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Do Foreign Direct Investment Inflows Benefit the Major Sectors in India?¹

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Executive Summary

Total foreign direct investment (FDI) inflows into India reached Rs.706.30 billion (US\$15.73 billion) in 2006-07, with the largest share coming from Mauritius, followed by the United States, the United Kingdom, the Netherlands and Singapore. The sectors that received the largest share of total FDI inflows between August 1991 and March 2007 were electrical equipment and the services sector, accounting for 18.77 percent and 17.84 percent of total FDI respectively. These were followed by the telecommunications, transportation, fuels and chemical sectors.

The main objective of this paper is to examine the benefits of FDI inflows into the major sectors in India. The paper assesses the long-run relationship of FDI with the gross output, export and labour productivity of the major sectors by using the panel co-integration test. The analysis is based on the annual data from 1991-92 to 2004-05. The results demonstrate that FDI has helped to raise the output, productivity and export in only few sectors but this does not then support a generalisation of a positive spillover of FDI inflows into all the nine sectors in India.

Although the power and fuel sector attracted consistently high FDI inflows over the years, it has not increased the gross output of the sector. The deterrent effect of FDI on the gross output of the power and fuel sector may be due to such inputs as the value of electricity and receipts for non-industrial services rendered by others. The results also indicate that FDI had a negative relationship with exports in three sectors namely, transport, chemicals and food processing. The distribution network is the main constraint for food processing industries in India. In many cases, the design, packaging, distribution and servicing of the products are as important as the ability to produce them at or below prevailing prices in world markets. The

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lack of such skills has constituted a key barrier for India entering the world markets. It needs to address these issues in order to realise the positive impacts of FDI in these sectors. FDI inflows into highly labour-intensive sectors such as transport and chemicals may lack the competitive edge for export-oriented production in technology-intensive and dynamic products for world trade. In fact, these two sectors have attracted 11.18 percent and 9.25 percent respectively of total FDI technology transfers in India. This investment has not benefited to these two sectors in a significant manner in terms of facilitating India's access to new and larger markets by involving foreign affiliates' privileged access to the MNCs' international production systems, their intra-firm markets and their customers in global and regional markets.

The only sector in India that has enjoyed a positive relation between export and FDI is drugs and pharmaceuticals. It may be due to many global drug majors sourcing their production from India. Indian pharmaceutical industry is the fourth largest producer of pharmaceuticals in the world. It is also due to more numbers of Greenfield investment projects, which have expanded their exports through overseas affiliate by the parent companies. As far as the co-integrating relation between FDI and labour productivity is concerned, the result shows that two sectors, that is, transport and metallurgical, have a positive co-integrating relationship whereas two sectors, that is, food processing and industrial machinery have a negative co-integrating relationship. The positive relationship implies that FDI has helped to raise the labour productivity in the two sectors. This positive impact of labour productivity shows that foreign firms are interested in using the steady growth of labour productivity in these sectors to maximise their profits. However, the higher levels of labour productivity may have lead to a lack of employment growth in these two sectors. Further, the negative relationship between FDI and labour productivity in the two sectors (food processing and industrial machinery) calls for a judicious wage rate in these sectors since FDI is supposed to raise the labour productivity. If there is a higher labour productivity in these sectors, there will be the possibility of a reduction of employment in these sectors. This implies that a higher labour productivity of these sectors will attract foreign firms as the higher the productivity of the labour input, the higher the profit for these firms.

An overall impact of flow of FDI into the major sectors has not raised the gross output, labour productivity and export in all the nine sectors, which together accounted for more than 75 percent of total FDI inflows during 1991-2007 in India. There is also no significant co-integrating relationship among the variables such as FDI, gross output, export and labour productivity in the core sectors of the Indian economy. This means that when there is an increase in the output, export or labour productivity of the sectors, it is not due to the advent of FDI. It could, therefore, be concluded that the advent of FDI has not benefitted the Indian economy at the sectoral level.

On the eve of India's plan to further open up of its economy, it is perhaps advisable for it to open up its export-oriented sectors so that a higher growth can be achieved for the economy through the growth of these sectors.

1. INTRODUCTION

Foreign Direct Investment (FDI) inflow into the core sectors is assumed to play a vital role as a source of capital, management, and technology in transitional economies. It implies that FDI can have positive effects on a host economy's development effort (Caves, 1974; Kokko, 1994; Markusen, 1995; Caves, 1996; Sahoo, Mathiyazhagan and Parida 2001; Sahoo and Mathiyazhagan 2003). On this line, it has been argued that FDI can bring technological diffusion to the sectors in India through knowledge spillover and can enhance a faster rate of growth of output via increased labour productivity. There have also been few evidences to demonstrate that there is a long-run relationship between gross domestic product (GDP), FDI and export in India (Sahoo and Mathiyazhagan, 2003).

India has opened its economy and has allowed the entry of multinational corporations (MNCs) as a part of reform process which was started at the beginning of the 1990s. Like many countries, India also has offered greater incentives to encourage FDI inflows into its economy. In this context, it is imperative to assess the impact of FDI inflows in the core sectors in India. This assessment is also motivated by recent political developments in India, following the opening of such sectors as insurance and telecommunication with increased financial gap for private players. In particular, the Left parties, who are the main coalition partners of the present government in India, are not in favour of the provision of increased financial gap to private players in these sectors. They are also against the disinvestment of public enterprises. An empirical analysis could offer the basis for a further opening up the Indian economy if FDI inflows into the core sectors set a positive spillover in the economy.

