Foreign Direct Investment And Economic Growth: The Case of Developing Countries

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CERTIFICATE

I Jaya Prakash Pradhan certify that, the dissertation entitled **"Foreign Direct Investment And Economic Growth: The Case of Developing Countries"** submitted by me for the degree of **Master of Philosophy** is my bonafide work and may be placed before the examiners for evaluation.

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Dedicated

To

MY revered teacher Shri Prasanna Kumar Sahu

And

To the primary source of all true knowledge
and all that is known by its means

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Introduction

The role of foreign direct investment (FDI) in the development of world economy has by now assumed a critical proportion. This is clearly discernable in the value as well as growth rate of global FDI inflows standalone to or in relation to various macroeconomic indicators. Economic development in developing countries along with their pursuance of market-friendly policies are further expediting the process of FDI led economic integration. The overall outcome is an increasing internationalization of national production systems. However, this integration process is inherently uneven, not only with respect to different regions but also with in a given region. Chapter I analyses this aspect and reviews the distribution of global FDI inflows since seventies. It also looks at the economic significance of FDI inflows for various regions and countries.

Chapter II has gone further and examines the role of FDI in the economic development of developing countries. What has FDI meant for development? Does it contribute anything to growth and if it is yes through which possible channels? The study briefly reviews major theoretical arguments in this context and provides empirical findings from the panel data analysis of developing countries.

Chapter III concentrates on the Indian experience with FDI. The study looks at how the pattern of FDI affect economic growth and what policy imperatives should a developing country like India follow in the context of

the major findings of the study. It also estimates national production function for Indian economy including FDI stock as an additional variable in the production process.

In the last chapter (IV), the study focuses on the developmental effect of FDI from a micro perspective. The study focuses on two sets of issues relating to Indian pharmaceutical industry: (i) Are the productivity levels of local firms improved by the presence of foreign firms? (ii) What policy options can be resorted to facilitate increase in the productivity of local firms?

Overall, it is hoped that this dissertation covering above issues may throw some useful light on a complex issue like the linkage between FDI and economic growth and suggests relevant policy options for the consideration of developing countries.

CHAPTER I

TRENDS, REGIONAL PATTERN AND SIGNIFICANCE OF FDI: THE CASE OF DEVELOPING COUNTRIES

FDI-led economic integration being largely confined to the developed countries during seventies now it is rapidly captivating developing countries into its production networks. Both in terms of the size and share in global FDI inflows, the developing countries found their economic activities being increasingly internationalized. The increasing share of FDI inflows in the capital formation and overall economic activities of developing countries provides further testimony to this fact. However, not all the developing regions had been equally important to FDI. The unevenness in the distribution of FDI inflows is even more glaring within a given region. Among different regions, Asia and Latin America and the Caribbean were observed to be star performers while Africa remains a long marginalized region with respect to FDI-led economic integration. It is ironic that FDI, which is supposed to be an important input in the development process, is in turn, dependant upon the level of development achieved by the region or country in the question. A region like Africa or an under developed country like Mauritania will naturally be left out of this process of integration. Answer to this problem seems to ultimately rest with the ability of underdeveloped countries to developed themselves first

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The last two decades has witnessed a tremendous pace in the process of FDI-led economic integration. Being a driving force of the globalization process, since the second half of 1980s, it has been growing faster than international trade and world GDP. In fact, between 1991 and 1995 nominal FDI inflows have grown at an annual average growth rate of 19.6 percent, two times faster than the growth of world exports (9.3 %) and three times than that of nominal global output (6.4 %) and gross fixed capital formation (6.5 %). For the same year, the sales and

exports of foreign affiliates contributed nearly 32 percent of world GDP and 28 percent of world export respectively (WIR, 1999). Overall, these conventional measures of economic significance suggest that FDI has already assumed a significant role in the world economy and development.

In the backdrop this increasing role of FDI in the world economy, this chapter reviews the trends and pattern of global FDI inflows, particularly regional dimensions among developing regions. Which region has been left out of the FDI-led integration and which is the main beneficiary? Why this happen if this happens at all? Moreover, we will examine the economic significance of FDI for the host economy. We have focused on the three decades of seventies, eighties and nineties in addressing these aspects of the problem.

A. Trends in FDI inflows

1.The Seventies: Largely A Decade of North-North Integration

During the seventies FDI had been largely concentrated among developed countries, accounting for nearly 77 percent of the total global FDI inflows in the period 1970-1979. Of about estimated $22 billion of net inflows in this period, merely $5 billion had been received by the developing countries (table-1.1). Reason for this developed countries dominated location pattern of global FDI inflows can be trace to the relative levels of development characterizing the developed and developing region. In this period, as compared to the developed countries, developing countries were identified by a smaller size of market, insufficient infrastructure and low level of created resource accumulation. They were also characterized by their inefficient economic system, unfavorable incentive framework and restrictive policies of the government. As neither domestic market nor resources offer opportunities for corporate profits, developing

countries received little FDI inflows in this period. Within developing region, there was uneven distribution of FDI inflows specifically owing to differential levels of development among different regions. The structure of FDI inflows into developing countries reflects following regional trends:

- *Latin America and the Caribbean.* Over this period FDI inflow into Latin America and the Caribbean grew at 20 percent per annum to reach an estimated average amount of $3 billion. This region was the largest recipient of total inflows into developing countries, nearly accounting for 60 percent of the same (table- 1.1,1.2). Among all countries, Brazil, Mexico and Uruguay were the major recipients in the region. They together accounted two-third of total inflows in to the region.
- *Asia.* The region was the second most preferred FDI location with $1.3 billion of average inflow during this period. The region accounted for 26 percent of total inflows into developing countries. However, the region had an average growth rate of 15 percent per annum, the lowest among all the regions. Within the region, East, South and South-East Asian countries have been the concentrating point, leaving countries of west and the pacific to share an insignificant share of developing region FDI inflows. Respectively these three sub region accounted for 20, 6 and 0.4 percent of total inflows into developing countries (table-1.1, 1.2). Major attractive destinations of the region include: Malaysia, Indonesia, Philippines, Thailand and Korea, jointly claiming nearly two-third inflows into Asia.
- *Africa.* Being the long marginalized region in the FDI led economic integration, Africa share mere 20 percent of inflows into developing countries, amounting to $1 billion of inflow. However, in terms of growth rate the region was found to be ahead of other two regions (table-1.1, 1.2). Within Africa, major destinations were Egypt, Nigeria, Algeria, Tunisia and Zaire.

Table-1.1: Average FDI Inflows into Developing Countries, 1970-79, 1980-85, 1987-92, 1993-98

Host Region	Billions of FDI Inflows (U.S. $)			
	1970-79	1980-85	1987-92	1993-98
All Countries	22 (100)	51 (100)	174 (100)	378 (100)
Developed countries	17 (77.3)	38 (74.5)	137 (78.5)	239 (63.2)
Developing Countries	5 (22.7)	13 (25.5)	35 (20.3)	127 (33.5)
Latin America & the Caribbean*	3 (60.0)	6 (46.2)	12 (34.3)	45 (35.4)
Asia*	1.32 (26.4)	5.5 (42.3)	20 (57.1)	75 (59.1)
West Asia*	0.3 (6.0)	0.4 (3.1)	1 (2.9)	2 (1.6)
East, South & South-East Asia*	1 (20.0)	5 (38.5)	19 (54.3)	70 (55.1)
The Pacific*	0.02 (0.4)	0.1 (0.8)	0.22 (0.6)	0.24 (0.2)
Africa*	1 (20.0)	1 (7.7)	3 (8.6)	6 (4.7)

Note: 1. Parentheses denotes percentage share
2. * Percentage of total developing country FDI inflows
Source: World Investment Report, 1992, 1999

Table-1.2: Average Growth Rate of FDI Inflows into Developing Countries, 1970-79, 1980-85, 1986-90, 1993-98

Host Region	Annual Average Growth Rate (%)			
	1970-79	1980-85	1986-90	1993-98
All Countries	16	-1	24	23.1
Developed countries	15	-1	27	25.9
Developing Countries	21	4	22	17.2
Latin America & the Caribbean	20	-5	17	29.5
Asia	15	20	20	10.8
West Asia	..	53	37	35.9
East, South & South-East Asia	16	7	28	10.3
The Pacific	28	-1	-5	-7.9
Africa	22	52	6	17.3

Source: World Investment Report, 1992, 1999

2.The Eighties: The Decade of Emerging North-South Integration

a. The Early Eighties (1980-85)

The first half of the eighties saw a boom in the global FDI inflows. The global surge of FDI in this period was estimated to be $ 51 billion, a whooping 132 percent increase over the amount estimated in the period of seventies. Out of this total, $13 billion has gone into developing countries, whose share in the total global inflows now increased to 26 percent from 22.7 percent during the earlier period. It is also observed that the growth rate of FDI inflows was negative for both global and developed countries whereas it was positive for developing countries. During this period, FDI inflows into developing countries grew at a growth rate of 4 percent per annum (table-1.1, 1.2). These features signal the emergence of developing countries as a growing location destination of FDI inflows.

During this period, most of the developing regions have reported average FDI inflows higher than they received during the seventies. The main regional trends of the period are given below:

- *Latin America and the Caribbean.* The FDI inflows into the region was doubled the figure of seventies to reach an amount of $ 6 billion. However, the share of the region in the total inflows into developing region declined by 14 percent to accounted for only 46 percent (from 60 percent in 1970-79). In fact, the region was observed to have a negative growth rate of –5 percent per year over this period (table-1.1, 1.2).
- *Asia.* This is the only region to gain maximum from the FDI boom of early eighties. FDI inflows into the region have grown at a rate of 20 percent per annum to be aggregated at an average amount of $ 5.5 billion. The region had accounted for one-third of investment flows into all developing

countries, which was nearly 16 percent higher than the share of the seventies. Within the region South, East and South-East Asia continued to the vibrant location. An estimated $5 billion was claimed by this sub region, which is the same amount received by the developing countries as a group in the seventies. The West Asia on the other hand reported a decline in its share to mere 3 percent from 6 percent of 1970-79 (table-1.1).

- *Africa.* The FDI inflows into the region remain stagnant during this period. The received amount $1 billion was exactly the amount the region had in the seventies. Although the rate of FDI inflows is faster than that for any other region, the share of the region dwindled by 12 percent between these two periods, to mere 8 percent of FDI inflows into developing countries (table-1.1).

In general, the attractiveness of developing countries over this period can largely be explained by their rising levels of development reflected by growing market size and expanding created asset base because of large-scale investment in human capital (education and training) and by the provision of more infrastructure. Further, the process of liberalization and outward orientation that had started slowly among many developing countries across different regions had improved their business environment and they relatively now offer more opportunities for inward FDI. The prospect of hosting FDI inflows by the developing region also was brightened with the lingering recession or slow growth in developed countries.

b. The Late Eighties (1987-92)

The global surge of FDI inflows was continued over this period also. The average amount of global FDI inflows was estimated to be an impressive figure of $ 174 billion, more than three fold increase over the global inflows of the period of 1980-85. This is nearly 241 percent change between the early eighties figure and

the figure of this period. Developed countries had received a substantial part of this global surge. They received an estimated amount of $137 billion, accounting for 78.5 percent of the total global inflows. This is 4-percentage point gain as compared to their share of 74.5 percent during early eighties. Obviously, they stand out as relatively more attractive region for FDI inflows in this period. Although developing countries as a whole received a record level of $35 billion in this period, nearly a three fold increase over their received amount of early eighties, there has been a steady decline in their share of global inflows to mere 20 percent (table-1.1). The relatively better performance of developed countries over this period can be attributed to their size dynamism and recovery from slow growth performance of the early eighties.

The structure of developing region FDI inflows reveals that almost all sub regions have experienced multiple times the average amount they accounted for in the first half of the eighties. Main regional trends of the period are the followings:

1) Latin America and the Caribbean continued to experience declining importance as expressed in its declining share in the total inflows into developing countries. The share of the region declined to 34 percent from 46 percent in the period 1980-85 (table-1.1).
2) Asia, on the other hand, had strengthened its attractiveness as the most preferred FDI location and consequently emerged as the largest developing region-recipient. It had received an estimated amount of $20 billion, accounting for 57 percent of the total developing-country FDI inflows. The relative position of Asia and Latin America and the Caribbean is in complete contrast to the situation during the period of seventies where both have accounted for 26.4 and 60 percent respectively. With in Asia, however, not all the regions have performed better in this period. The average FDI inflows into West Asia and the Pacific continued to be very small, amounting to an average of $1 and $0.22 billion respectively. In fact

over this period theses two sub regions had witnessed declining share in the total inflows into the developing countries in relation to the same over the early eighties. On the other hand, East, South and South-East Asia continued to be relatively the most preferred FDI location. With over $19 billion inflows, as the most dynamic region for FDI, accounting for over one-half of total inflows to all developing countries table-1.1).

3) FDI inflows into Africa, however, continued to be smaller aggregated at an amount of $3 billion (table-1.1). Over this period, the region saw a recovery in its share in comparison to the early eighties.

Overall, during eighties particularly in the first half developing countries have performed relatively better than what was the situation during seventies. Among developing region, Asia had consistently outperformed other regions in attracting FDI inflows. It is the large size of Asian markets, growing at fairly stable and rapid pace, which was the most important determinant of FDI inflows into that region. A severe international debt burden, erratic growth and fluctuating domestic patterns, on the contrary marked Latin America, reducing its attractiveness as a dominant host. Africa, traditionally identified by its political instability, less openness to FDI and underdevelopment remain less attractive vis-à-vis other developing regions (UNCTAD, 1993).

3.The Nineties: The Decade of Faster North-South Integration

The phenomenal global upsurge in the FDI inflows continued during the nineties and particularly over the period 1993-1998. This set a new record level of $378 billion in the period 1993-98, an increase of 117 percent over the estimated amount of 1987-92. Whatever decline in the share of developing countries as a group has been noted in the period 1987-92 was seemed to be turn around in the period 1993-98. In fact, they achieved an impressive 14-percentage point gain in the share, which has risen from 20 percent in the former period to 34 percent over

the latter. Out of $378 billion global inflows, developing countries have claimed a respectable amount of $ 127 billion. This is four times, what they had in the preceding period. Although developed countries received a record level of $239 billion inflows over this period, their share has been declined to 63 percent (from 78.5 percent in 1987-92) in the global total FDI inflows (table-1.1). In sum, this period witnessed an increasing significance of developing countries as hosts to FDI with developed countries becoming less important hosts. This regional shift in the FDI pattern may be partly explained by the sustained growth performance of developing countries, especially those that are growing rapidly and have large markets. Other important factors that may have responsible for this increasing role of developing countries were their long-lasting liberalization and privatization process.

The regional trends in the FDI inflows into developing countries over this period was characterized by the following findings:

- *Latin America and the Caribbean.* Investment inflow into the region over the period 1993-98 was fastest among different regions. Its growth rate has increased by 12.5 percent to grow at 29.5 percent per annum (from 17 percent in 1986-90). With $45 billion in inflows over this period, it accounted for 35 percent of all developing country inflows, a one-percentage point recovery over the preceding period (table-1.1, 1.2). Relatively stable growth performance contrast with the erratic performance during eighties in several countries of the region seemed to have encouraged more investment inflows into the region. Sustained economic reforms along with further liberalization of FDI regimes and privatization programmes were the other significant factors in the revival of the region as a major location destination. Along with the traditional performer, namely, Brazil and Mexico, some new countries like Argentina, Peru, Colombia and Chile significantly emerged as destinations that are more active.

- *Asia.* Over this period the region continued to be the largest developing-country FDI region, further consolidating its location attractiveness. With an estimated $75 billion inflows, which was one and half times higher than that received by Latin America and the Caribbean, the region accounted 59 percent of total inflows into developing countries. This increasing importance of Asia was largely contributed by their size and growth dynamism along with accelerated outward orientation of the region as a whole. Within Asia, East, South and South-East Asia alone claimed $70 billion, nearly 93 percent of total FDI inflows claimed by Asia. West Asia and the Pacific continued to witness a declining share in the total developing country FDI inflows (table-1.1). The distribution of FDI inflows in Asia was largely concentrated among few countries like China, Singapore, Malaysia, Indonesia and Thailand. China's emergence was rather dramatic and was the largest developing country investment recipient.
- *Africa.* In contrast to the participation of other regions in the FDI boom of the period, Africa remains a less active region for FDI location. With a meager amount of $6 billion received in the period, the share of the region in the developing country FDI inflows becomes half to 4.7 percent from 8.6 percent in 1987-92 (table-1.1). Egypt, Nigeria and Tunisia continued to be favorable FDI destinations and were joined by Morocco and Angola as newly emerging attraction.

