $\rho_i = \rho$. The test assumes that ε_{it} is independently distributed across panels and follows a stationary ARMA process for each panel.

In an alternative way we can express the specification as

$$\Delta y_{it} = \varphi y_{i,t\text{-}1} + z_{it}^{'}\gamma_i + \varepsilon_{it}$$

In Levin-Lin-Chu test in order to mitigate the serial correlation of ε_{it} the model is augmented with additional lags of the dependent variable specified as,

$$\Delta y_{it} = \varphi y_{i,t\text{-}1} + z_{it}^{'}\gamma_i + \sum_{j=1}^{p} \theta_{ij} \Delta y_{i,t\text{-}j} + u_{it}$$

The test assumes that ε_{it} is independently distributed across panels and follows a stationary invertible autoregressive moving-average process for each panel. By including sufficient lags of Δy_{it} , u_{it} will be white noise.

In our case, the Levin-Lin-Chu test found the variables to be stationery at levels. The results of the test are presented in Table 4 at the end of the paper.

6. Estimation Results

6.1 The fixed effects model has been found to be appropriate for our purpose given the Hausman test (Hausman 1978) results reported in Table 5. The results show that manufacturing FDI in India is significantly negatively affected by tariffs, import-intensity and R&D intensity, whereas it is significantly positively impacted by concentration of market power. FDI inflows has been higher in those sectors where market imperfections give an opportunity to exploit ownership advantages of FDI allowing companies to increase their margins and hence profits. Overall, our results support the efficiency-seeking objective of inward FDI flows. The negative relationship between tariffs and FDI shows that reduction of tariff barriers has encouraged FDI which is efficiency seeking (Goldar and Banga (2007)). Further, FDI flows are negatively impacted by import-intensity across sectors. The period of study considered had experienced consolidation of FDI flows into India and overall reduction in tariffs. Since lower resource cost is one of the pull factors for FDI, sectors more dependent on imports (meaning non-availability or higher cost of local factors) have received lesser foreign inflows.

6.2 In case of R&D intensity similar results have been found by Chung and Alcacer (2002) who find that on average high tech firms locate their FDI in low-tech industries. Mishra (2011) finds a similar result in case of India. The author concludes that low-tech firms invite foreign participation for assimilation of better technology. Caves (1996) were one of the first studies which found positive relationship between FDI flows and market concentration in empirical work. In case of India Athreye and Kapur (1999) found a positive correlation between FDI inflows and HHI at the three-digit industry classification level. The reasons given for such flows are possibility of higher profit for FDI making firms given the market imperfection present in the sector in the host country.

7. Conclusion

7.1 In case of India FDI flows picked up after the significant dose of liberalization happened in early 1990s. The flows became significantly higher in the year 2000 and thereafter specifically in services sectors. Manufacturing FDI poured in significantly in drugs and pharmaceuticals, chemicals (excluding fertilizers) and automobiles. Much of

the FDI were domestic market driven, cost-efficiency seeking and export-oriented. We have used appropriate variables from past studies and according to theoretical conjectures to find out the driving forces behind manufacturing FDI in India. Our results show that manufacturing FDI in India is significantly negatively affected by tariffs, import-intensity and R&D intensity, whereas it is significantly positively impacted by concentration of market power. FDI inflow has been higher in those sectors where market imperfections give an opportunity to exploit ownership advantages of FDI making companies to increase their margins and hence profits. The negative relationship between tariffs and FDI shows that FDI has been efficiency-seeking. Further, FDI flows have been lower in high cost sectors more dependent on imports. High-tech firms are generally less dependent on FDI.