Finally, the analysis is also motivated by the current worldwide trend towards assessing the impact of FDI on the core sectors of transitional economies. The evidence to-date on this issue is mixed. The positive merits of FDI inflows in the host economy in practice have begun to be questioned. It has been argued that multinational enterprises (MNEs), in the name of FDI, may drive out local firms because of their oligopolistic power, and the repatriation of profit may also drain the capital of the host country. Hanson (2001) argues that the evidence of FDI generating positive spillovers for the host countries is weak. In a review of micro data on spillovers from foreign-owned to domestically-owned firms, Gorg and Greenwood (2002) concluded that the effects are mostly negative. Lipsey (2002) takes a more favourable view of the micro literature by arguing that there is evidence of a

positive effect. He also argues that there is need for more consideration of the different circumstances that obstruct or promote positive spillovers. On this line, this paper is set to analyse the impact of FDI inflows into the core sectors of the Indian economy.

The paper contains six sections. Section Two presents the different dimensions of FDI flows to India, which include size and growth, sources and sectoral distribution of FDI inflows. The empirical studies that relate the FDI and economic growth in general and in the sectors, in particular, are reviewed in the third section. The fourth section explains the empirical analysis in terms of framework, data and estimation. The empirical results, policy implications and discussions are in the fifth section. The conclusion drawn from the analysis is presented in the last section.

2. DIMENSIONS OF FDI IN INDIA

The dimensions of FDI flows into India can be explained in terms of their growth and size, sources and sectoral compositions. The growth of FDI inflows in India was not significant until 1991, due to its regulatory policy framework. However, under the new policy regime, it is expected to assume a much larger role in India's economic development. It can be observed that there has been a steady build up in the actual FDI inflows in the post-liberalisation period (see Table 1).

The actual FDI inflows have steadily increased from Rs.4,090 million (US\$167 million) in 1991 to Rs.706,300 million (US\$15,726 million) in 2007. This reflected an annual average growth rate close to 52.44 percent (see Table 1). While the annual percentage growth is large, compared to the global average in recent three years, the value of FDI inflows to India, relative to all developing countries, remains small. However, FDI inflows to India surpassed inflows to South Korea in 2006, making India the fourth largest destination for FDI in Asia, behind China, Hong Kong and Singapore (WIR 2006). Nevertheless, India has also registered a declining trend of FDI inflows and the FDI-GDP ratio (see Figure 1), especially in 1999-00 and 2002-04, can be attributed to many factors, including the United States' sanctions imposed in the aftermath of the nuclear tests, the East Asian melt-down and the perceived Swadesh image of the Bharathi Janatha Party, which formed the government during this period in India. It is also important to note that financial collaborations have out numbered technical collaborations over the years.

Table 1: Foreign Direct Investment and its share to GDP in India from 1991-2005
(Amount in Indian Rupees in million)

Years	FDI inflows*	Annual Growth Rate@	FDI as % of GDP@
1991-02	3,534.80	-	0.03
1992-03	6,912.00	167.48	0.06
1993-04	18,619.60	84.46	0.15
1994-05	31,122.30	113.68	0.24
1995-06	64,853.60	60.39	0.46
1996-07	87,521.90	39.59	0.58
1997-08	129,897.60	40.34	0.83
1998-09	132,692.30	-8.89	0.79
1999-00	101,667.10	-16.46	0.57
2000-01	126,450.00	22.64	0.68
2001-02	193,610.00	53.11	0.98
2002-03	149,320.00	-22.88	0.73
2003-04	121,170.00	-18.85	0.55
2004-05	171,380.00	41.44	0.72 (P)
2005-06	246,130.00	43.62	0.95 (QE)
2006-07	706,300.00	186.96	2.48 (RE)

Note: (1) The amount of inflows on account of ADRs/ GDRs has been removed the FDI in order to align the data as per international best practices.

(2) P, QE and RE are the data from the provisional, quick estimates and revised estimates of GDP in India.

(3) @ Author's computations

Source: (1) Ministry of Commerce & Industry, Department of Industrial Policy and Promotion, Government of India; and (2) Handbook of Statistics on Indian Economy, Reserve Bank of India (1st Oct 2007), Mumbai, India.