B. The Economic Significance of FDI

Is FDI playing a significant role in the host regions? Does it have economic significance for them? This section will consider some traditional indicators like FDI share in domestic capital formation and GDP to throw some light on these questions.

4.Contribution of FDI inflows in Capital Formation

One important function of FDI is bridging the domestic resource gap by allowing higher level of investment otherwise not possible. Therefore, one simple measure of the importance of FDI inflows to an economy is its size relative to gross fixed capital formation. For world economy, the share of FDI inflows in the gross fixed capital formation was found to be steadily increasing from 1.9 percent in 1981-85 to 3.2 percent in 1986-90 and further to 5.6 percent in 1996. The same upward trend in the ratio was also observed in the case of developing countries, but the increase was relatively faster in the nineties. Inward FDI inflows had contributed nearly 9 percent of fixed capital formation of developing countries in 1996 (table-1.3). An analysis of the contribution of inward FDI inflows in the capital formation of different regions reveals following features:

a) For the period 1981-85, the percentage share of FDI inflows in the gross fixed capital formation varies among regional groupings, ranging from 15.7 percent to mere 0.5 percent. For developing countries as a whole, FDI inflows into the region on the average accounted for only 2 percent of gross fixed capital formation. The ratio for Asia was found to be largest at 6 percent, followed by Latin America and the Caribbean (6.4%) and Africa (3.7%). This clearly suggests that the role of FDI in the developing region's economic development was more significant than that for world economy

as a whole. The pacific within Asia has shown a very significant role of FDI inflows in contributing towards its fixed capital formation (15.7%). This high ratio in fact reflects a lower level of domestic investment in this sub region.

b) The role of FDI in the gross fixed capital formation of developing countries has further increased during the period 1986-90. FDI inflows now contribute nearly 3 percent of capital formation in the developing countries as a whole, a marginal increase in relation to the past share. For Asia the ratio also increased by 2 percent to become 8 percent over this period. The role of FDI inflows continued to be largest in the case of Asia in relative to other region. This was due to substantial amount of FDI inflows that the region received because of stable and faster growth performance of its economies. Within Asia, the pacific continued to experience a larger role played by FDI in bridging the domestic resource gap and the same is also true for East, South and South-East Asia. The role of FDI inflows for Latin America and the Caribbean, although remain second in the ranking, the ratio had declined by 2 percent to only 3.6 percent. Main reasons for this decline can be explained by the severe debt problem with the instable domestic investment pattern that featured the region over this period consequently reducing its attractiveness as a FDI host. The ratio for Africa, in this period like previous, stands at the bottom of the ladder. However, the share of FDI inflows in its capital formation has shown a marginal improvement relative to the last period.

c) The ratios for different years of nineties also indicate the increasing role that FDI is playing in the development process of all developing regions. The ratio for Asia varies with in the range of 22 percent to 6 percent over 1991-96. For Latin America and the Caribbean, the range was 12.8 percent to 7.5 percent whereas that in the case of Africa it varies within10.5 to 4.7 percent. These rages are quite impressive to indicate the fact that FDI is

playing a more important role in the capital formation of developing countries never before.

Table-1.3: Share of FDI in Gross Fixed Capital Formation of Developing Countries, 1981-85, 1986-90, 1991-1996

Host Region	FDI Inflows as a % of Gross Fixed Capital Formation					
	1981-85	1986-90	1991	1992	1994	1996
All Countries	1.9	3.2	3.5	3.7	4.5	5.6
Developing Countries	2.4	2.7	4.0	7.8	7.6	8.7
Latin America & the Caribbean	5.6	3.6	7.5	11.6	8.9	12.8
Asia	6.1	8.0	13.4	22.0	6.3	8.0
West Asia	0.5	0.5	0.2	0.3	1.2	0.2
East, South & South-East Asia	2.0	3.5	4.1	15.4	7.9	8.3
The Pacific	15.7	19.9	35.9	50.4	9.9	15.6
Africa	2.5	3.7	4.7	10.5	9.5	7.3

Source: World Investment Report, 1994, 1998

The role of FDI inflows in the capital formation of some selected developing countries across different regional grouping has been furnished in the following three figures- Figure1.1, Figure1.2 and Figure1.3.

The contribution of FDI inflows towards domestic capital formation of developing countries of Latin America and the Caribbean over the period 1973-95 varies from 1.2 to 18.6 (Figure1.1). The only outlier in the figure is Trinidad and Tobago for whom the ratio was an impressive two-digit figure of 18.6 percent. The single-digit but greater five percentage point contribution has been reported in the case of nine countries of the region. They are: Bolivia (7.7%), Chile (6.9%), Colombia (5.3%), Ecuador (5.6%), Uruguay (5.3%), Costa Rica (9%), Dominican Republic (7.2%), Guatemala (8.2%) and Mexico (6.4%).

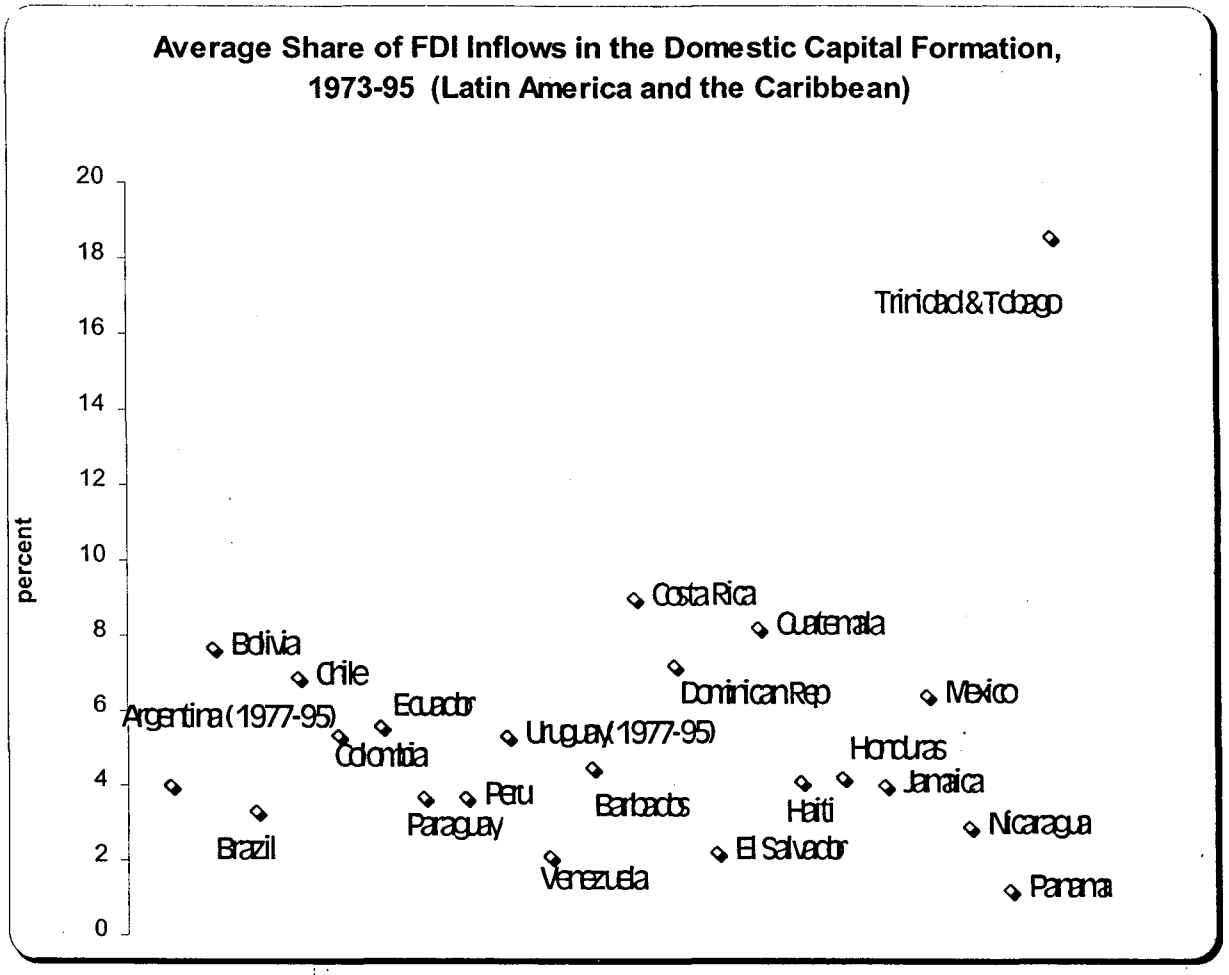

Figure1.1

For Asian developing countries, the share of FDI inflows in the domestic capital formation has been a two-digit percentage contribution for a group of four small countries and for rest the contribution is even less than five percent exception being one country (figure1.2). The group of four comprises Papua New Guinea (16.5%), Malaysia (13.5%), Fiji (13%) and Solomon Islands (10.8%). The only other Asian country that has reported a percentage figure crossing a respectable limit of five percent is Oman (6.4%) (Figure 1.2).

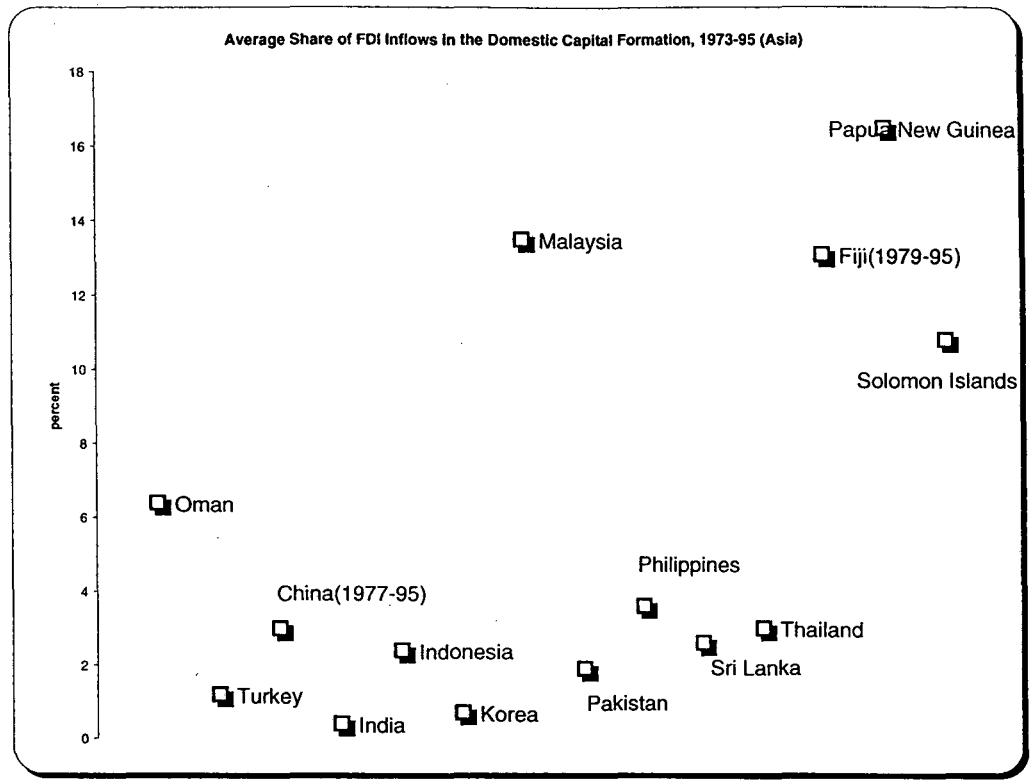

Figure1.2

Inward FDI flows contribute a significant proportion of the domestic capital formation in African countries as well. The ratio exceed a two-digit percent figure for as many as six countries and nine countries are in the rage between two-digit and single-digit greater than 5 percent (figure1.3). Countries belong to the first group are: Swaziland (21.3%), Botswana (14%), Chad (12.8%), Gabon (11.5%), Nigeria (11.3%) and Zambia (10.7%). More than five percent but less than two-digit contribution to domestic capital was observed for Egypt (7.2%), Tunisia (6.5%), Congo (6.8%), Ghana (5.3%), Malawi (5%), Niger (5.6%) and Rwanda (5%) (Figure 1.3).

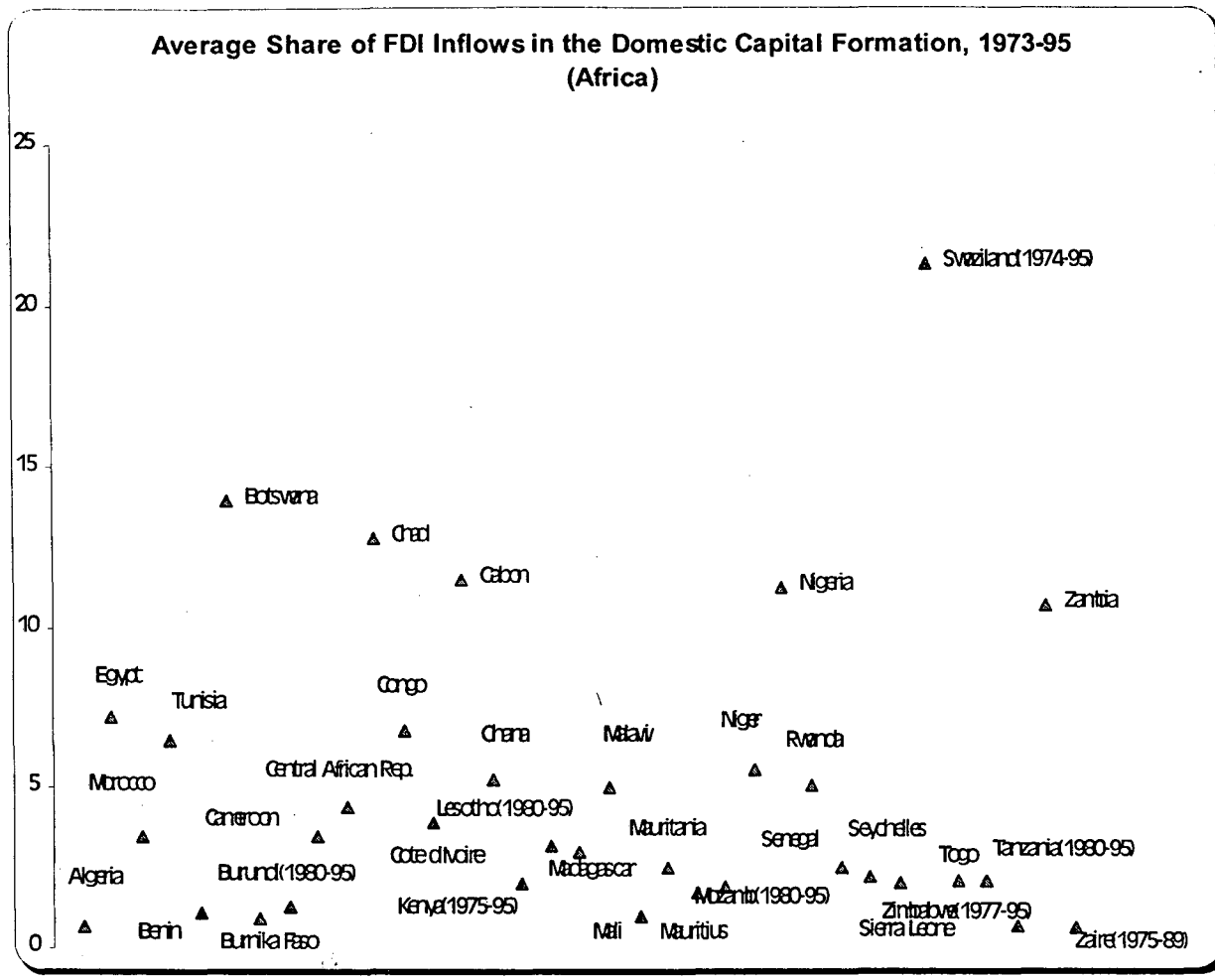

Figure1.3

5.Relative Importance of FDI Inflows in the GDP of Host Country

The economic significance of FDI inflows to an economy can also be obtained by considering its role in relation to the GDP of the economy. Traditionally GDP is the summary measure of all economic activities that has taken place in a specified period with the participation of the resources of the economy. If FDI inflows can be taken to represent the activities carried out by foreign resources in the economy, than the share of FDI to GDP measure the importance of these foreign economic activities in the economy to it's overall economic activities.