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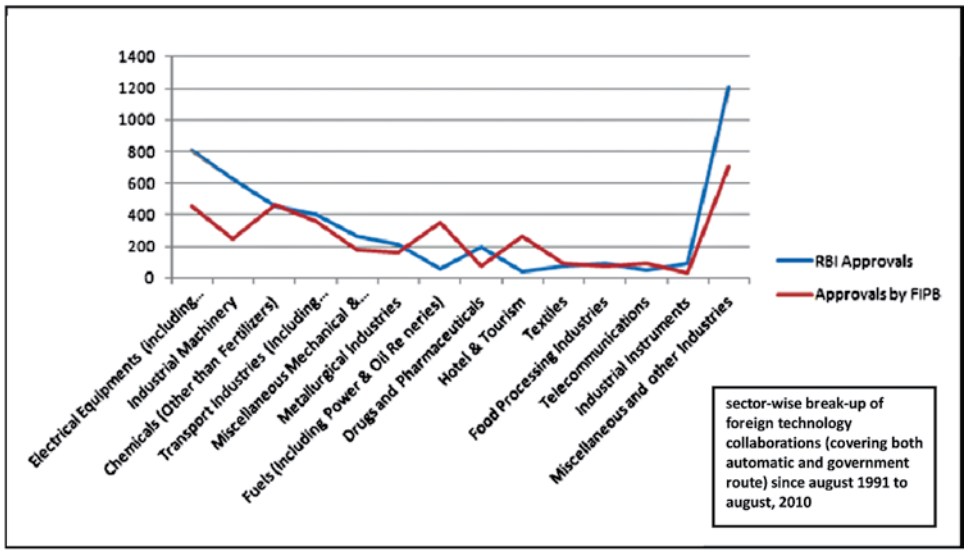
Figure 1: Sector-wise Automatic vs. Approval Route 1991 to 2010



Source: DIPP Annual Report 2011

Figure 2: Distribution of FDI Proposals across States/UTs 1991 to 2010

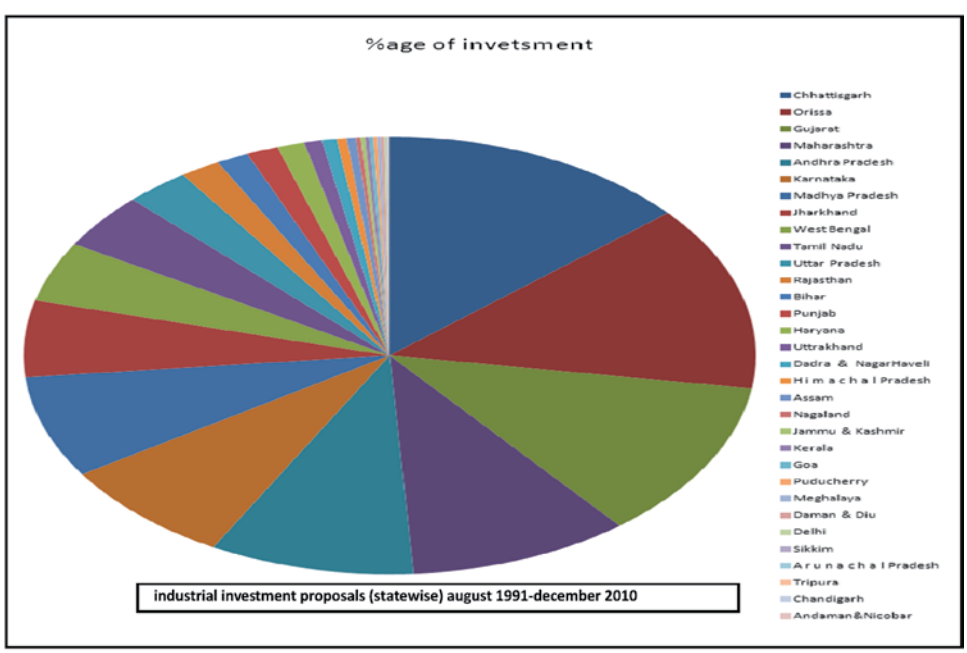
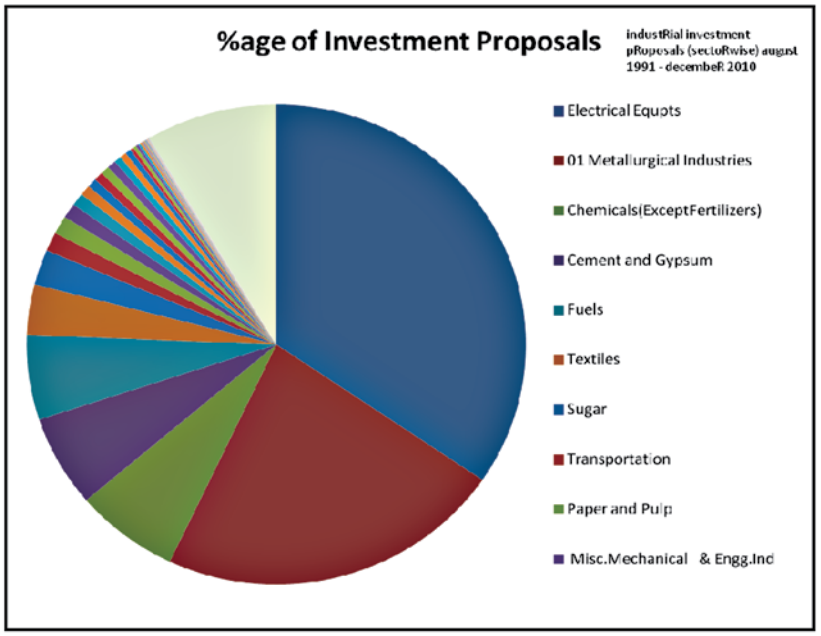