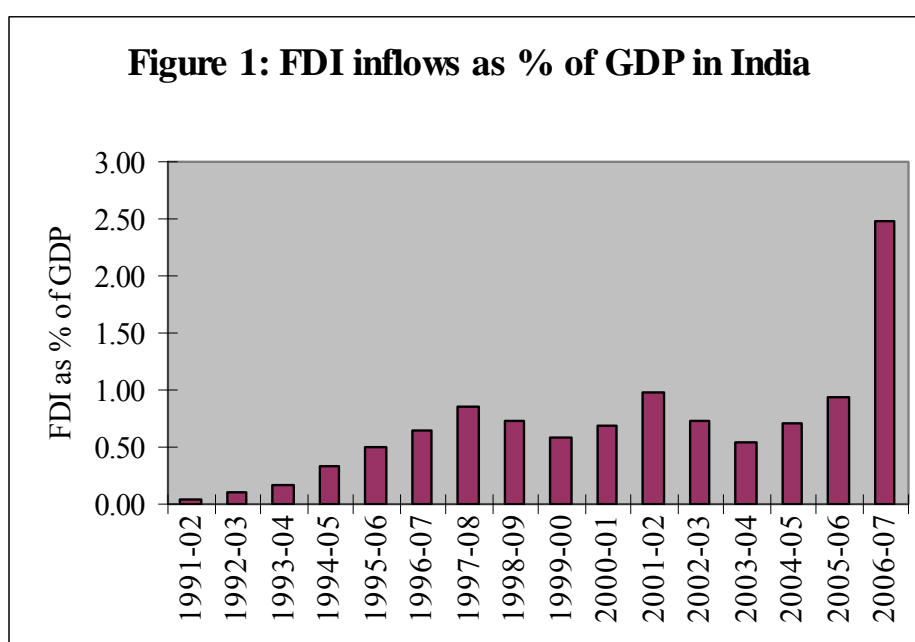


Table 2: Share of top investing countries in FDI inflows (Amounts in million)

Country	Cumulative total FDI for 1991-2007	Share of FDI inflows, 1991-2007 (%)	Share of FDI inflows, 2003-04 (%)	Share of FDI inflows, 2004-05 (%)	Share of FDI inflows, 2005-06 (%)	Share of FDI inflows, 2006-07 (%)	Cumulative total for 2003-2007	Share of FDI inflows, 2003-07 (%)
Mauritius	791,620	41.28	21.53	30.00	46.48	40.72	479,500	38.51
USA	245,360	12.78	13.68	17.83	8.98	5.47	107,840	8.66
UK	166,600	8.68	6.35	2.67	4.43	11.88	107,800	8.66
Netherlands	114,020	5.94	18.54	7.10	1.38	4.11	67,090	5.39
Japan	93,130	4.85	2.97	3.36	3.76	0.54	22,420	1.80
Germany	70,600	3.68	3.08	3.87	5.46	0.76	29,210	2.35
Singapore	70,500	3.67	1.42	4.80	4.95	3.77	48,740	3.91
France	38,030	1.98	1.45	3.13	0.33	0.75	13,230	1.06
South Korea	32,340	1.68	0.91	0.92	1.09	0.45	8,570	0.69
Switzerland	28,790	1.50	1.71	2.06	1.73	0.36	12,430	1.00
Total of all countries (in Indian Rupees)	2,320,410	-	121,170	171,380	246,130	706,300	124,498	-
Total of all countries (in US\$)	54,628	-	2,634	3,754	4,549	15,726	26,663	-

Table 3: Top Sectors attracting the highest FDI inflows in India**Amounts in million**

Sector	FDI stock (1991-2007)	Share of FDI inflows, 1991-2007 (%)	Share of FDI inflows, 2003-04 (%)	Share of FDI inflows, 2004-04 (%)	Share of FDI inflows, 2003-04 (%)	Share of FDI inflows, 2003-04 (%)	Cumulative FDI stock, 2003-07 (%)	Share of FDI inflows, 2003-07 (%)
Electrical Equipments (including IT and Electronics)	360,337.92	18.77	20.21	19.14	26.40	17.45	245,540	19.72
Service sector	342,380.97	17.84	10.19	12.29	10.42	30.35	273,400	21.96
Telecommunications	166,908.44	8.70	4.39	3.43	12.48	3.33	64,970	5.22
Transportation industry	154,273.26	8.04	11.69	4.76	3.99	2.99	53,270	4.26
Fuels (Power & Oil Refinery)	121,054.42	6.31	4.30	4.43	1.69	1.60	28,250	2.27
Chemicals (other than fertilizers)	95,101.63	4.95	0.78	5.30	8.04	1.32	39,120	3.14
Construction activities	63,956.90	3.33	1.78	4.06	2.71	6.26	60,030	4.82
Drugs & Pharmaceuticals	52,811.23	2.75	4.14	7.84	3.09	1.37	35,750	2.87
Food processing industries	51,431.16	2.68	4.22	1.02	0.74	0.62	13,090	1.05
Cement and Gypsum products	43,292.86	2.26	0.36	0.01	8.00	1.56	31,130	2.50
Total FDI inflows (in Indian Rupees)	2,320,412.09	-	-	-	-	-	1,244,980	-
Total FDI inflows (in US \$))	54,628.07	-	-	-	-	-	26,663	-