It can be seen from the table-1.4 that FDI per $1000 of GDP is more or less increasing across different regions. In the year 1970, per 1000 dollar of GDP, FDI amounts to eight dollar for Africa, seven and three dollar for Latin America and the Caribbean and Asia respectively. By 1997, FDI amounts to be an impressive 15 dollar for Africa and for latter developing regions correspondingly the same is thirty-four and twenty-eight dollar. The rise in the role of FDI in the overall economic activity of the region has been spectacular in the case of Asia. The ratio has risen from 3 percent in 1970, lowest among all regions, to reach a whooping 28.3 percent in 1997. The large size of Asian economies along with a faster trend in their over economic activities may explain this increasing role of FDI in Asia. However, poor growth performance and size disadvantage in the case of Africa seems to still obstructing FDI in performing relatively a larger role in its economic activities.

Table-1.4: The Relative Importance of FDI Inflows to GDP of Developing Countries 1970-1997

Year	*FDI in dollars per $1000 of GDP*		
	Africa	*Latin America & the Caribbean*	*Asia**
1970	7.9	6.7	2.7
1975	3.1	10.5	4.0
1980	0.8	10.0	4.3
1985	6.0	10.1	4.6
1990	5.1	8.5	12.4
1991	6.5	13.6	12.5
1992	6.6	14.4	14.9
1993	8.1	12.7	23.6
1994	13.2	18.4	25.6
1995	10.9	19.8	24.2
1996	13.6	24.8	25.7
1997	14.7	33.8	28.3

Note: *-South, East and South-East Asia only
Source: UNCTAD, 1999

Among Latin American and the Caribbean countries, the role of FDI led activities in the overall economic activities of the economy has been found to be in

the range of 3.4 percent to 0.3 percent over the period 1973-95. The range for Asia was 4.3 percent to 0.1 percent. In addition, the same in the case of Africa was 5 percent to 0.1 percent (Figure1.4, 1.5,1.6). This wide variation indicates that the role played by FDI has significant regional variation. There are three reasons responsible for this variation. First, it is depended upon the FDI inflows into the country in relation to other countries. Second, it also influenced by the size of GDP in relation to inflows into the economy. Third, these two factors in turn depend upon the level of development achieved by the host and its attractiveness to FDI. Therefore, the level of economic development in the economy largely determines the role played by the FDI in its economic activities.

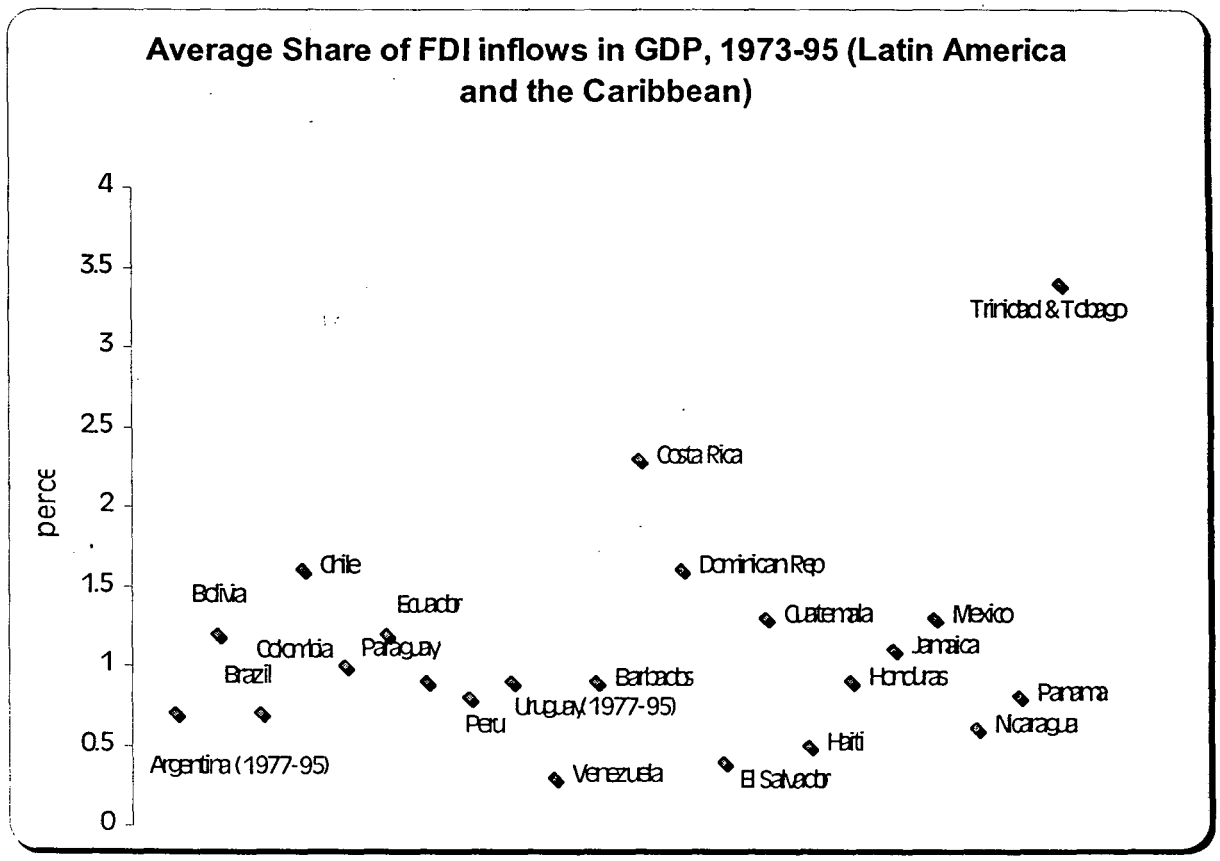

Figure1.4

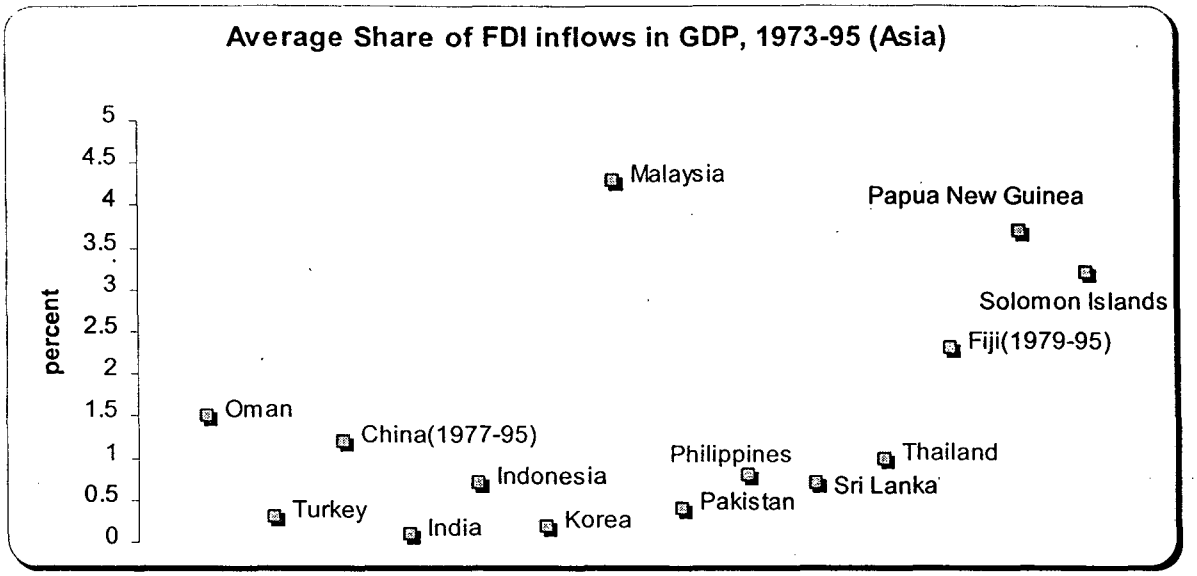

Figure1.5

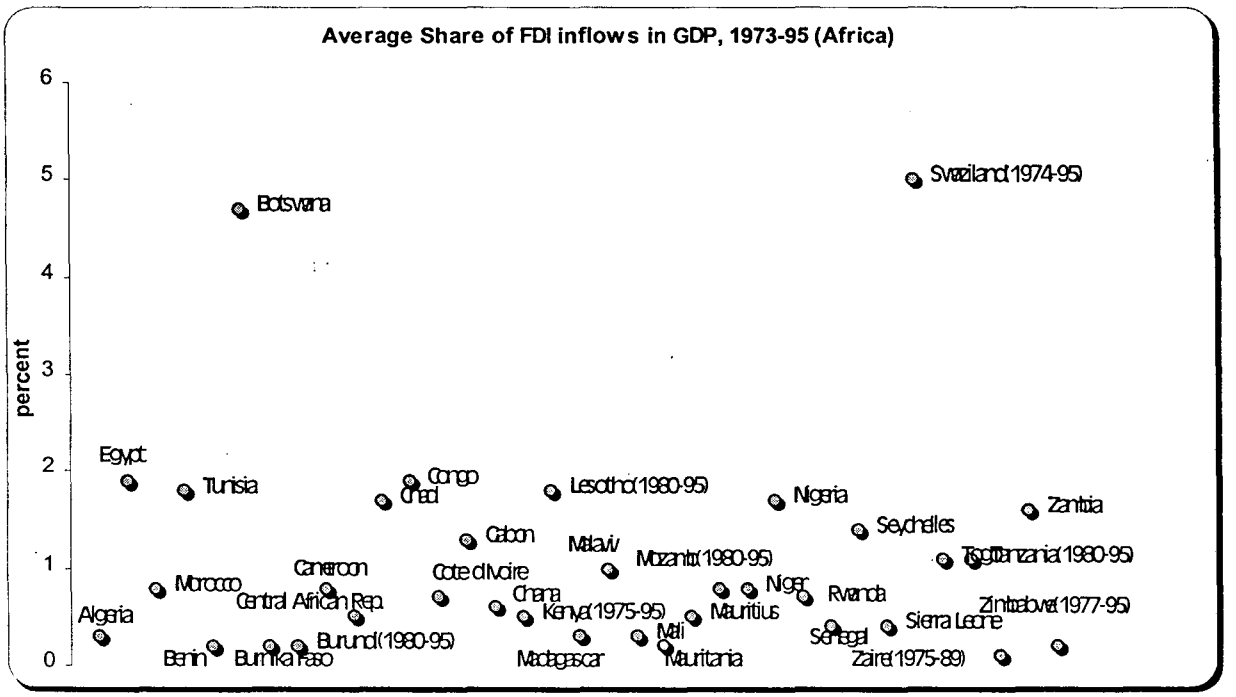

Figure1.6

Another expected feature obtained by the study is that the average contribution of FDI in the domestic capital formation of an economy and the role of FDI in its overall economic activities is highly correlated across different regions. The correlation coefficient for Latin America and the Caribbean was

found to be 0.94 and that in the case of Asia and Africa were 0.95 and 0.86 respectively. This is largely because the level of capital formation in an economy crucially depends upon the level of economic activities in it. This relation seems to be very strong in the case of Latin America and the Caribbean and Asia whereas relatively less in the case of Africa. Erratic growth performance and instable investment pattern of Africa might have strongly responsible for this relatively less correlation level for the region.

The above discussion clearly suggests that FDI is now playing a major role in global development finance and its role as a source of capital is increasing in the context of continued declining official aids in the net resource transfer to developing countries. In relation to the overall economic activities of different developing regions as measured by their GDP, a rising importance is clearly discernable.

C. Conclusions

The role of international production in the world economy is increasingly becoming critical and even more so for the development of developing countries. The global FDI inflows, which was largely a North-North integration process during the seventies, has expanded itself to embrace developing countries into its production networks faster than ever before. This integration was largely because of rising level of development in the developing region and their pursuance of outward looking strategy marked by further market friendliness. However, not all the regions are equally integrated in the process and within a region, uneven integration is the rule rather than the exception. In this context, economic development seems to be the assured route to get sufficient amount of FDI inflows and more importantly to get maximum benefit from what is being received.

CHAPTER II

FOREIGN DIRECT INVESTMENT AND ECONOMIC GROWTH IN DEVELOPING COUNTRIES: FURTHER EVIDENCE FROM PANEL DATA

Recent theoretical and empirical advancement on growth accounting and endogenous growth front has emphasized that FDI can be a catalyst for the development of developing countries. FDI can contribute to the domestic stock of knowledge and its very presence generates a host of externalities enhancing productivity and competitiveness of the host country. It has also been consistently argued that developing countries can maximize benefits from FDI only when they achieve a critical level of human development. The present study has attempted to empirically verify the above role of FDI in the growth process of developing countries. Panel data evidence, however, does not find any significant role for FDI in the growth of all developing countries. The conclusion remained unchanged even if human development interaction with FDI was included in the model. Estimations for developing groupings, however, suggest that FDI significantly affects the growth of Latin American and the Caribbean countries but not in the case of Africa and Asia. One of the significant observations that this study derived is that the growth effect of domestic investment is relatively more sensitive than FDI to the level of human development. The study also found that the role of international linkages has a major role in the growth process if the country is at a lower level of human development than a country with a higher level. Developing countries have to pursue a human-development-led-growth strategy supplemented by export-led growth if they want to improve their local productivity as well as that from FDI and maintain their competitive advantages in global markets.

The experience of developing countries with FDI has been of critical interest to the literature on international production and development. This chapter focuses attention on how FDI and development are related and what mechanism developing countries can resort to for minimizing the negative impact involved, if any, and maximizes positive influence on growth. These questions are of particular importance in the context of national policy for FDI and international monitoring in the era of globalization.

A. The Theoretical Background

What has FDI meant for development? Although simple, this question has generated a long debated concern in the development literature. Beginning with the productivity/growth impact of FDI, the problem in the long run has diversified to include distribution impact also. However, for the purpose of this study our attention will be confined to the former impact only and hence to those theoretical understandings that concentrate on it.

The growth impact of FDI can be conceptualized by a number of linkages that link FDI and development. The literature has identified following important linkages as shown in the flow diagram given below (Figure 2.1).

During sixties and seventies, the growth impact of FDI was presumed to be largely negative and growth retarding for host developing countries. In some sense these perceptions about MNCs-development linkage was more an ideological and historical one than based on any rational economic theorizing (Caves, 1982; Lall, 1993). The dominant structuralist perspectives combined with empirical evidences in the nature of cost-benefits analysis reports net social benefits of MNCs to be either negligible or negative, this has strengthened the negative attitudes of many developing countries recently freed of colonial regime towards MNCs (Lall and Streeten, 1977; Hood and Young, 1979).

One of the important functions that FDI can perform in a poor country is to supplement the meager domestic savings and hence allow the host to achieve a higher level of capital formation. This raise the growth performance of the poor country by enabling utilization of resources that would have remained unutilized otherwise. However, the contemporary theoretical thoughts of sixties and seventies do not share this optimism from FDI.