Figure 3: Distribution of FDI proposals Sector-wise 1991 to 2010



Data Source: DIPP

Table 1: Change in Doing Business Ranking of India between 2010 and 2011

Items	dB 2011	dB 2010	Change in rank
(Overall)	134	135	1
Starting a Business	165	168	3
Dealing with Construction Permits	177	176	-1
Registering Property	94	90	-4
Getting Credit	32	30	-2
Protecting Investors	44	41	-3
Paying Taxes	164	168	4
Trading Across Borders	100	93	-7
Enforcing Contracts	182	182	No change
Closing a Business	134	137	3

Table 2: Matching Industry data with FDI data

NIC 2004	NIC 2008	FDI Sectors
151, 152, 153, 155	101-108, 110	Food Processing & Fermentation
171	131	Textiles
210	170	Paper
233,241, 242	201,202,210	Chemicals & Drug and Pharmaceuticals
269	239	Cement
271,272,273	241,242, 243	Metallurgical
300, 321, 322, 323, 331-333	261-268	Electronics
293, 311-315, 319	271-275, 279	Electrical Equipment
292	282	Industrial Machinery
341-343	291-293	Automobile & Ancillary

Table 3: Deflators used

Variables	Deflators
Wages	CPI (IW)
skilled wage	CPI (UNME)
value of output	IIP of that sector
net VAD	IIP of that sector

Table 4: Panel data unit root test results (Levin-Lin-Chu Test)

Variable	Description	Value of LLC bias adjusted test statistic t^*_σ	P-Value	Conclusion
lfdi	Log of FDI	-6.6671	0.0000	Panels are stationary
lnva	Log of net VAD	-1.8e+04	0.0000	Panels are stationary
gr_vao	Growth of Value of Output	-4.4517	0.0000	Panels are stationary
lex_sal	Log of export to sales ratio	-16.4110	0.0000	Panels are stationary
limp_sal	Log of Imports to Sales ratio	-25.4063	0.0000	Panels are stationary
lres_sal	Log of R&D to Sales ratio	-80.1268	0.0000	Panels are stationary
hhi	Herfindahl Index	-3.3797	0.0004	Panels are stationary
llabint	Log of skilled labour wages to total wages	-30.1724	0.0000	Panels are stationary

Table 5: Panel Estimation Results

Description	Variable	(1)	(2)
Log of FDI	lfdi	**Fixed Effects**	**Random**
Log of net VAD	lnva	0.483	1.846**
		(0.46)	(3.04)
Growth of Value of Output	gr_vao	1.010	-0.146
		(1.47)	(-0.21)
Log of tariff	ltar	-3.938***	-0.860
		(-3.60)	(-1.31)
Log of export to sales ratio	lex_sal	-1.459	-0.519
		(-1.46)	(-0.91)
Log of Imports to Sales ratio	limp_sal	-2.217*	0.0165
		(-2.03)	(0.03)
Log of R&D to Sales ratio	lres_sal	-2.231*	0.156
		(-2.04)	(0.65)
Herfindahl Index	hhi	43.44*	8.984
		(2.51)	(1.06)
Log of skilled labour wages to total wages	llabint	0.641	1.802
		(0.52)	(1.63)
	_cons	-9.694	-5.387
		(-0.66)	(-0.82)
	N	66	66

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Hausman Test
χ^2 (8) = 53.56
Prob > χ^2 = 0.000