The analyses of the origin of FDI inflows to India show that the new economic policy has broadened the source of FDI into India. In 2007, the Indian government approved FDI from 116 countries, compared to 86 countries in 2000 and 29 countries in 1991. Nevertheless, a lion's share of FDI still comes from only a few countries. Table 2 shows the actual investment flows of top 10 countries (and percentage to total FDI) during the period August 1991 to March 2007. The FDI stock for the period of 1991-2007 from Mauritius is the largest (41.28 percent), with the United States as the second largest (12.78 percent) of total FDI inflows. The other top eight countries viz. the United Kingdom, the Netherlands, Japan, Germany, Singapore, France, South Korea, and Switzerland collectively accounted for 44.76 percent of the total actual FDI inflows to India in the last decade. These top 10 countries accounted for around 86.04 percent of the FDI inflows during the aforementioned period. However, the stock of FDI of the top 10 countries has decreased of late and accounted for 72.51 percent during the years of 2003-2007. It is also imperative to note that Singapore was the fourth largest contributor to the FDI inflows in India for last two years. This is due to the signing of the Comprehensive Economic Cooperation Agreement between these two countries in 2005. Nevertheless, the geographic concentration of FDI inflows in the reform period is lower than in the pre-reform period (Sahoo and Mathiyazhagan, 2003). In 1990, only six countries, viz. the United States, the United Kingdom, Germany, Japan, Italy and France were responsible for over two-thirds of total FDI inflows in India. The country-wise annual growth rate of the FDI inflows shows that Mauritius, which was not in the picture till 1992, has the highest growth rate. A lion's share of such investment is represented by the holding companies or shell companies of Mauritius which are set up by United States firms. It means that the investment flowing from tax havens such as Mauritius is mainly the investment of the multinational corporations headquartered in other countries. There are several reasons why United States companies have routed their investment through Mauritius. Firstly, these companies have positioned their funds in Mauritius and they would like to invest elsewhere. Secondly, the tax treaty between Mauritius and India stipulates a dividend tax of five percent, while the treaty between Indian and the United States stipulates a dividend tax of 15 percent (World Bank, 1999). On the other hand, the shares of total FDI inflows of these top 10 countries have been fluctuating in recent years (Table 2).

The analysis of sector-wise FDI inflows shows that electrical equipments, services, telecommunication, transportation, fuels, chemicals construction activities, drugs and pharmaceuticals, food processing and cement and gypsum products attracted considerable FDI. Together, they accounted for more than 75.63 percent of total FDI inflows during 1991-2007 (Table 3). Among these core sectors, electrical equipments, including information technology and electronics, accounted for 18.77 percent of FDI inflows, followed by telecommunications at 8.7 percent, and transport and fuels, including power and oil refinery, at 8.04 percent and 6.31 percent respectively. It is important to note that the services sector has emerged as the second largest investment choice, with 17.84 percent of total FDI inflows in recent years (Table 3).

3. LITERATURE OVERVIEW

This section reviews the empirical studies on the relation between FDI and economic activities in the host economy, which can help identify the issues relating to the impact of FDI at the sectoral level. In the earlier stage, only few studies showed that FDI has a negative impact on the growth of the developing countries (Singer, 1950; Griffin, 1970; Weisskof, 1972). The main argument of these studies was that FDI flows to less developing countries (LDCs) were mainly directed towards the primary sector, which basically promoted the less market value of this sector. Since these primary products are exported to the developed countries and are processed for import, it receives a lower price for its primary product. This could create a base for the negative impact of FDI flows in the economy. On the other hand, Rodan (1961), Chenery and Strout (1966) in the early 1960s argued that foreign capital inflows have a favourable effect on the economic efficiency and growth towards the developing countries. It has been explained that FDI could have a favourable short-term effect on growth as it expands the economic activity. However, in the long run, it reduces the growth rate due to dependency, particularly as a result of “decapitalisation” (Bornschiefer, 1980). This is due to the reason that the foreign investors repatriate their investment by contracting the economic activities in the long run. The studies that used the endogenous growth theory challenged this view in explaining the long run growth rate of the economy by using variables such as technology and human capital (Barro and Martin, 1999; Helpman and Grossman, 1991). FDI is an important vehicle for the transfer of technology and knowledge and it demonstrates that it can have a long run effect on

growth by generating increasing return in production via positive externalities and productive spillovers. Thus, FDI can lead to a higher growth by incorporating new inputs and techniques (Feenstra and Markusen, 1994).

A recent study by Kasibhatla and Sawhney (1996) in the United States supports a unidirectional causality from GDP to FDI and not the reverse. This may be due to the fact that, for a developed country, FDI follows GDP, as GDP is an indicator of the market size. Aitken, et al. (1997) showed the external effect of FDI on export with the example of Bangladesh, where the entry of a single Korean multinational in garment exports led to the establishment of a number of domestic export firms, creating the country's largest export industry. The recent study by Chen, Chang and Zhang (1995), using time series data for the period of 1979-93, estimated the regression between gross national product (GNP), domestic saving in one period lag and FDI in one period lag (all in logarithmic value). The results of the study show that there is a positive relationship between FDI and GNP and it is significant at five percent for the Chinese economy. This is also supported by another study by Sahoo et al. (2002). Hu and Khan (1997) attribute the spectacular growth rate of the Chinese economy from 1952 to 1994 to the productivity gains largely due to its market-oriented reforms, especially the expansion of the non-state sector, as well as China's "open-door" policy, which brought about a dramatic expansion in foreign trade and FDI. Further, Bashir (1999) examined the relationship between FDI and growth empirically, using panel data, in some Middle East and North African countries. The study found that FDI leads to economic growth; the effect however varies across regions and over time. Xu (2000), by using panel data, investigated the United States MNEs as a channel of international technology diffusion in 40 countries from 1966 to 1994. This study found a strong evidence of technology diffusion from United States MNEs affiliated in developed countries but weak evidence of such diffusion in the LDCs. The result for the developed countries indicates that United States MNEs are almost as important as international trade for technology spillover. Nearly 40 percent of the total factor productivity of developed countries is attributable to the technology transfer of United States affiliates. The study also found that the level of human capital is crucial for a country to benefit from technology spillovers of MNEs. A country needs to achieve a human capital threshold of about 1.9 years (in terms of male secondary school attainment) to benefit from technology transfer by the MNEs. The results are consistent with the findings of single country

studies that the technology spillover effects of MNEs are positive in advanced countries but are insignificant in LDCs.