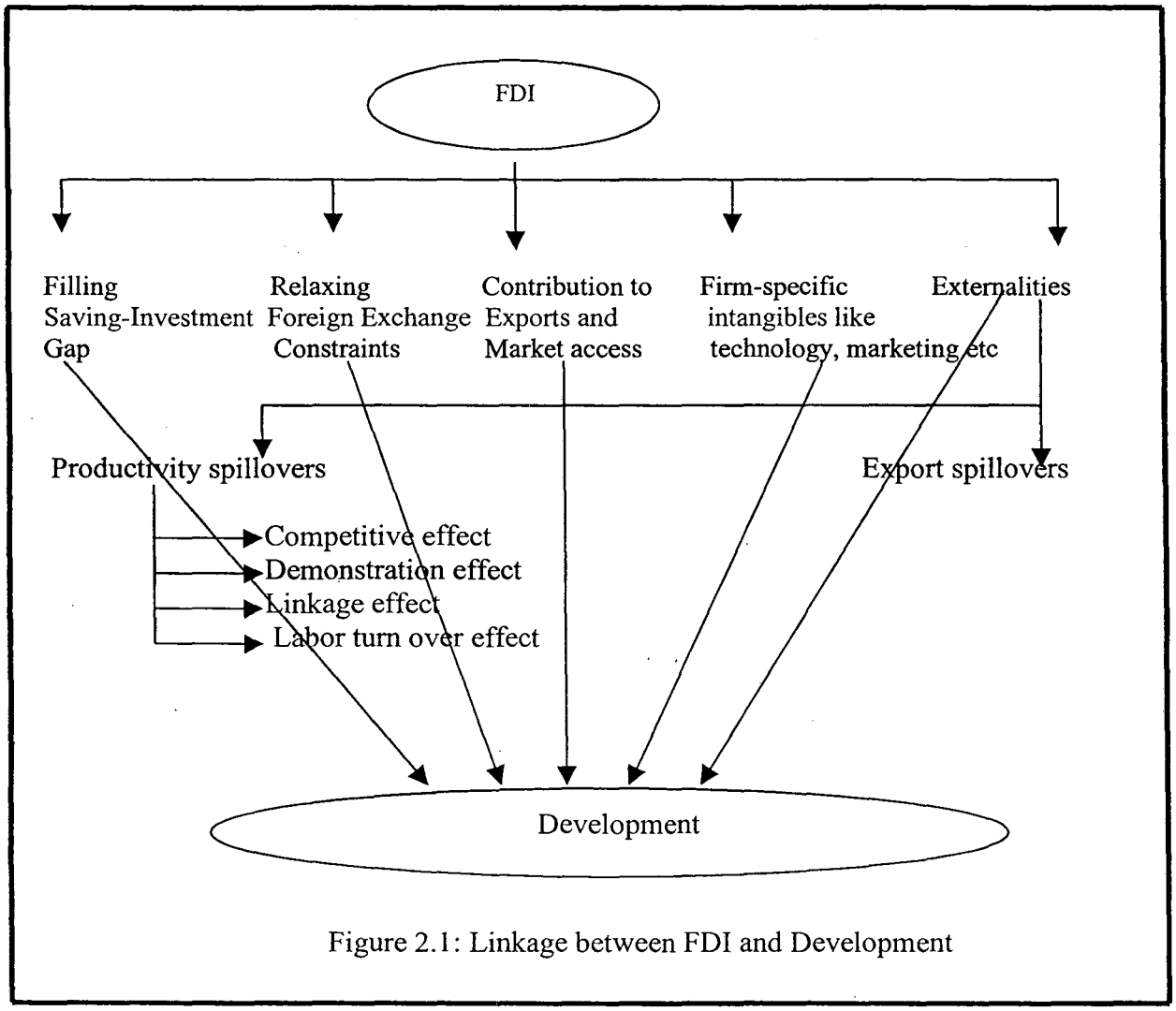

Figure 2.1: Linkage between FDI and Development

Singer (1950) argued that the contribution of foreign investments towards the growth process of a poor country has been largely unfortunate. There are three specific reasons responsible for this. Firstly it removed most of the secondary and cumulative effects of investments like additions to income, employment, capital,

technical knowledge, and growth of external economies from the country in which the investment took place to the investing country. Secondly it promotes the specialization of underdeveloped countries along the lines of static comparative advantages offering less scope for technical progress, and without a significant impact on the general level of education, skill, way of life, inventiveness, habits, creation of new demands, etc. Thirdly, the factor that has significantly reduced the benefits of foreign trade-cum-investment to poor countries was the export specialization on food and raw materials. The hypothesis of secular deterioration of terms of trade has been advanced to show how development of developing countries was constrained in the long run.

Another line of concern that has been invoked in the late seventies is the problem of 'transfer pricing' by which MNCs transfer undisclosed remittances, and profits. A number of studies confirmed this problem, thus arguing that host economies do not gain significant financial benefit from foreign direct investment (Lall, 1993). Further it has been noted that TNCs may, as many empirical evidences supports, have captive access to local savings due to its large size, reputation etc. and which may crowds out domestic investments (Hood and Young, 1979).

The contribution of FDI towards foreign exchange may be positive in the short run by allowing developing countries to be able to imports capital goods and other intermediate inputs so vital for their strategy of industrialization. However, in the end it may adversely affect the balance of payment position of the host countries. It is a known fact that the rate of profit of TNCs is significantly higher than the long-term rate of interest in international capital markets and once profits, remittances, technical fees, etc. starts flowing back to the home country, this results in a balance of payment problem. In addition, it has been suggested that MNCs are highly import-intensive and this slowly aggravates the problem.

As far as FDI as a bundle of intangibles is concerned, technology is the most important asset sought by the developing countries. In this context, it has been argued that it may be against the factor endowment of the developing countries. The problem of 'appropriate technology' however was backed by little empirical evidence. The critical aspect of the problem relates to the terms and conditions of technological agreement and cost of it. Firstly the royalties and the license fees charged by MNCs are too high; secondly, that tie-in clauses in technology contracts require the licensee to purchase capital equipment and intermediate parts from the parent company, when such items could have been obtained more economically from elsewhere; and thirdly, that technology contracts frequently incorporate export prohibition clauses, limited the sale of goods using this imported technology to the receiving country (Hood and Young, 1979). The experience of Latin American countries provides a certain amount of evidence concerning the last two costs of technology contracts.

It is also argued that as MNCs have little linkage with the local economy it will not generate the much-pursued Marshallian externalities. Whatever other assets of the package remain like managerial superiority, marketing, market access etc. are argued to be critical for economic development but there exists little empirical evidence for this. About export performance, it was found that both local as well as foreign firms are more oriented towards domestic markets rather than exporting. Reason cited for these findings was the inward-looking policy of developing countries marked by inefficiency, high cost industrial structure, and market distortions.

As the developing countries are characterized by large-scale market failures, presence of foreign firms only leads to a highly concentrated oligopolistic market structure. This is because MNCs by their very nature has been traced to market failures in the production, distribution and diffusion of ownership-specific assets.

Concisely the above discussion suggests that the literature of sixties and seventies in some sense was critical about the contribution of FDI towards development of underdeveloped countries. In the late seventies, however, the theoretical understanding has shown more maturity than that of sixties and it suggests that the FDI factor can be growth enhancing, depending upon the level of development the host country has already achieved (Lall, 1993).

In contrast to the views of earlier periods, 1980s and more explicitly 1990s saw a more liberal view about MNCs-development linkage. An era of structural adjustment and competitive outward orientation among developing countries marked by a liberalizing trade, FDI, and exchange rate regimes and acceleration of fiscal reforms, has put TNCs as the leading international market actors into the centre of economic development (WIR, 1992).

For host developing countries, the role of FDI is recently becoming critical. There are various reasons responsible for this. Firstly, with the decline in official financing and the instability of private financial flows FDI is increasingly seen as a solution to the problem of resource gap and external financing (TDR, 1999). Secondly, the source of economic growth is increasingly becoming less material-intensive and more skill, knowledge and technology-intensive. Given the low technological base of developing countries, they see FDI as a vehicle of international knowledge and technology and thus a main factor contributing towards their global competitiveness and growth. Moreover, the pattern of FDI inflows has shown a growth-oriented trend unlike the Singerian growth-retarding pattern. [1]

[1] In 1913 the primary sector (mainly mining and unprocessed agricultural raw materials) accounted for more half of FDI flows to LDCs and the manufacturing sector received only 10% of total FDIs; in 1990s about 40% of FDI went to manufacturing, 50% to services and only 10% to primary sectors (Dutt, 1997, P: 1926)

With these changing contexts of development, theoretical advancement in analyzing the FDI-growth linkage was more significant during this period. Recent theoretical developments deriving strength from growth accounting framework and endogenous growth literature treats FDI as a package of tangible and intangible assets that are either scare in supply or unavailable in the poor countries. These include capital, technology, marketing strategy, management practices and skills, market access, and a host of externalities generated by these factors in the development process of host country.

Following the growth accounting approach, growth impact of FDI can be incorporated via an augmented production function which includes FDI as an additional input that along with traditional factors of production determine the maximum level of output attainable for the host country. In this context, stock-flow consistency among explanatory variables has to be maintained.

However there are two problems associated with this growth accounting methodology. The first one is empirical in nature and is concerned with explaining higher estimates of the elasticity of output with respect to capital obtained in both cross-section and time series regressions. The second is theoretical in nature and is the absence of demand orientation of growth in the supply orientation of growth accounting (de Mello, 1997).

Emergence of theoretical modeling based on the endogenous growth literature seems to overcome these limitations of growth accounting framework. Moreover, these developments have provides the real theoretical basis for the role of FDI in influencing the steady state growth rate of the recipient economy.

Before the emergence of the endogenous growth literature, the growth-enhancing role of FDI was severely limited in the Solowian growth framework in which the long run growth rate was entirely exogeneously determined by the

technological progress and the growth rate of labor force. As the steady state growth rate is independent of the proportion of income saved and invested, the role of FDI in filling the resource gap would only affect the steady state per capita output level, leaving the long run growth rate unchanged. The only effect it can have is through permanent technological shocks (de Mello, 1997).

A group of growth economists, during the late eighties found this neoclassical-led exogeneously driven explanations of the long run growth rates to be unsatisfactory and their contributions structured a class of growth models, which endogenises the growth determinants. Contrary to the neoclassical assumption of diminishing returns, the essence of endogenous growth models is the absence of diminishing returns to capital. This absence of diminishing returns is usually explained by a broader concept of capital that encompassed physical and human components or learning by doing or the economy-wide knowledge and productivity spillovers (Barro and Sala-I-Martin, 1995).

This broader concept of capital and existence of knowledge spillovers in the economy has been advanced to provide the explanation for the higher output elasticity of capital than what is its share in total output. Moreover, the role of consumer behavior is an integral part of the growth models, which are in essence a general equilibrium approach to the problem. Moreover, the endogenenisation of growth determinants provides a significant space for policy variables to determine the dynamics of economic growth.

One simple way to introduce FDI as a determinant of long run growth is to view FDI as a factor contributing towards the overall knowledge stock of the economy (de Mello, 1997). FDI can contribute to this by both direct and indirect ways. First, introduction of new technology by MNCs has a higher skilled content. This is reflected by new vintages of capital, quality control and precision in production and accompanying increased training and skill upgradation (World

Bank, 1997). Secondly, they brought with them a package of market knowledge and marketing skill accumulated from their long-standing experience and broader exposure to worldwide competitive markets (de la Torre, 1974). The indirect contributions of FDI in enriching the over all knowledge of the host economy is equally important as the above mention direct contributions. Broadly these includes productivity and exports spillovers

The presence of foreign firms affects the structure, conduct and performance of various markets of the developing economies. Local firms may improve their productivity by imitating the technology used by the MNCs operating in the local markets (demonstration effect) or either by utilizing existing technology and resources more efficiently or opting for most up to date technology in response to MNCs-induced increased competition (competitive effect). Productivity spillovers also occurred when trained labor migrates from foreign affiliates to domestic companies (labor turnover effect), and more importantly through existence of forward and backward linkages between foreign and local firms (linkage effect) (Markusen and Venables, 1997; Kathuria, 2000; Barva Navaretti and Tarr, 2000).

It is not essential that the productivity spillover from FDI would always be beneficial. By definition foreign firms are characterized by a group of intangibles like new technology, efficient marketing strategy, thriving organizational skill, brand names and so on which provides them with an edge over their local competitors. Further, their entry size is large enough to realize scale economies that exist in any productive lines and consequently are producers with better quality at lowest costs. All these factors together contribute to their market power and consequent increased in market concentration. This in turn reduces market share of local firms forcing them to face negative scale-effect and resultant high cost of production inurn reinforces their compulsion to exit from the market in

some subsequent round of cumulative effect. In sum, entry of multinational firms may substitute for final goods producers (Markusen and Venables, 1997).

Still there is another way by which FDI may be detrimental to growth of domestic firms as well as local entrepreneurial and technical development. Foreign firms, given their size and other advantages being a part of a global system of production have a preferential access to host country local savings through financial institutions. This will result in credit rationing for small sized local firms and consequent negative impact on their growth, and competitive strength through technical development. If this argument were true than, given the scarcity of domestic entrepreneurship and the need to nurture existing entrepreneurial talent, this would cast doubts on the favorable development effects of FDI (Agosin and Mayer, 2000).

Very recently, the literature has emphasized another important spillover impact that FDI may generate. This is the export spillover from multinational enterprises. It is argued that MNCs are a natural conduit for information about foreign markets, foreign consumers, and foreign technology, and they provide channels through which domestic firms can distribute their goods. To the extant that MNCs directly and indirectly provide information and distribution services, their activities enhance the export prospects of local firms (Aitken et.al, 1997).

What the above arguments suggest is that FDI not only contributes towards knowledge capital stock of the host economy, it may also substitute already accumulated or potential local knowledge resources. It seems that the relative strength of positive and negative effects of FDI determine its growth enhancing capacity.

As mentioned earlier, one can introduced FDI as a contributing factor in the accumulation of knowledge input in the recipient country and thereby incorporates

externalities generated by FDI in country's production chains. Another line of approach proceeds along the technology diffusion models of open economy based endogenous growth literature. In these models inputs are differentiated horizontally or vertically in case of quality ladder and when FDI measured by the number of inputs produced by foreign firms increases or the improvements in the quality of products brought out by them, this results in the technological progress in the host economy and affect the steady state growth rate of the same (Borensztein et. al, 1995).

B. Previous Empirical Studies

1.Macro Level Studies

Early empirical studies using multiple regression framework sought to answer whether FDI lowers or enhances economic growth of host developing countries and how it effect recipient's domestic capital formation. Economic growth was measured by the growth of per capita income/GDP growth rate and the saving rate usually represents the domestic capital formation. Main theoretical motivations behind these studies were either the 'orthodox perspective' on the role of foreign capital or the 'dependency theory'.

The orthodox position was that foreign capital (and for that reason FDI) supplements domestic investment without raising the incremental capital-output ratio in the recipient economy and hence had largely beneficial impact on the economic growth (Rosenstein-Rodan, 1961; Chenery, 1966; Papanek, 1973). The dependency theory, on the contrary, argued that foreign capital was necessarily growth retarding and its variant the 'decapitalisation hypothesis' suggests that foreign capital negatively effect the domestic saving rate of developing countries, or displaces domestic investments opportunities (Griffin, 1970; Weissopf, 1972; Bornschier, 1980).

Stoneman (1975) has examined the impact of FDI on the growth of a number of developing countries covering Latin America, Africa, Asia and Mediterranean. His cross-sectional growth relation took annual average growth in GDP as the response variable and the set of controlled variables includes gross domestic investment, net FDI inward flows, net inflows of foreign aid and other foreign long term borrowing, and stock of foreign direct investment (all variables expressed as proportion of GDP). He has estimated the above relationship across different geographical regions as mentioned above over early and late fifties, early and late sixties. The results established a significant negative relationship between economic growth and FDI stock while although positive the coefficients of net FDI inflows are rarely significant. From this Stoneman concludes that direct investment is associated with structural effects that retard growth.

Another study taking growth of per capita national income between 1965 and 1975 as the dependent variable and stock of direct foreign investment in 1965 as the explanatory variable, also reported a significantly negative relationship between the economic growth of developing countries and their FDI stock (Bornschier, 1980). This study also evidenced the decapitalisation hypothesis where FDI lowers investment growth in LDCs.