The results by Borensztein, De Gregorio and Lee (1998) and Carkovic and Levine (2002) found little support for FDI having an exogenous positive effect on economic growth. These results point to the inclusion of other growth determinants such as human capital measures, domestic financial development and institutional quality, along with the use of lagged values of FDI.

The studies on FDI and economic growth in India are very limited. A recent study by Banga (2005) demonstrates 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, a 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 the import of technology has unfavourably affected employment in India.

The study by Dua and Rashid (1998) on the Indian economy does not support the unidirectional causality from FDI to index of industrial production (IIP), where IIP is taken as the proxy for GDP. In fact, this study used the monthly data for IIP and GDP, which may include seasonal component in its variation and, hence, there is a need to de-seasonalise the data. Alam (2000), in his comparative study of FDI and economic growth of the Indian and Bangladesh economies, stressed that, though the impact of FDI on growth is greater for the Indian economy, it is not satisfactory. Sharma (2000) used a multiple regression technique to evaluate the role of FDI on the export performance of the Indian economy. The study concluded that FDI does not have a statistically significant role in the export promotion in the Indian economy. This result is also confirmed by the study by Pailwar (2001) which argues that foreign firms are more interested in the large Indian market rather than aiming for the global market. By using a vector error correction model, Chakraborty and Basu (2002) tried to find the short run dynamics of FDI and growth. The study reveals that GDP in India is not granger caused by FDI; the causality runs more from GDP to FDI and the trade

liberalisation policy of the Indian government had some positive short run impact on FDI flow. The study by Sahoo and Mathiyazhagan (2003) also support the view that FDI in India is not able to enhance the growth of the economy. Though there is a common consensus among all the studies in the Indian context that FDI is not a growth stimulant but rather a growth resultant, none of the studies have tried to examine the role of FDI at the sectoral level in the Indian economy. The present study is an endeavour in this regard. FDI is the major factor in the liberalisation and globalisation policy of all the transitional economies, including India. The present study examines the impact of FDI at the sectoral level, by using the precise new technique called panel co-integration in order to validate the results of the analysis.

4. ANALYTICAL FRAMEWORK

In order to analyse the impact of FDI at the sectoral level on the Indian economy, this paper uses the basic theoretical framework as presented by Sahoo, Mathiyazhagan and Parida (2002) and Sahoo and Mathiyazhagan (2003). The relation between FDI and the host country economy activities could be expressed as:

$$\gamma = (1/\theta)\{(H/\varphi)A^{1/(1-\alpha)}(1-\alpha)/\alpha\alpha^{2/(1-\alpha)} - \rho\} \dots\dots\dots [1]$$

- Where, γ is the growth rate of the host economy,
- H is the stock of human capital in the economy,
- A is a fixed technology parameter,
- r is the steady state rate of return of capital
- ρ is the subjective rate of time preference,
- θ is the inverse of the inter-temporal elasticity of substitution.

The expression in (1) is valid only if the parameters are such that $\gamma \geq 0$. The expression shows that rate of growth of the economy is an increasing function of A, H and a decreasing function of ρ , θ and φ (thus an increasing function of the number of MNCs).

As is evidenced from the literature, FDI is assumed to transfer technology, promote learning by doing, train the labour and, in general, result in the spillovers of human skills and technology. It also promotes the growth of output of the sectors, and raises their labour productivity and export performances. As per economic *priori*, the output of the firm is positive determinants of FDI – the higher the output, the higher the FDI inflows because maximising the output is one of the objectives of firms. In this paper, the gross output of the sector is defined as an ex-factory value of products and by-products manufactured during the accounting year. It also includes the receipts for non-industrial services rendered to others, the receipts for work done for others or materials supplied by them, value of electricity produced and sold and the net balance of goods sold in the same condition as purchased. The labour productivity of the sectors is calculated by taking the ratio (labour productivity) of the gross value added of a sector to the number of workers employed in that sector.⁴ The higher the labour productivity of the sectors, the higher the FDI inflows to that sector – this happens particularly in the case of foreign firms which are interested in exploiting the abundant potentially skilled labourer of India to maximise their profit. Exports are considered one of the determinants of FDI inflows into the sectors in order to cater to the demand of a third country or to take advantage of the trade treaty between the host country and a third country. As a demand determinant, export is assumed to have a positive impact on the inflow of FDI into the sectors. Exports are the total earnings of the sectors, which include the earnings from the export of goods as well as the forex earning from services. On this line, it is important to examine the impact of FDI inflows on sector-specific variables such as labour productivity, output and export. The main sectors included for this measurement are power and fuels, electrical equipment, transport, chemicals, food processing, metallurgical, drugs and pharmaceuticals, textiles and industrial machinery. The study uses the panel co-integration⁵ technique in order to examine the impact of FDI inflows at the sectoral level. A panel co-integration model is best suited because of the following reasons:

⁴ Moreover, the labour productivity is usually expressed as the average output produced by each input of labour each working hour. Labour productivity can be calculated on a national level or within industries, but when it comes down to the firm level, it becomes more complex. The lack of information of working hours on firm level makes labour productivity theory difficult to use when one analyses annual report data.

⁵ For a detailed discussion, see Pedroni, 2001.