Singh (1988) study includes 73 developing countries divided into middle-income countries and low-income countries. Following earlier precedent, he has constructed a variable termed as the multinational's concentration index in poor countries based on the stock of foreign direct investment in relation to total energy consumption and population in the host country. His regression model includes saving, total population (in log), per capita income in US $ (in log), export as percent of GDP, state economic intervention, literacy rate, and two binary variables for oil exporter and regional groupings as the independent variables. His dependent variable alternatively includes GDP growth rate and industrial output growth. The postulated model was estimated for two periods, namely, 1960-70 and

1970-80. Findings from sample growth function imply that the presence of the multinational corporations per se has been of little or no consequence to economic growth for either the middle-income countries or the low-income countries across both the periods of 1960-70 and 1970-80. The same conclusion has been obtained from the equation including industrial output growth as the dependent variable. As far as the role of FDI in the domestic capital formation of developing countries is concerned he founds that there is a strong positive relation between these two and thus strongly refutes the decapitalisation hypothesis.

Other cross-sectional studies that supported this negative or no relationship include Chase-Dunn (1975), Biersteker (1975), and Myer-Fehr (1978). Areskoug (1976) through a cross-section regression of 21 developing countries found that among various sources of saving, FDI and govt. borrowing from abroad have a negative impact on the capital formation as measured by aggregate domestic fixed-asset investment.

However, there exists another group of studies that established other extreme, namely FDI enhances economic growth. Papanek (1973) has shown that FDI inflows have a significant positive impact on the growth. The estimated co-efficient was 0.17 which is of course observed to be lower than that of foreign aid and other foreign inflows. Thus, he concluded that foreign inflows are beneficial for developing countries. Other studies that have supported a positive relationship include Ruber et al. (1973) and Kobrin (1973). Evidence from Asian developing countries also implies a positive role for FDI. Rana and Malcolm Dowling (1988) have estimated a simultaneous equation model to examine the effect of foreign capital on growth of a sample of nine Asian developing countries. They concludes that while FDI has contributed to growth both by augmenting resources available for capital formation and by improving investment efficiency, foreign aid contributed only by aiding in capital formation. The impact of foreign private capital on the saving rate of these countries was reported to be positive.

These early studies are characterized by severe methodological deficiencies, suffered both from the lack of theoretical guidance and in some direct case a surfeit of special pleading by the researchers. As a result, their conclusions regarding the link between FDI and economic growth were a matter on which we totally lack trustworthy conclusions (Caves, 1982).

Recent FDI studies are reflected by far more methodological sufficiency, theoretical advancement and are based on data set internationally comparable. As discussed earlier these studies are based on growth accounting framework or derived their theoretical strength from recent developments on the growth economics front.

Blomstorm, Lipsey, and Zejan (1994) have included FDI inflows as a percentage of GDP as an additional variable in an augmented production function to capture disembodied knowledge transfer to developing countries. Estimated long period cross-section growth relationship over the period 1960-85 reported a significant relationship between growth and FDI for the upper half of the distribution of the developing countries but not in the lower half. Absence of demonstration effect as well as linkage effect in the least developed countries has been advanced for the explanation of the above results. Thus, they concluded that the beneficial impact of FDI depends on the level of development of the host country.

A positive contribution from FDI towards the economic growth of a group of 69 developing countries has also been evidenced by another study (Borensztein et al., 1995). The estimated cross-country regressions over two decades, 1970-79 and1980-89 suggests that FDI has a positive effect on economic growth, although the magnitude of this effect depends on the stock of human capital available in the

host economy. The same study has found that FDI has largely complementary effects on the domestic capital formation of the developing countries.

Using cross-section data on a sample of forty-six developing countries over the period 1970 to 1985, another study attempted to examine the efficiency of FDI given the trade regime (Balasubramanyam et al., 1996). Following the theoretical arguments of new growth theory, they have directly included exports as another argument in the production function along with domestic capital stock, FDI stock and labor. Their findings confirmed Bhagwati's hypothesis (1985) that the growth enhancing effects of FDI are stronger in countries characterized by an export promotion policy than in those following an import substitution one. For EP countries, the impact of FDI was found to be statistically significant on the GDP growth where as the impact for IS countries was found to be statistically not different from zero.

Dutta (1997) has examined whether the sectoral pattern of FDI can affect the way in which FDI affects growth. As there have been a shift of FDI pattern from the primary sector to manufacturing and services sector of developing countries, theoretical arguments suggests that this will strengthen the positive development effects of FDI inflows while it will weakened the negative effects. The estimated cross-section growth relation, over the period 1985-94, suggests that the co-efficient of the stock of FDI for the year 1983 was invariably negative over different formulations and different measures of the pattern of FDI seems to do not affects the economic growth.

Results from a simultaneous model for Taiwan over 1959-95 verified that output responds positively to FDI but interestingly FDI responds negatively to the current stock of human capital in the economy (Bende-Nabende and Ford, 1998). The last finding is diametrically opposite to the conclusions of many other studies emphasizing the role of human capital. The study argued that the presence of

human capital implying skilled personnel attracts the latest vintage (high-tech) related FDI and equally facilitates the relocation of low-tech labor intensive FDI to neighboring less-developed countries.

Dua and Rashid (1998) have examined the relationship between foreign direct investment and economic activity in India. The index of industrial production has been used as a proxy for economic activity and actual as well as approved amount represent FDI. Results from Granger causality tests and innovation accounting on the basis of monthly data over January 1992 to march 1998, suggest that FDI flows (approval and actual) respond to the level of industrial production. Actual flows, however, do not Granger-cause industrial output.

From a time series and panel data analysis of the impact of FDI stock on the growth of gross national income, domestic capital stock, and factor productivity, for a sample of OECD and non-OECD countries in the period 1970-90, De Mello (1999) concluded that the long-run growth enhancing potential of FDI depends on the nature of relationship between FDI and domestic investment i.e. the degree of complementary and substitutability between them. Further, as the degree of substitutability between domestic capital stocks embodying old technologies and FDI–related new technologies is higher in technologically leader economies than developing follower countries, this implies that FDI may be a less important vehicle for cross-border knowledge transfers and the elimination of technological gaps between leaders and followers than previously thought.

WIR (1999) have analyzed the role of FDI on the economic development of developing countries as measured by the real per capita income. The study although reported a positive coefficient for the past inflows of FDI, but did not find any statistical strength in this context. The only statistically consistent finding over both time series-cross section combination and in the pure time series

relationship to growth covering 1970-95 is that FDI interacting with human development as represented by schooling positively contributes towards growth.

Assuming that FDI as an exogenous variable for the host country and domestic investment follows a version of the neoclassical investment model, Agosin and Mayer (2000) have formulated a simple model of investment which lends itself to tests for long-term crowding in or crowding out associated with FDI. Panel data estimation for the period 1970-96 and for the two sub periods 1976-85 and 1986-96, indicate that in Asia – but less so in Africa – there has been strong crowding in of domestic investment by FDI; by contrast, strong crowding out has been the norm in Latin America. By this, the paper concludes that 'the effects of FDI on domestic investment are by no means always favorable and that simplistic policies toward FDI are unlikely to be optimal'.

Through growth accounting framework, another study has attempted to estimate the contribution of FDI to growth of ASEAN-5, namely, Indonesia, Malaysia, Philippines, Singapore, and Thailand. Findings indicate that FDI directly accounted for 4 to over 20 per cent of GDP growth in the ASEAN-5 during the 1987-97 period. The study also found FDI inflows to be a stabilizing factor during the ASEAN financial crisis (Fan and Dickie, 2000).

Ramirez (2000) through a cointegration analysis found that FDI has in fact played a significant role in the economic development of Mexico. The error correction model estimates for both private and (lagged) foreign investment, along with that of export were observed to be statistically significant and positive on the rate of labor productivity.

In another recent study, Xu (2000) has examined the role of US multinational enterprises as a channel of international technology diffusion in forty countries from 1966 to 1994. His regression results suggest that the technology

transfer provided by US MNEs contributes to the productivity growth of developed countries but not in less developed countries. This result is in conformity with many other studies but conflict with that of Bende-Nabende and Ford (1998). Xu has explained this results in terms of threshold criterion of human development. As the developing countries lacked required threshold level of human capital to reap benefit from FDI, latter do not contribute to former growth of productivity.

2.Industry Level Studies

In contrast to macro-approach, there is a rich literature completely devoted to empirically estimate and determined the nature of spillovers from FDI-firms to local productive units. However, we have given an overview of these studies because our study is primarily concerned with macroeconomic approach. Like results from macro studies, results from this approach are inconclusive on whether FDI generates positive or negative spillovers in the host economy. One-group of studies reported a positive or weak positive spillover impact of FDI-firms on the productivity of local firms. This includes caves (1974) on Australia, Globerman (1979) on Canada, Blomstrom and Persson (1983) and Blomstrom and Wolf (1989) on Mexico, Nadiri (1991) on a sample of OECD countries and Djankov, Hoekman (2000) on Czech and Branstetter (2000) on United States. On the contrary Cantwell (1989) on several European countries, Aitken and Harrison (1993) on Venezuela, Haddad and Harrison (1993) on Morocco, Perez (1998) found either negative or no spillover impact from the presence of foreign firms.

Kokko et al. (1996) on Uruguayan Manufacturing sector found a positive and statistically significant spillovers effect from the foreign presence only in a sub-sample of locally owned plants with moderate technology gaps vis-à-vis foreign firms. On the contrary, for Indonesian manufacturing Sjoholm (1999) observed that the positive spillovers from the presence of foreign firms are sector

specific and spillovers are found in sectors with a high degree of competition. Moreover, he finds that the larger the technology gaps between domestic and foreign establishments, the larger the spillovers. A very recent study on Indian manufacturing indicate that out of the total 26 sectors, there exists negative spillovers from the presence of foreign firms in the sectors, but available foreign technical capital stock has a positive impact (Kathuria, 2000).

C. The Model Specification

From above discussion, it is clear that FDI can play a decisive role in the host economy, by adding to the capital formation and contributing to the total stock of knowledge. Nevertheless, the possibility that FDI related knowledge might substitute domestic knowledge of the recipient economy also exists. Overwhelming empirical evidence supports the hypothesis that to get benefit from FDI, the economy must have a critical level of human development. In this section, we will consider an endogenous growth model, which will take account of above findings. Our model specification largely follows that of de Mello (1997).

We begin with an aggregate production function for the recipient economy. The following relation gives the technology of the economy:

$$y = Ak_d^{\alpha} k_f^{\beta} H^{1-\alpha-\beta} \qquad (1.1)$$

All are expressed in per capita terms y, k_d and k_f are respectively output, domestic capital stock and foreign capital stock. H is the total knowledge stock of the host economy. α and β are respectively the shares of domestic and foreign capital stock in the total output. A is the efficiency parameter.

Obviously above specification treats domestic and foreign capital as two separate inputs in the production process. This is a reasonable assumption as far as

FDI is associated with new vintage of capital stock, new technology, and efficient production structure is concerned.

The knowledge capital stock of the economy consists of two parts: domestic contribution to the knowledge stock and international knowledge spillovers to the economy. Learning-by-doing of Arrow (1962) is the basis for domestic knowledge accumulation. It is assumed that the process of learning-by-doing works through aggregate domestic capital stock. Specifically, an increase in the economy's capital stock leads to a parallel increase in its stock of knowledge.

Our economy also learns from external sources. Literature emphasized three important channels of international leanings:

(a) Imports of capital and intermediate goods as a conduit for R&D spillovers (Rivera-Batiz and Romer, 1991; Grossman and Helpman, 1991,Tybout, 1992)

(b) Learning by exporting (Aw et al., 1997; Clerides et al., 1998; Bernard and Jensen, 1999)

(c) FDI or other forms of non-equity co-operation involving transfer of tangible and intangible assets between local and foreign firms (de Mello, 1997; Blomstrom and Kokko, 1998; Branstetter, 2000)

We have assumed that the following relation gives the total knowledge stock of the host economy:

$$H = \left[k_d k_f^{\omega} x^{\psi} m^{\rho}\right]^{\eta} \qquad (1.2)$$

Where x and m represents exports and imports of the economy in per capita term. One can visualize x and m in terms of a cumulative sense so that their incorporation is consistent with other stock determinants of knowledge stock. ω, ψ, and ρ are respectively, the negative of the ratio of percentage change in

domestic capital stock to percentage change in foreign capital stock, exports and imports successively. Symbolically:

$$\omega = (-)\frac{\partial k_d / k_d}{\partial k_f / k_f}\Big|dH = 0$$

$$\psi = (-)\frac{\partial k_d / k_d}{\partial x / x}\Big|dH = 0 \qquad (1.3)$$

$$\rho = (-)\frac{\partial k_d / k_d}{\partial m / m}\Big|dH = 0$$

And

$$\eta = \frac{dH / H}{d(k_d k_f x^{\psi} m^{\rho}) / (k_d k_f x^{\psi} m^{\rho})}$$

This specification of knowledge stock obviously allows for the possibility that foreign knowledge stock may substitute or complement domestic one. When $\omega>0$, then foreign capital stock substitutes domestic capital stock. When $\omega<0$, then both are complementary.

Substitution of relation (1.2) into (1.1) leads to the following relation for the host economy:

$$y = Ak_d^{\alpha+\eta(1-\alpha-\beta)} k_f^{\beta+\omega\eta(1-\alpha-\beta)} x^{\psi\eta(1-\alpha-\beta)} m^{\rho\eta(1-\alpha-\beta)} \qquad (1.4)$$

Corresponding to (1.4), a standard growth accounting equation can be derived as:

$$g_y = g_A + [\alpha+\eta(1-\alpha-\beta)]g_d + [\beta+\eta\omega(1-\alpha-\beta)]g_f + [\psi\eta(1-\alpha-\beta)]g_x + [\rho\eta(1-\alpha-\beta)]g_m \qquad (1.5)$$

Where g_i, i=A, d, f, x, m are respectively growth rate of total factor productivity, domestic capital stocks, foreign capital stocks, exports and imports.

Relation (1.5) suggests that the output elasticity of domestic capital stock, in the presence of foreign capital stock and international trade, also depends on 'η' -the nature of relationship between total knowledge stock and its determinants

through assumed functional form as shown in (1.3). Obviously, a positive η will inflate the output elasticity of domestic capital stocks. This may explain higher estimates of the elasticity with respect to capital obtained in previous estimated long run growth relations.

The above growth accounting specification of the model can be supplemented by demand related factors by explicitly introducing the saving behavior. It can be shown that along with domestic capital stock, foreign capital stock, exports and imports determine the steady-state growth rate of the host economy.

For empirical implementation of the model, we have adopted one-way error component approach of the panel data literature. It well known that this approach is superior to pure cross-sections or time-series approach. Panel data controls country heterogeneity and produces more reliable parameter estimates by providing more variability, less collinearity, more degrees of freedom and more efficiency (Hasio, 1985, Baltagi, 1996). Measurements of different variables are as set by the pervious studies. Following precedents from previous studies, the growth rate of domestic capital stock, foreign capital stock, exports and imports will be measured respectively by the domestic capital formation (DINV), net FDI inflows (FDI), merchandise exports (EXP), and merchandise imports (IMP), all expressed as a percent of GDP of the host economy. The growth rate of output is the growth rate of real GNP per capita (g_y).

As the literature on FDI and growth emphasized the role of human development for a host country to reap benefits from FDI, we have introduced this variable in to our model specification. The measurement of the variable differs across studies, as proxies used are literacy rate, the secondary school enrollment, mean years of schooling and real government expenditure on education. For the purpose of the study the variable was constructed following UNDP methodology

taking only two indicators namely the combined primary and secondary enrollment ratio (ENR), and life expectancy at birth (LEB). ENR is the average of the combined ratio for 1970 and 1980. LEB is the average of the figures for 1970 and 1985.

Most of the empirics on growth relations suffered from the problem of endogeneity, i.e. the cause-and-effect relationship is now simultaneous. Ignoring this problem produces inconsistent estimators and consequently misleading conclusions from OLS application. To minimize this bias the study, like WIR 1999, introduced independent variables in one period lagged form.

The empirical specification of the model is thus following:

$$g_{yit} = V_i + \beta_1 LogGNP_{0i} + \beta_2 HD_{0i} + \beta_3 (HD_{0i} * FDI_{i,t-1}) + \beta_4 DINV_{i,t-1} + \beta_5 FDI_{i,t-1} + \beta_6 EXP_{i,t-1} + \beta_7 IMP_{i,t-1} + \varepsilon_i$$

For i = 1...n and, for each i, t = 1...T, of which T_i periods are actually observed. v_i is the individual effect and assumed to be time (t) invariant and cross-sectional specific (i). ε_{it} is the classical disturbance term. GNP_0 and HD_0 are the initial per capita gross national product and human development respectively.

D. Data Source

Data on net FDI inflows up to the year 1988 have been obtained from World tables, 1995, and World Investment Directory, Volume I (1992), Volume II (1994) and Volume V (1996), and thereafter from World Investment Reports various issues. Whenever the former two sources differ significantly from each other, average of both has been used instead. The poor quality of FDI data as reported in the national account statistics of different developing countries is a well-observed point in the empirical investigation.

The real GNP per capita (Atlas methodology), nominal GDP, share of domestic capital formation in GDP, merchandise exports and imports, were obtained from World Tables, 1995 and thereafter from World Development Reports (1995,1996,1997). Data on LEB and ENR for male and female are collected from United Nations (1989), Compendium of Statistics and Indicators On the Situation of Women. The life expectancy of person has been obtained by averaging that of male and female. The same has been done with respect to the combined enrollment ratio. In the construction of the HDI (Human Development Index), we have used the range- based-equally weighted procedure as proposed by the UNDP. The method is a two-step procedure. In the first step, we have derived the achievement levels of the chosen indicators by subtracting normative minimum values from respective actual level and next divide the same by the normative range level of the concerned indicator. Finally, the index is a simple average of the range scaled achievement series.

E. Empirical Results

There exist two estimation procedures for the model (1.6) depending on the assumption made about V_i to be either estimable fixed parameters or they are independent random variables. Respectively, the estimation technique is fixed effects or random effects. To decide between these two techniques, we depends on the Hauseman Specification Test (1978) (HST) which is in turn essentially a test of the equality of the coefficients estimated by these two effects.

Table-2.1 furnishes the random-effects estimation of the cross-country growth relation for all sample developing countries (71 in total). Results from regression 1.1 indicate that the initial per capita GNP and human development both multiplied by time t have statistically strongest impact on the growth. The negative sign of the former indicates neoclassical conditional convergence among

developing countries. The next important sources of growth are domestic capital formation and exports. Over the study period, a one percent increase in the investment-to-GDP ratio last year was, on the average, followed by an increase in the growth rate of about 20 percent in the following year. Considering the arguments of export-led growth, each one-percentage increase in the last year's merchandise exports-to-GDP ratio was observed to have a 13-percentage impact on current period growth. With a statistically insignificant coefficient, one period lagged imports seems to do not contributing to the growth. The argument that imports add to the knowledge stock of the economy was not true at least for the total imports figure. Instead, it would have been better to include only a part of it, namely the value of capital goods and intermediaries. Alternatively, one can resort to construction of a foreign R&D figure weighted by imports figure as suggested by Coe and Helpman (1995). But as many studies have pointed out that since eighties the trade of capital goods among developed countries have risen at a faster rate than that between developed and developing countries. It does suggest that knowledge spillovers from technological leaders to technological laggards were an exaggeration. Rather, knowledge spillovers have been phenomena more significantly confined to developed world only. Further, the trade in new technology is confined to developed world and except for a hand full of developing countries; the developing regions more or less remain left out of international markets for new technology. On the contrary, consumption goods, which form a major chunk of total imports, combined with international demonstration effect do not contribute to the growth of local enterprises due to shrinking demand for their products.

Foreign direct investment as a channel of international knowledge spillovers is not vindicated by the empirical findings. Although it was found to have a positive impact on growth, we do not have statistical strength with in this claim. Even though performing not very well in terms of R-square, which is

merely 0.32 percent, the model is highly significant as suggested by Wald Chi-square value. That means, taken together, our statistical results are significant.

To test the role of FDI interacting with the initial level of human development, we have extended our 1.1 regression model to include one more regressor in the form of an interaction term. Results have been shown by regression 1.2. The findings for all other variables remain unchanged. FDI and its interaction with human development seem to have positive impact on growth. Statistically both these coefficients are insignificant.

Table: 2.1
Random-effects estimation of the real per capita growth relation for all developing countries, An unbalanced panel data over 1974-1995

Independent variables	*GLS Regression1.1*		*GLS Regression1.2*	
	Coefficients (Standard Errors)	*P-values*	*Coefficients (Standard Errors)*	*P-values*
Log GNP_0*t	-0.2729	0.000	-0.2720	0.000
	(0.0511)		(0.0519)	
HD_0*t	1.9647	0.000	1.9521	0.000
	(0.4750)		(0.4864)	
HD_0*FDI (t-1)			0.3611	0.831
			(1.6891)	
DINV (t-1)	0.1979	0.046	0.1959	0.049
	(0.0991)		(0.0995)	
FDI (t-1)	0.3667	0.137	0.1552	0.880
	(0.2469)		(1.0243)	
EXP (t-1)	0.1304	0.022	0.1315	0.022
	(0.0569)		(0.0573)	
IMP (t-1)	-0.0886	0.074	-0.0876	0.080
	(0.0496)		(0.0500)	
Constant	7.6352	0.005	7.6577	0.005
	(2.6887)		(2.6990)	
R-square (overall)	0.0320	-------	0.0321	-------
Wald χ^2_{df}	49.64	0.0000	49.51	0.0000
HST (χ^2_{df})	7.70	0.2606	7.92	0.3399
Observations	1513			
Number of groups	71			

Note: HST-Houseman Specification Test

However, estimation of 1.1 and 1.2 relations for three developing groupings, namely, Latin America and the Caribbean, Africa, and Asia, reveals contrasting implications. For the first developing group, it that has been found that along with initial GNP per capita and initial human development, FDI contributes significantly to growth (see table-2.2). Last year's FDI-to-GDP ratio, on an average, had a more than one-to-one impact on the current period growth rate. Although exports and domestic investment ratio of last year had a positive impact on growth, the coefficients are not significant. These results are in contrast to the results for the sample of developing countries taken together. Imports-to-GDP ratio was found have a negative impact but is not statistically significant. The estimated model is highly significant and in term of R-square (0.12) performs better in comparison to that for all developing countries sample (0.03). When the FDI-HD interaction term was added to the model in 1.2 regression, it was observed that the coefficient of the term has a negative sign. This result is in contrast to many other studies supporting that domestic knowledge will be more productive in interacting with foreign knowledge. Perhaps it might be true that for developing countries to reap benefits from foreign knowledge they must achieve a critical level of human development. It seems that developing countries of Latin America and Caribbean do not meet this criterion.

Table: 2.2
Random-effects estimation of the real per capita growth relation for developing countries of Latin America and the Caribbean, An unbalanced panel data over 1974-1995

Independent variables	*GLS Regression1.1*		*GLS Regression1.2*	
	Coefficients (Standard Errors)	*P-values*	*Coefficients (Standard Errors)*	*P-values*
Log GNP_0*t	-0.2139	0.0030	-0.2302	0.0050
	(0.0727)		(0.0817)	
HD_0*t	1.3620	0.0420	1.5166	0.0450
	(0.6689)		(0.7572)	
HD_0*FDI (t-1)			-1.9217	0.6620
			(4.4007)	
DINV (t-1)	0.1272	0.1900	0.1286	0.1860
	(0.0970)		(0.0972)	
FDI (t-1)	1.0491	0.0000	2.5276	0.4560
	(0.2181)		(3.3927)	
EXP (t-1)	0.0354	0.5330	0.0353	0.5350
	(0.0568)		(0.0568)	
IMP (t-1)	-0.0784	0.0800	-0.0793	0.0770
	(0.0448)		(0.0448)	
Constant	9.3875	0.000 0	9.2276	0.000
	(2.5986)		(2.6264)	
R-square (overall)	0.1198	-------	0.1201	-------
Wald χ^2_{df}	66.80	0.0000	66.88	0.0000
HST (χ^2_{df})	11.9	0.0643	13.08	0.0701
Observations	498			
Number of groups	23			

Note: See table-1

Estimations for African countries suggest that domestic investment, FDI and exports, although they had a positive impact on growth, their contribution was not significant (table-2.3). The initial GNP per capita and human development continued to be significant determinants of growth. Previous findings pertaining to imports remain intact. According to goodness of fit, the model was worse than the estimated relation for Latin American countries. Extension of the model to include interaction term seems to reveals similar findings as obtained for the developing group of Latin America.

Table: 2.3
Random-effects estimation of the real per capita growth relation for developing countries of Africa,
An unbalanced panel data over 1974-1995

Independent variables	*GLS Regression1.1*		*GLS Regression1.2*	
	Coefficients (Standard Errors)	*P-values*	*Coefficients (Standard Errors)*	*P-values*
Log GNP_0*t	-0.3857	0.000	-0.3940	0.000
	(0.0973)		(0.0977)	
HD_0*t	3.6045	0.000	3.7199	0.000
	(0.9990)		(1.0073)	
HD_0*FDI (t-1)			-3.1109	0.370
			(3.4679)	
DINV (t-1)	0.1630	0.334	0.1683	0.319
	(0.1686)		(0.1688)	
FDI (t-1)	0.1251	0.756	1.7704	0.346
	(0.4028)		(1.8778)	
EXP (t-1)	0.1122	0.304	0.1110	0.309
	(0.1091)		(0.1091)	
IMP (t-1)	-0.0531	0.539	-0.0555	0.522
	(0.0866)		(0.0867)	
Constant	7.2112	0.1380	6.9622	0.1530
	(4.8674)		(4.8760)	
R-square (overall)	0.0292	-------	0.0303	-------
Wald χ^2_{df}	21.86	0.0013	22.66	0.0020
HST (χ^2_{df})	7.64	0.2654	7.81	0.3498
Observations	734			
Number of groups	35			

Note: See table-1

Results from Asian countries have been presented in table-2.4. Domestic capital formation was found to have a negative impact on growth. The same was true for FDI. Imports consistently have a negative sign. Nevertheless, none of these are statistically significant. Export was the most dominating factor in the growth process contributing more than 35 percent to the current growth for a one-percent increase in it last year. Overall R-square was observed to be highest for this developing group at 20 percent. Inclusion of interaction effect as before evidence a positive impact but was found to be insignificant.

Table: 2.4
Random-effects estimation of the real per capita growth relation for developing countries of Asia,
An unbalanced panel data over 1974-1995

Independent variables	*GLS Regression1.1*		*GLS Regression1.2*	
	Coefficients (Standard Errors)	*P-values*	*Coefficients (Standard Errors)*	*P-values*
Log GNP_0*t	-0.2792	0.0000	-0.2734	0.0000
	(0.0539)		(0.0604)	
HD_0*t	1.4621	0.0060	1.3988	0.0210
	(0.5299)		(0.6057)	
HD_0*FDI (t-1)			0.9762	0.7890
			(3.6461)	
DINV (t-1)	-0.0798	0.5730	-0.0795	0.5790
	(0.1415)		(0.1434)	
FDI (t-1)	-0.4989	0.4840	-1.0126	0.6240
	(0.7133)		(2.0676)	
EXP (t-1)	0.3541	0.0000	0.3554	0.0000
	(0.0673)		(0.0676)	
IMP (t-1)	-0.1484	0.1840	-0.1579	0.1830
	(0.1117)		(0.1185)	
Constant	14.7049	0.0000	14.8779	0.0000
	(3.4246)		(3.4978)	
R-square (overall)	0.2000	-------	0.2002	-------
Wald χ^2_{df}	68.50	0.0000	68.35	0.0000
HST (χ^2_{df})	10.34	0.1109	10.57	0.1586
Observations	281			
Number of groups	13			

Note: See table-1

One important question here is about the impact of domestic investment on growth. As we have seen, for all developing countries taken together, the investment ratio was found to significantly impinge on growth. However, for Latin America and Africa, although the impact was again positive but it was statistically insignificant. In addition, in case of Asian countries it was observed to have a negative sign but not a significant one. Explaining this finding was a real puzzle. We have consulted the empirical literature on cross-country growth estimation and found this puzzle exists there also. Recent studies including those of Delong and Summers (1991) and Mankiw, Romer, and Weil (1992) and Borensztein et. al. (1995) reported a significant impact of investment ratio on growth. In contrast to their findings, another study suggests that GDP growth in a period is more closely related to subsequent capital formation than to current or past capital formation

(Blomstrom et. al, 1996). Barro (1997) also reported that the impact of investment ratio even though positive was not significant. The results from Blomstrom et. al. and WIR, 1999, indicate that the past domestic capital formation had a negative impact on growth (see, table-II and III, pp.274-75 for Blomstrom et. al, 1996 and pp334-335 of WIR, 1999).

It has been emphasized that the reverse causation may explain these findings. Studies reporting a significant positive coefficient on the contemporaneous investment ratio may only be reflecting a positive relation between growth opportunities and investment rather than the positive effect of an exogenously higher investment ratio on the growth rate (Barro, 1997). Further, bi-way causation is most common among supposed causes of growth themselves. For example, exports might affect investment opportunities by widening market size and in turn might be affected by the size of domestic investment making it possible to achieve economies of scale. This study tries to minimize the role of such reverse causation between the dependent and independent variables by incorporating one period lagged series of all the independent variables. The result of all developing countries set suggests that gross domestic investment is the key to economic growth of developing countries in general. However, evidence from regional groupings, suggests that for growth it is not the level of investment alone that matters. It is the efficiency and productivity of investment that is more important for growth.

The impact of FDI on growth can also be examined in the above perspective. Many empirical studies provided evidence to the effect that the absolute size of market as well the rate at which that market is expanding are significant determinants of FDI inflows to host countries. This implies that there exists reverse causation between these two also. It is hoped that inclusion of lagged FDI series minimizes the severity of this problem so as not to bias our results. Findings suggest that although FDI has a positive coefficient in a majority

of cases, its impact is not statistically significant, exception being Latin American countries. It seems that the last mentioned regional groups have experienced an effective role of FDI in their economic growth.

The Role of Human Development

It has been argued by a number of studies that human development was a key for providing answer to the finding that FDI contributed to the productivity/growth of developed countries but not in LDCs. Threshold hypothesis has been advanced in this context and many researchers were found to be busy in identifying the threshold to have a positive impact from FDI and another threshold after which FDI impact was not only positive but statistically significant (see, Borensztein et al. 1995, Xu, 2000). This study adds one more finding, which indicates that a critical level of human development is not only essential for FDI to be productive but that the criterion is exactly same for domestic investment as well. In essence, any investment without the requisite knowledge and skill cannot be productive or efficient. Without this it results in an investment structure marked by inefficiency, poor quality, high cost of production and technological obsolesces.

For the purpose of our analysis, the total sample of developing countries was divided into two groups based on a cut-off point of human development equal to point five. It was observed that there were 43 developing countries that had a human development greater than 0.5. The sample of less than or equal to 0.5 criterion includes rest of 28 developing countries.

Table-2.5 has shown the estimation for developing countries having lower human development. In terms of our coefficients, we find that the initial GNP per capita for one-year increase in time decreases growth rate by .24 percent in the current year and that one percent increase in the last year's exports-to-GDP ratio

increases current year growth by 22 percent. The variable human development, although it has a positive sign, it is not significant. This was a priori expectation given the fact that the developing countries of this group were at the lower end of human development. Imports ratio also has a positive impact but was not significant. The domestic investment ratio turns out to have a negative sign. This result was understandable in the context of lower human development and consequently inefficiency and lower productivity. Mis-match between the level of human development and physical capital accumulation, results in economic inefficiency and mis-utilization of economy's scare resources. Inclusion of FDI-HD interaction term does not reveal major change in the findings except that the coefficient of FDI now has a negative sign and the interaction term has a positive sign. Both coefficients were statistically insignificant.