1. The pooling of the data for nine sectors over 14 years (that is, 1991-92-2004-05) will increase the degrees of freedom and it will also enable the exploration of the co-movement of the variables; and
2. It will allow the short-run dynamics to be potentially heterogeneous.

There is a considerable ambiguity in the quantitative data on FDI in India (Srivastava 2003; Nagaraj 2003; Sahoo and Mathiyazhagan 2003). It is mainly because of the discrepancy in defining FDI data by different agencies. The Economic Survey includes American Depositary Receipts (ADR) and the Global Depositary Receipts (GDR) in FDI inflows whereas the Reserve Bank of India considers ADR and GDR as portfolio investments. Thus, the figures on FDI as given by the Economic Survey overstate FDI inflows. FDI data at the sectoral level has been collected from various issues of the Secretariat for Industrial Assistance newsletter. The other variables of the sectors have been collected from the Annual Survey of Industry CD-Rom, which is published by the Central Statistical Organization, Government of India. The choice of the period of study is due to the structural adjustment programme and macroeconomic stabilisation policy launched in 1991 and, as a consequence, India became a lucrative place for most international investors. In order to capture the effect of price change in the economy, all the variables used in the study, except labour productivity, are deflated by using the GDP deflator. In order to estimate the panel co-integration relationship among the sector specific variables, the panel co-integration model is described as follows:

$$FDII_{it} = \alpha_i + \beta_i X_{it} + V_{it} \dots\dots\dots (2)$$

Where,

$FDII_{it}$ = foreign direct investment inflows to sector ‘i’ at time period t.

X_{it} = vector of right-hand side variables at time “t” for cross-section units “i” = 1 to 9;

B_t = coefficient vector, and

V_{it} = error vector over N.

In the above equation, $FDII$ and X are co-integrated with slopes β , which may or may not be homogeneous across ‘i’. In this case, in order to have the co-integrating relationship among the variables, we require under the null hypothesis that $H_0 : \beta_i = 1$ for all i . Let,

$$\xi_{it} = (\hat{u}_{it}, \Delta \hat{p}_{it})'$$

be a stationary vector consisting of the estimated residual from the co-integrating regression and the differences in the X values, and let,

$$\Omega_i \equiv \lim_{T \rightarrow \infty} E[T^{-1} (\sum_{t=1}^T \xi_{it}) (\sum_{t=1}^T \xi'_{it})]$$

be the long-run covariance for this vector process. It can be decomposed as:

$$\Omega_i = \Omega_i^o + \Gamma_i + \Gamma_i'$$

where Ω_i^o is the contemporaneous covariance and Γ_i is a weighted sum of autocovariances. Using this notation, the expression for the between-dimension, group-mean model panel fully-modified ordinary least square (FMOLS) estimator is given as:

$$\hat{\beta}_{GFM} = N^{-1} \sum_{i=1}^N [\sum_{t=1}^T (p_{it} - \bar{p}_i)^2]^{-1} \times [\sum_{t=1}^T (p_{it} - \bar{p}_i) s_{it}^* - T \hat{\gamma}_i] \dots \dots \dots (3)$$

where

$$s_{it}^* = (s_{it} - \bar{s}_i) - (\hat{\Omega}_{21i} / \hat{\Omega}_{22i}) \Delta p_{it},$$

and

$$\hat{\gamma}_i \equiv \hat{\Gamma}_{21i} + \hat{\Omega}_{21i}^o - (\hat{\Omega}_{21i} / \hat{\Omega}_{22i}) (\hat{\Gamma}_{22i} + \hat{\Omega}_{22i}^o)$$

In the similar spirit, a between-dimension, group-mean panel dynamic ordinary least square (DOLS) estimator can be constructed as follows. The DOLS regression is:

$$s_{it} = \alpha_i + \beta_i p_{it} + \sum_{k=-k_i}^{K_i} \gamma_{ik} \Delta p_{it-k} + u_{it} \dots \dots \dots (4)$$

From the equation 3, the group-mean panel DOLS estimator can be constructed as:

$$\hat{\beta}_{GD} = [N^{-1} \sum_{i=1}^N (\sum_{t=1}^T z_{it} z'_{it})^{-1} (\sum_{t=1}^T z_{it} \hat{s}_{it})]_1 \dots \dots \dots (5)$$

where z_{it} is the $2(K+1) \times 1$ vector of regressors and the subscript outside the brackets indicates that we are taking only the first element of the vector to obtain the pooled slope coefficient.

The vector X has three sector specific variables⁶, namely, gross output, labour productivity and exports. Since the number of observations in the current study is

⁶ From the literature on FDI inflows and sectoral determinants, we have identified a set of variables for our analysis. It includes wholesale price index, labor force, wages, total inputs, interest paid, gross output, profits, gross value-added, labor productivity ratio, gross capital formation, exports and imports. In order to select most robust variable for the panel co-integration model, this paper has carried out a panel log-regression analysis with those identified variables for nine sectors. The results of the panel log-regression analysis demonstrate that the gross output, labor productivity and exports were emerged as the most robust variables for the present analysis.

limited to only 126, the study has the following combinations of the variables to test the co-integrating relations among the variables:

PCONT: (FDI_{it}, GO_{it}, EX_{it}, LPR_{it})

There is a need for the verification of the stationary properties of the variables in the analysis of a panel co-integration model and, for the present study, it has been carried out for all the pooled variables by the unit root tests as prescribed by Pedroni (1999).⁷ However, all the variables are used in their logarithmic values to make them unit free. The usual tests for the unit root for a panel set of data are Levin-Lin Augmented Dickey-Fuller (ADF) test. The test covers the most general specification for all the pooled variables which include a constant, a trend and lags. It is also necessary to determine the lag length of the variables in the panel co-integration model. The Akaike Information Criterion and Schwarz Criterion are the common test-criterion to fix the lag length in any model. However, in the current panel co-integration model, the lag length cannot exceed one, since the time period is small (that is, 13 years) and the explanatory variables vector consists of three variables, that is, gross output, export and labour productivity. Moreover, it is also appropriate to have a one lag because the analysis is done for the yearly data.

5. RESULTS AND DISCUSSION

The estimation of the panel co-integration model first needs to examine the unit-root properties of times series variables in the system. It is imperative to mention here that the analysis of the variables is carried out at their logarithmic value. The result of unit root tests for all the variables used in the panel co-integration is given in Table 4. It shows that all the four variables, namely, FDI, export, wages and interest rates are non-stationary at their log level. These variables are stationary at their first difference and are integrated of order one (I (1)). Thus, in order to carry out the analysis, all the variables are made stationary by differentiating them once. The lag lengths of the variables, as mentioned earlier, are decided by taking into the statistical logic of the model. Given that the number of variables included in the panel co-integration and the

⁷ For details, see Pedroni 1999.

time dimension of the time series, the system cannot be tested for a lag length more than one.⁸ Confirming the variables are stationary at their first difference, the panel co-integration model is estimated with the first difference of all variables. The analysis included the computation of individual sector-wise fully modified OLS (FMOLS) and DOLS, panel group FMOLS and panel co-integration.

Table 4: Unit-root Test Results for Variables for Panel Co-integration

Variables	ADF	
	Level	First Difference
LFDI	-4.21	-7.91
Lgross output	-2.72	-5.92
Lexport	-0.65	-3.24
Llabour productivity	-1.33	-3.36

Note: The unit root test regressions include the intercept and trend. The critical values for ADF test at 1 percent, 5 percent and 10 percent are -4.06 , -3.46 , and -3.15 respectively.

The results of the individual FMOLS are presented in Table 5. The results show that FDI has a co-integrating relation with gross output in five sectors, that is, power and fuel, electrical equipment, food processing, textiles and industrial machinery. Of these five sectors, one sector, power and fuel, had registered a negative co-integration relation between FDI and gross output, which has a deterrent effect on the gross output of this sector. In fact, the power and fuel sector had attracted consistently higher FDI inflows over the years, which is expected to increase the outputs of this sector.

The deterrent effect of FDI on the gross output of these sectors may be due to the other inputs such as the value of electricity and receipts for non-industrial services rendered by others. However, the results show a positive co-integrating relation between FDI and gross output for four sectors, that is, electrical equipment, fuel and power, textiles and industrial machinery. This may be due to the advent of better technology through FDI, especially in the industrial machinery sector, and having the advantage of local resources (especially skilled labour) in the other three sectors (electrical equipments, including computer software and electronics, industrial

⁸ If lag length is k , each of the n equation in the system will contain $nk+1$ coefficients. In the present case, with 13 data points, the maximum lag-length can be one, in which case panel co-integration will have to estimate 6 coefficients.

machineries, food processing and textile), thus allowing them to grow at a faster rate. In fact, such sectors as electrical equipment and industrial machinery have had the highest number of technical collaborations over the years and it has, therefore, helped to increase the output of these sectors.

As a demand determinant, export is assumed to have a positive impact on the flow of FDI into the sectors in India. The results indicate that FDI had a negative relationship with exports in three sectors namely, transport, chemicals and food processing. The distribution network is the main constraint for food processing industries in India (Pricewaterhouse Coopers 2002; Deshingkar et al 2003). In many cases, the design, packaging, distribution and servicing of the products are as important as the ability to produce them at or below prevailing prices in world markets.

The lack of such skills is a key barrier for India to enter in the world markets. This needs to be addressed in order to realise the positive impacts of FDI in these sectors. FDI inflows into highly labour-intensive sectors such as transport and chemicals may lack the competitive assets for export-oriented production in technology-intensive and dynamic products in the world trade. In fact, these two sectors in India have attracted 11.18 percent and 9.25 percent respectively of total FDI technology transfers.⁹

This investment has not benefited these two sectors in a significant manner in terms of facilitating India's access to new and larger markets by involving foreign affiliates' privileged access to the MNCs' international production systems, their intra-firm markets and their customers in global and regional markets. The only sector in India that has enjoyed a positive relation between export and FDI is drugs and pharmaceuticals. It may be due to the attraction of many global drug majors to source their production from India. India's pharmaceutical industry is the fourth largest producer of pharmaceuticals in the world. It is also due to more numbers of Greenfield investment¹⁰ projects, which have expanded their exports through overseas affiliates.

⁹ Data refers to the stock of FDI technology transfers until October 2007 (Secretariat of Industrial Assistance, Government of India)

¹⁰ Greenfield FDI takes place with the establishment of new overseas affiliate by a parent company.