Table: 2.5
Random-effects estimation of the real per capita growth relation for developing countries having human development less than point five (HD≤0.5), An unbalanced panel data over 1974-1995

Independent variables	*GLS Regression1.1*		*GLS Regression1.2*	
	Coefficients (Standard Errors)	*P-values*	*Coefficients (Standard Errors)*	*P-values*
Log GNP_0*t	-0.2356	0.0000	-0.2303	0.0000
	(0.0441)		(0.0446)	
HD_0*t	0.7720	0.1650	0.7097	0.2060
	(0.5554)		(0.5616)	
HD_0*FDI (t-1)			1.8467	0.4450
			(2.4186)	
DINV (t-1)	-0.1026	0.1880	-0.1073	0.1700
	(0.0779)		(0.0782)	
FDI (t-1)	0.4472	0.0840	-0.2819	0.7760
	(0.2585)		(0.9892)	
EXP (t-1)	0.2231	0.0000	0.2178	0.0000
	(0.0407)		(0.0413)	
IMP (t-1)	0.0404	0.3150	0.0395	0.3250
	(0.0401)		(0.0402)	
Constant	12.7788	0.0000	12.9191)	0.0000
	(1.8263)		(1.8361)	
R-square (overall)	0.1824	-------	0.1832	-------
Wald χ^2_{df}	130.95	0.0000	131.44	0.0000
HST (χ^2_{df})	2.89	0.8220	3.98	0.7825
Observations	594			
Number of groups	28			

Note: See table-1

Contrasting above findings with that for developing countries with a high level of human development, reveals some interesting implications. As shown by table-2.6, for latter group, initial GNP per capita, initial human development, and domestic investment ratio are the significant determinants of growth. Exports and FDI ratios have positive impact but are not significant. Imports ratio has its as usual insignificant negative impact on growth.

Table: 2.6
Random-effects estimation of the real per capita growth relation for developing countries having human development greater than point five (HD>0.5), An unbalanced panel data over 1974-1995

Independent variables	*GLS Regression1.1*		*GLS Regression1.2*	
	Coefficients (Standard Errors)	*P-values*	*Coefficients (Standard Errors)*	*P-values*
Log GNP_0*t	-0.5339 (0.1500)	0.0000	-0.5103 (0.1523)	0.0010
HD_0*t	4.7852 (1.3826)	0.0010	4.5556 (1.4062)	0.0010
HD_0*FDI (t-1)			3.5457 (3.9474)	0.3690
DINV (t-1)	0.4947 (0.1765)	0.0050	0.4944 (0.1765)	0.0050
FDI (t-1)	0.2724 (0.3456)	0.4310	-2.0480 (2.6062)	0.4320
EXP (t-1)	0.0849 (0.1143)	0.4580	0.0930 (0.1147)	0.4180
IMP (t-1)	-0.1380 (0.0923)	0.1350	-0.1303 (0.0927)	0.1600
Constant	-0.5052 (5.1433)	0.9220	-0.8146 (5.1554)	0.8740
R-square (overall)	0.0269	-------	0.0277	-------
Wald χ^2_{df}	25.18	0.0003	25.98	0.0005
HST (χ^2_{df})	4.68	0.5861	5.39	0.6126
Observations	919			
Number of groups	43			

Note: See table-1

This result reveals that the productivity of domestic investment is more sensitive to the level of human development than that in the case of FDI. For the lower human development developing countries, the coefficient of last year's domestic investment ratio is both negative and statistically insignificant as

compared to the highly significant positive impact of the same on growth of high human development level developing countries. Interestingly the contribution of international knowledge stock towards growth is more important for the sample of developing countries with a lower human development level. For these countries, specifically exports-to-GDP ratio is positive and highly significant indicating that exports have more potential to contribute to the growth and knowledge stock of the economy. In contrast, the same is positive but insignificant for developing countries with a high level of human development. Moreover, the coefficient of FDI and imports-to-GDP ratio are positive for the lower human development countries as compared to the positive (insignificant) and negative coefficients respectively for human developed developing countries. This fact of inverse relationship between the growth impact of international linkages and the level of human development can be interpreted in terms of the scope of learning from these linkages. For a country with a lower human development, the scope of learning or knowledge transfer is relatively more than for a country with a higher human development level. The coefficient of interaction in the case of developing countries with relatively higher human development level is equal to 3.6, which more than twice than the same for relatively lower human development countries (= 1.9). This indicate that FDI is more productive, higher the level of human development in the country. However, as none of the interaction is statistically significant this comparison is statistically untenable.

F. Conclusions

Recent theoretical and empirical advancement on growth accounting and endogenous growth front has emphasized that FDI can be a catalyst for the development of developing countries. FDI can contribute to the domestic stock of knowledge and its very presence generates a host of externalities enhancing productivity and competitiveness of the host country. This optimism from FDI is

conditional, however, and consequently the literature on FDI-empirics has been cautious on more than one point. It has been consistently argued that developing countries can maximize benefits from FDI only when they achieve a critical level of human development. Further, many studies have pointed out that there exist cases where FDI can crowd out domestic investment and puts impediments in the way of building up of local capabilities.

The above empirical exercise, however, does not find any significant role for FDI in the growth of all developing countries. The conclusion remained unchanged even if human development interaction with FDI was included in the model. Estimations for developing groupings, however, suggest that FDI significantly affects the growth of Latin American and the Caribbean countries but not in the case of Africa and Asia. The interaction effect was observed to be positive only in the case of Asia and negative in case of other two other two developing groupings. In none of the cases, the interaction was found to be statistically significant. If we hold on to human development argument, it can be argued, as already suggested by many, that the developing countries do not have the required level of human development. This conclusion was also reached by Xu (2000) who also finds that the technology transfers by US MNEs contribute to productivity growth in DCs but not in LDCs.

One of the significant observations that this study derived is that the growth effect of domestic investment is relatively more sensitive than FDI to the level of human development. For higher human development developing countries, the impact of domestic investment on growth is not only positive but also statistically significant, whereas, it has no significant impact in the case of lower human development developing countries. It is true that the interaction effect is more in case of countries at higher level of human development than in the case of countries at the lower level; the effect nonetheless is not significant. Lastly, the study found that the role of international linkages has a major role in the growth

process if the country is lower human development one than a country with a higher level of human development.

The policy implication is obvious. It is a human-development-led-growth strategy supplemented by export-led growth. Developing countries have to pursue a strategic human development policy, by not only investing more in expanding basic human capability but more importantly the knowledge space of the country. This is the key strategy if they want to improve their local productivity as well as that from FDI and maintain their competitive advantages in global markets. This conclusion was also reached by the Human Development Report-1996, which explored in detail the complex relationship between economic growth and human development and found bi-way linkages. More importantly, this strategy is essential in the context of restrictive functioning of global markets where developing countries enter as unequal partners and leave with unequal rewards. In addition, for developing countries, learning from exports is important for their endowments of knowledge resources.

CHAPTER III

FOREIGN DIRECT INVESTMENT AND ECONOMIC GROWTH: THE INDIAN EXPERIENCE

The economic role of FDI is increasingly becoming significant in the Indian economy with the transition of FDI policy from a restrictive phase of seventies and early eighties to a relatively liberal phase of late eighties and nineties. In this context, it is essential to investigate whether FDI contributes positively to the production process, or negatively. Estimation of production function for the Indian economy suggests that FDI stock had contributed positively to the national production. Although the FDI impact was not significant for the overall period, bifurcating the sample indicate a significant impact for the relatively liberal policy phase. Further, Granger causality results for Indian economy indicate that as the FDI concentrate in the high technology-intensive sectors, this lead to growth but growth does not precede the pattern of FDI in favor of the technology intensive-sectors. The study also found that building basic infrastructure services with foreign participation is an essential ingredient for rapid economic growth. The study conclude that the FDI policy which deliberately discriminate FDI flows in favor of the high technology-intensive sectors and basic infrastructure services would be more optimal in the long run than across the board liberal FDI policy as pursued today.

Before mid-1980s, India had consistently pursued an inward looking development strategy and consequently there was little openness to FDI. Marked by three principal regulations, namely, the Industrial Development and Regulation Act (IDRA, 1951), the Monopolies and Restrictive Trade Practices Act (MRTPA, 1969) and the Foreign Exchange Regulation Act (FERA, 1973), the FDI regime of the period was commonly featured by entry requirements and ownership restrictions, foreign exchange controls on investment related capital flows and strict govt. scrutiny of all technology transfer agreements. However since late

1980s and particularly 1991, India adopted an outward looking policy characterized by abolition of the mandatory licensing system, opening of sectors hitherto closed to foreign investment, flexible foreign exchange regime, adoption of the national treatment principle, and a host of fiscal incentives through special economic zones meant for export promotion. In the backdrop of this policy changes, this chapter tries to ascertain the changes in the structure of FDI and its impact on the economic development in India. The protagonists of economic reforms argue that the benefits from FDI can only be maximized in a market-based economic system. Have their expectations realized? What does the pattern of FDI suggest and does this contribute anything to growth?

A. Recent Trends In FDI

At the end of the year 1955, the inward FDI stock of India was aggregated to be Rs 387 crores, out of which extractive sectors of the economy (Mining & Petroleum) along with plantation claimed nearly half of the total. Manufacturing sector accounted an amount of Rs 101 crores, nearly 26 % of aggregate stock. Services claimed the rest (table-3.1). The pattern of FDI stock was clearly in the line of Singerian thought that foreign investment usually concentrated on the primary sectors of the economy.

By the end March 1965 the total FDI stock in the economy was estimated at Rs 611.9 crores, more than one and half times the amount at the end of 1955. Sectoral shift in the composition of FDI stock was clearly discernable over the period 1955-1965. Manufacturing was slowly emerging as the preferred sector, nearly accounting 44 percent of the total stock amounting to Rs 269.7 crores. In terms of the sectoral share, this was a whooping 18-percentage point gain over other sectors during this period. This indicated declining importance of traditional

sectors (plantations plus mining plus petroleum) and more so for the services sector.

The same trend was noted until end March 1985. The traditional locations together now claim merely 9 percent of the total stock as compared to its 50 percent share at the end of the year 1955. Between 1965 and 1985, Manufacturing saw quadrupling its amount to Rs 1124 crores and nearly doubling of its share to 86 percent of the total FDI stock. Accounting a meager amount of Rs 61.4 crores, the service sectors share stood at mere 4.7 percent of the outstanding total. In comparison to past, the total FDI stock had grown at 34 per cent to reach an outstanding figure of Rs 1307 crores at the end March 1985.

Table: 3.1 Sectoral Composition of Inward FDI Stock (Rs. Crores), India, 1955-1995

Sectors	*End March - 1955*	*End March- 1965*	*End March- 1975*	*End March- 1985*	*End March- 1990*	*End March- 1995*
Plantations	80.8	111	104.3	87.6	256	449
	(20.9)	(18.1)	(10.7)	(6.7)	(9.5)	(4.8)
Mining	7.8	4.4	5.5	7.8	8	24
	(2.0)	(0.7)	(0.6)	(0.6)	(0.3)	(0.3)
Petroleum	103.6	147.3	146.6	27.4	3	274
	(26.8)	(24.1)	(15.1)	(2.1)	(0.1)	(2.9)
Manufacturing	100.7	269.7	685.6	1124.0	2298	7852
	(26.1)	(44.1)	(70.4)	(86.0)	(85.0)	(83.4)
Services	93.6	79.5	31.3	61.4	140	817
	(24.2)	(13.0)	(3.2)	(4.7)	(5.2)	(8.7)
Total	386.5	611.9	973.3	1307.0	2705	9416
	(100)	(100)	(100)	(100)	(100)	(100)

Note: Stock Data from RBI is available only up to ~~only up to~~ March 1995.
Source: RBI Bulletin various issues

Between 1985 and 1995, it was observed that the dominating role of manufacturing sector started slowly declining and at its cost service sector was slowly reasserting itself. From 86 percent of the total stock in 1985, now it claimed 83 percent. Service sector doubled its share to 8.7 per cent from 4.7 percent, amounting to Rs 817 crores. The total FDI stock was estimated to be Rs 9416 crores, nearly 24 times the amount the economy had at the end of 1955.

Elsewhere, we have reviewed FDI policy of India into three distinct phases of evolution. Since Independence until seventies, the policy was more cautious and regimented towards FDI and technology transfers to India. Eighties was marked by a touch of liberalization and a half-hearted openness featured FDI regime. Nineties FDI policy was a distinct break with past and pursuance of market-led developmental strategy visualized a more progressive policy with respect to FDI (Radhakrishnan and Jaya Prakash, 2000). Given the developmental path of the economy identifying a well developed productive system, skill and knowledge accumulation, and lowering infrastructural bottlenecks, the changes in FDI policy was supposed to be the most dominating location factor that accelerate foreign direct investment into the economy. This supposition was not mere theoretical but was an empirical fact as noted by many studies conducted by United Nations (1992,1993) and various individual researchers.

For India, this fact of liberalizing FDI policy and the accompanying larger FDI-response was clearly visible, both in terms of the amount received and its growth rate. A restrictive FDI policy frame of the post Independent period had reduced the growth rate of total FDI stock to lowest ever rate of mere 2.91 per cent per year during the period 1966-1979 (table-3.2). This growth rate was nearly half as compared to the growth rate of 4.63 percent per annum over 1955-65. During 1966-1979, growth rate of traditional sectors (plantation, mining and petroleum) and service sectors FDI had in fact witnessed deceleration as a host and was consequently marked by negative trends. Manufacturing was the most favored destination during this period of FDI recession for other sectors.

During the period 1980-1985, losers of the previous period seemed to be struggling to regain their location strength. In effect, service sector FDI and traditional FDI had grown at rates faster than the growth rates of manufacturing and total FDI stock. Obviously, emergence of manufacturing sector as a dominant host and later giving way to service sector showed the FDI maturity of the

economy. Nineties also had seen the same trends as observed for first half of eighties and service sector was the faster growing sector with an impressive growth rate of 26.51 per cent per annum.

Table: 3.2 Compound Growth Rate of Inward FDI Stock, India, 1955-65, 1966-79, 1966-79, 1980-85, 1986-95

Period	*Traditional Sectors*	*Manufacturing*	*Services*	*Total*
1955-65	3.28	10.91	-1.97	4.63
1966-79	-7.1	7.82	-7.14	2.91
1980-85	7.98	6.98	9.16	7.15
1986-95	21.02	20.7	26.51	21.09

Note: Calculated using semi-logarithmic regression

As the role of manufacturing sector remained dominant in the sectoral pattern of FDI in India, it is a relevant exercise to look at the structure of manufacturing FDI itself. At the end March 1964 the outstanding manufacturing FDI was estimated to Rs 234.6 crores, out of which major chunk was located in chemicals and pharmaceuticals, nearly 27 percent of the total. Next, came metal and metal product segment claiming a stock amount of Rs 33.1crores whose share in the total was 14.1 percent. Jointly these two dominating segments exhausted 40.7 percent of the total figure. Traditional consumer goods industries such as food & beverages and textile segment together accounted for 20 percent of the total amounting to Rs 46.8 crores. Machinery and machine tools, transport equipments, and electrical goods, collectively shared 22.1 per cent of total and rest of it had gone to non-classified other manufacturing segment (table-3.3)

Up to 1980, traditional consumer goods industries were slowly missing out of the dynamics of FDI activities as indicated by their reducing share from 20 percent in 1964 to mere 8.7 percent in 1980. Technology intensive segments like chemicals and pharmaceuticals, metal and metal products and machinery and machine tools continued to receive new FDI inflows to increase their share by 13-percentage point to 60.5 percent in 1980 as compared to 47.5 percent in 1964.Other

segments like transport equipment and electrical goods witnessed increase in their share as well.

Between 1980 and 1995, consumer goods industries seemed to recover its lost attractiveness, thanks to liberalization. Their share increased by 5-percentage point to become 13.4 percent in 1995. Technology intensive sectors lost by 15 percentage point to account only 45.7 percent of the total stock as compared to the impressive figure of 61 percent in 1980. This decline in the group's share largely came from the losing importance of chemicals and pharmaceuticals segments. The manufacturing FDI stock became ten times the amount and reached an impressive figure of Rs 7852 crores in 1995.