Table 5: Results from FMOLS for individual sectors

Sectors	Coefficient of Gross output (gross output)	Coefficient of Exports (export)	Coefficient of Labour Productivity Ratio (labour productivity)
Power and fuels	-1.92 (-2.62)*	1.02 (0.05)	3.16 (1.22)
Electrical equipments	2.33 (2.59)*	6.93 (1.00)	-0.08 (-0.33)
Transport	-1.04 (-2.06)	-1.50 (-2.80)*	1.29 (2.30)*
Chemicals	-2.88 (-1.52)	-1.74 (-4.71)*	3.35 (0.69)
Food processing industries	2.59 (2.64)*	-1.77 (-4.00)*	-1.62 (-2.46)*
Metallurgical	-0.38 (-1.05)	-0.26 (-0.79)	1.58 (2.39)*
Drugs and pharmaceuticals	2.13 (0.83)	1.22 (2.79)*	0.63 (-0.23)
Textiles	2.33 (2.36)*	1.44 (0.67)	1.92 (0.33)
Industrial machineries	2.46 (2.66)*	0.74 (-0.13)	-2.96 (-3.63)*

Note: Figures in parenthesis are t-statistics * significant at five percent level of significance

As far as the co-integrating relation between FDI and labour productivity is concerned, the result shows that two sectors, that is, transport and metallurgical, have a positive co-integrating relationship whereas two other sectors, that is, food processing and industrial machinery have a negative co-integrating relationship. The positive relationship implies that FDI has helped to raise the labour productivity in the two sectors.

This positive impact of labour productivity shows that the foreign firms are interested to use the steady growth of labour productivity in these sectors to maximise their profits. However, the higher levels of labour productivity may lead to a lack of employment growth in these two sectors. Further, the negative relationship between FDI and labour productivity in the two sectors (food processing and industrial machinery) calls for a judicious wage rate in these sectors since FDI is supposed to raise the labour productivity. If there is a higher labour productivity in these sectors, there will be the possibility of a reduction of employment in these sectors. This implies that a higher labour productivity in these sectors will attract foreign firms as the higher the productivity of the labour input, the higher the profit for these firms.

Table 6: Results from DOLS for individual sectors

Sectors	DOLS
Power and fuels	3.16 (1.22)
Electrical equipments	-0.08 (-0.33)
Transport	3.29 (2.03)
Chemicals	3.35 (0.69)
Food processing industries	-3.62 (-2.46)
Metallurgical	4.58 (2.39)
Drugs and Pharmaceuticals	0.63 (-0.23)
Textiles	1.92 (0.33)
Industrial Machineries	-5.96 (-3.63)

Note: Figures in parenthesis are t-statistics

The result of the individual sector-wise DOLS has been presented in Table 6. The result shows that FDI has a positive co-integrating relationship with the other variables like gross output, export and labour productivity in two sectors namely, transport and metallurgical, whereas it has a negative co-integrating relationship in two other sectors, that is, food processing and industrial machinery. There is the absence of any co-integrating relation in other sectors.

Table 7: Panel Group FMOLS Results

Coefficient of gross output	Coefficient of export	Coefficient of labour productivity
0.66 (0.04)	0.90 (-3.05)	0.81 (0.00)

Note: Figures in the parenthesis are the t-statistics

Table 8: Panel Co-integration Results

Panel rho-stat	0.30
Panel PP-stat	-7.12
Panel ADF-stat	-5.58

Note: The critical values for Panel rho-statistics, PP-statistics and ADF-statistics are 1.36, -10.03 and -7.58 respectively.

The result of the panel FMOLS also suggests that the flow of FDI has not helped to raise the gross output and labour productivity; rather it has an adverse impact on the export of all the sectors (Table 7). Further, the panel co-integration result also reveals that there is no significant co-integrating relationship among the variables like

FDI, gross output, export and labour productivity in all the nine sectors (Table 8). This implies that when there is an increase in the output, export or labour productivity of the sectors, it is not due to FDI. It can, therefore, be concluded that the advent of FDI has not helped to wield a positive impact on the Indian economy at the sectoral level.

6. CONCLUSION

It can be observed from the above analysis that, at the sectoral level of the Indian economy, FDI has helped to raise the output, productivity and export in only few sectors, which has not been supported for a generalisation of positive spillovers of FDI inflows into all the nine sectors in India. It is very evident from the panel co-integration results that there is no significant co-integrating relationship among the variables like FDI, gross output, export and labour productivity in all the nine sectors. This implies that when there is an increase in the output, export or labour productivity of the sectors, it is not due to the advent of FDI. Thus, it can be concluded that the advent of FDI has not wielded a positive impact on the Indian economy at the sectoral level. This may be a reason for the Left-wing parities' opposition to greater private players' participation in such as sectors as insurance and telecommunication – these sectors employ a high number of workers in India. Though the inflow FDI into sectors has helped to raise the output, labour productivity and export in only a few sectors, it would not be right to make a generalisation that there have been positive spillovers of FDI inflows into all the sectors in India, as shown by the co-integration results. Further, the results also demonstrate that the degree of relationship between FDI inflows into the major sectors and their output, labour productivity and export is very low. This may be due to the low flow of FDI into India both at the macro and sectoral level. It implies that the spirit in which the economy has been liberalised and exposed to the world economy at the late 1980s and early 1990s has not been achieved after so many years. This calls for a judicious policy decision towards FDI at the sectoral level. Therefore, on the eve of India's plan to further open up its economy, it is perhaps advisable for it to open up the export oriented sectors so that a higher growth of the economy can be achieved through the growth of these sectors.

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