Table: 3.3 Structure of Manufacturing FDI stock (Rs. Crores), India, 1964-1995

Category	*End March-1964*	*End March-1975*	*End march-1980*	*End March-1985*	*End March-1990*	*End March-1995*
Food and beverages	30.2	50.9	39.1	70.8	162	687
	(12.9)	(7.4)	(4.8)	(6.3)	(7.0)	(8.7)
Textiles	16.6	29.8	32	50.6	92	370
	(7.1)	(4.3)	(3.9)	(4.5)	(4.0)	(4.7)
Machinery and machine tools	16	50.9	71	125.9	354	1062
	(6.8)	(7.4)	(8.7)	(11.2)	(15.4)	(13.5)
Transport equipment	15	35.6	51.5	100.0	282	987
	(6.4)	(5.2)	(6.3)	(8.9)	(12.3)	(12.6)
Metal and metal products	33.1	95.1	118.7	119.1	141	437
	(14.1)	(13.9)	(14.6)	(10.6)	(6.1)	(5.6)
Electrical goods	20.8	79.6	97.5	140.5	295	1021
	(8.9)	(11.6)	(12.0)	(12.5)	(12.8)	(13.0)
Chemical and allied products	62.5	230.1	301.8	402.4	769	2087
	(26.6)	(33.6)	(37.2)	(35.8)	(33.5)	(26.6)
Other manufacturing	40.4	113.6	100	114.7	203	1201
	(17.2)	(16.6)	(12.3)	(10.2)	(8.8)	(15.3)
Total	234.6	685.6	811.6	1124.0	2298	7852
	(100)	(100)	(100)	(100)	(100)	(100)

Source: RBI Bulletin various issues

An examination of the pattern of actual as well as approved FDI inflows had reinforced the finding that the FDI is now increasingly located in service sector and new technology sectors. However, the importance of manufacturing sector continued to be a favorable sectoral destination. As the process of economic

reforms opened up hitherto reserved manufacturing areas meant for public sector, this seemed to attract attention of foreign investors. During the post reform period (1992-99) the actual FDI inflows was estimated to be Rs 36209 crores and nearly half of this amount (Rs 19400 crores) was received in the last two years (table-3.4). Engineering segment, the leading location alone claimed 22.4 percent of the total inflows over 1992-99. Chemicals & allied and electronics & electrical equipment segments both stood at second position in terms of amount received and together accounted for 26.3 per cent of the total inflows. Next in the order of importance were services (9.7%), finance (9.5%), food & diary products (5.6%), computers (3.9%) and pharmaceuticals (2.2%).

Table: 3.4 Sectoral Composition of Actual Inward FDI inflows (Rs crores), India, 1992-1999

Industry	*1992-93*	*1993-94*	*1994-95*	*1995-96*	*1996-97*	*1997-98*	*1998-99*	*1992-93 to 1998-99*
Engineering	214	103.1	413.2	842.5	2592.2	2155.1	1799.1	8119.2
	(24.9)	(8.9)	(15.1)	(17.8)	(35.5)	(19.6)	(21.4)	(22.4)
Chemicals &	144.1	117.5	443.3	423.8	1078.5	956.2	1579.7	4743.1
allied	(16.8)	(10.2)	(16.2)	(8.9)	(14.7)	(8.7)	(18.8)	(13.1)
Services	7.5	63.3	293.2	336	53.9	1194.1	1550.3	3498.3
	(0.9)	(5.5)	(10.7)	(7.1)	(0.7)	(10.9)	(18.4)	(9.7)
Electronics &	100.5	179.2	177.1	433.6	545.4	2395.6	960.4	4791.8
electrical	(11.7)	(15.5)	(6.5)	(9.1)	(7.5)	(21.8)	(11.4)	(13.2)
equipment								
Finance	11.3	132.3	306.9	903.3	770.4	549.7	777.6	3451.5
	(1.3)	(11.4)	(11.2)	(19.0)	(10.5)	(5.0)	(9.2)	(9.5)
Computers	25.3	23.9	32	174.3	208.4	517.2	446.7	1427.8
	(2.9)	(2.1)	(1.2)	(3.7)	(2.9)	(4.7)	(5.3)	(3.9)
Pharmaceuticals	9.6	155.3	31.7	183.2	169	125.6	119.6	794
	(1.1)	(13.4)	(1.2)	(3.9)	(2.3)	(1.1)	(1.4)	(2.2)
Food & diary	85.5	136.5	191.3	284.2	843.2	417.8	78.1	2036.6
products	(10.0)	(11.8)	(7.0)	(6.0)	(11.5)	(3.8)	(0.9)	(5.6)
Others	260.4	246.2	849.2	1162.1	1051	2674.6	1102.8	7346.3
	(30.3)	(21.3)	(31.0)	(24.5)	(14.4)	(24.3)	(13.1)	(20.3)
Total	858.2	1157.3	2737.9	4743	7312	10985.9	8414.3	36208.6
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)

Note: Excluding of NRI Direct Investment routed through RBI and inflows due to acquisitions of shares under section 29 of FERA
Source: RBI, Annual Reports, various issues

Over the period August 1991 to July 1999, the approved amount of FDI was aggregated to be an impressive figure of Rs 198329 crores, of which nearly one third of the amount was meant for power and fuels (table-3.5). Telecommunications claims Rs 35834 crores and stood second in the order. As

suggested by another study that the approved projects in telecommunications are mainly cellular mobile and basic phone services, this can well be clubbed with service segment along with hotel & tourism. This regrouping now jointly claimed 26.26 percent of the total approval during this period (Rao et al, 1999). This clearly showed that the service sector of the economy was slowly emerging as the most preferred sectoral destination. Traditional consumer goods industries comprising of food processing industries and textiles, received Rs 11498 crores, accounting 6 percent of the total approval. Electrical equipment, transportation, and industrial machinery had accounted for 13 percent of total, amounting to Rs 27458 crores.

Table: 3.5 Sectoral composition of approved FDI (Aug.1991 to July 1999), India

Category	Amount Approved (Rs crores)	% Of Approved Amount
Metallurgical Industries	11939.299	6.02
Power & Fuels	61890.270	31.21
Electrical Equipment	11135.029	5.61
Telecommunications	35834.217	18.07
Transportation Industry	14202.534	7.16
Fertilizer & Chemicals	11783.616	5.94
Food Processing Industries	8453.789	4.26
Services	12044.044	6.07
Hotel & Tourism	4206.634	2.12
Paper and Pulp including paper products	2492.294	1.26
Textiles	3043.863	1.53
Industrial Machinery	2120.936	1.07
Others	19182.767	9.67
Total	198329.292	100.00

Source: SIA News Letter, August 1999

B. The Pattern Of FDI And Economic Growth : An Empirical Analysis

The theoretical understanding that the pattern of FDI can have a profound impact on the growth of developing countries had been a recurrent theme in development economics. Singer (1950) had long back suggested that the role of FDI in the development of developing countries was largely negative. This was because of the fact that FDI in LDCs had been concentrated in the primary sectors

of the economy. Consequently, there was not much scope for technological development and even if there was any productivity growth, it had translated as lower prices to consumers rather than as higher profits to the producers. Further, this had resulted in the specialization of the host poor country in static comparative advantages and as terms of trade turned against primary products, net results was immiserization of the growth process in the long run.

However, Singerian growth retarding pattern of FDI is not valid today. As the process of international production and globalization is becoming increasingly integrated, the source of firm's competitive advantage is changing. Natural resource base no longer determines global competitiveness of firms. Innovation, knowledge and skill lie at the heart of growth and specialization. Specialization of firms has replaced specialization of country. As a result, the pattern of FDI is now more concentrated in the technology intensive sectors of the less developed countries. Firms are using their endowments of created assets in combination with the locational advantages of the less developed host countries to maintain their global presence and consolidation of their position in an era of intense global competition.

The above fact was clearly evidenced by the changing pattern of FDI inflows to developing countries. The pattern of FDI inflows into developing countries in the early twentieth century was characterized by the dominance of primary sector. In 1913, more than 50 per cent of the FDI inflow into these economies went to the primary sector, the share of manufacturing sector being only about 10 per cent. The 1990s pattern was completely opposite in that mere 10 percent had gone into the account of primary sector, and the rest 90 percent was shared by manufacturing and service sector respectively claiming 40 percent and 50 percent of the total (Dutta, 1997). It was argued that this sectoral shift in the pattern of FDI had strengthened its developmental effect and minimized the negative effects.

Further, the 'spillovers-literature' emphasized that the competitive, linkage and labor turnover effects of FDI is relatively higher in the technology intensive manufacturing sectors rather than in the primary sectors. As a result, the potential for FDI led spillovers to domestic firms is higher in the former sector and insignificant in the case of latter. Hence, the pattern of FDI can be a powerful determinant of the growth of developing countries. A recent study, which had tried to empirically verify this hypothesis, land up on a disappointing conclusion of no effects of the pattern of FDI on growth (Dutta, 1997). However, there is a serious limitation to this study. We know that the structural shift in the pattern of FDI is essentially a phenomenon over time. Therefore, regressing the share of FDI stock in the primary or the secondary sector for 1982 on the growth for 1985-94, among other variables will not capture time series aspect of the problem in a cross-sectional growth relation.

It is true that the unavailability of the FDI stock data consistently over a long period for a large international sample limits any ambitious empirics in this regard. Further, what can we expect about stock data, when measurement problem is formidable even in case of flow data. However, fortunately for India we have a long series of FDI stock data available from RBI. This has permitted us to look in to the problem from a time series perspective and add to the existing knowledge from the experience of India. This has immense policy implication as India is now pursuing a proactive FDI policy towards foreign investment, assuming that FDI necessarily lead to growth irrespective of its sectoral location. Many researchers in India are still debating over the issue whether it is essential to relax the FDI policy concerning less technology intensive sectors if the purpose is to develop the core and priority sectors with foreign participation (see, for instance, Rao et. al., 1999). We hope this study will provide some useful insights to the debate.

An important issue that one needs to understand in investigating the link between FDI-pattern and economic growth is the direction of causality. Theoretical understanding and empirical evidence suggest the existence of bi-way causation. Economic growth over a long run, always accompanied by structural changes in the economy, is a well-evidenced observation in development economics. It is postulated that as the economy developed, the share of secondary sector in GDP increases with the declining share of primary sector and later service sector emerges overtaking secondary sector. This transition of the economy from primary sector dominated growth to secondary and later service sector dominance is associated with the expansion of infrastructural facilities, accumulation of locally created assets, rising income level, entrepreneurial ability and well developed market fundamentals. The faster growing market with large size, specifically for manufactured goods due to low income elasticity of demand for primary products provides the best package of locational advantage for global firms to exploit their ownership advantages in locating production unit in the manufacturing sector. On the other hand, firms operating in the global markets have ownership advantages in line with economic growth in developed countries and thus mainly in the secondary sector. This implies that changing pattern of FDI may very well reflect changes in the nature of created assets owned by global firms as well as in the locational advantages offered by the host developing country.

Above discussion makes it clear that the relation between the pattern of FDI and growth involves bi-way interdependence. To investigate the link empirically, the study has adopted the Granger causality test (Granger, 1969). This test is essentially an exercise to determine whether the pattern of FDI precedes growth or growth precedes the pattern of FDI. If the former case is true, then the pattern of FDI Granger causes growth and if later is true growth Granger causes the pattern.

1.Measurement of Sectoral Pattern And Economic Growth

Before we proceed to state our methodology formally, it will be better to discuss the measurement of structural change in the sectoral location of FDI. Our measure of the sectoral pattern of FDI is similar to that of Dutta (1997). We measure firstly, the sectoral pattern of FDI as the percentage share of primary sector/ manufacturing sector / service sector in the total outstanding stock of inward FDI and secondly, by the percentage share of technology-intensive sector in the total manufacturing FDI stock. The last group of technology-intensive segments includes: machinery and machine tools, metal and metal products, electrical goods and chemical and allied products. The change in sectoral pattern of FDI has been measured by the change in the percentage share of above-defined sectoral category ($\Delta Share_t = Share_t - Share_{t-1}$)

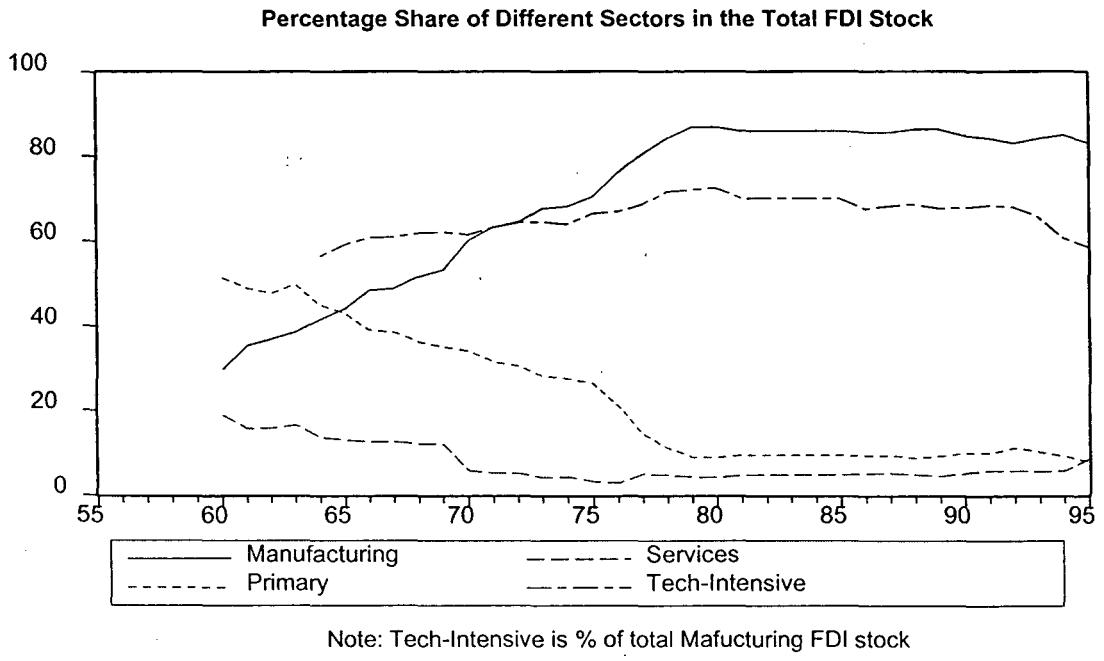

Figure: 3.1

It is obvious from the above diagram that over the years manufacturing sector has emerged as the most preferred destination of sectoral location. At the

end-March 1960, it accounted for merely thirty percent of the total FDI stock as compared to fifty-one percent for the primary sector. Thanks to government policy of channeling FDI and foreign technology agreements into priority areas, manufacturing has turned the complete scenario and within manufacturing, it is the technology-intensive segment, which is the major beneficiary. By 1985, the share of manufacturing has reached an impressive proportion of 86 percent of the total FDI stock and within it 70 percent of the stock has gone into technology-intensive segments. The dominance of manufacturing sector has not changed significantly but within it the share of the tech-intensive group has declined to 59 percent by the end-March 1995. Significantly, this eleven percent decline in the tech-intensive segments has been affected during the immediate four years after reforms started in 1991. It seems that non-discriminatory approach to FDI as regards to sectoral location has been responsible for this phenomena and consequent concentration of FDI in the traditional, and modern consumer goods segments of the manufacturing sector.

This study has measured economic growth as the annual growth rate of GDP at factor cost. The GDP series used is at the constant price of 1980-81. This is a better measure than using GDP at market prices as the latter includes govt. taxation and do not reflect the real value added that the economy's production process is making.

2.The Econometric Methodology And Data Source

Simply running OLS can produce spurious relationship between economic variables over time, if these series are not stationary. Conventional hypothesis testing procedure based on t, F, and chi-square tests leads to mis-leading inference. Detrending series by regressing time on it may be of little help if the trend itself is shifting (Granger and Newbold, 1974; Engel and Granger, 1987; Charemza and Deadman, 1997). Therefore, in a time series analysis, it is essential at the

beginning to test for stationarity of the series involved. We have conducted the Augmented Dickey-Fuller test for a unit root in a more general specification including both a constant and a deterministic trend (Dickey and Fuller, 1981). The specification of the test is as follows:

$$\Delta y_t = \beta_1 + \beta_2 t + (\rho - 1) y_{t-1} + \Sigma \delta_i \Delta y_{t-i} + u_t \qquad (1.1)$$

Where y_t is the variable of interest, t is the trend and u_t is a white noise error term. If we run (1.1) and find that in fact (ρ-1) is statistically not different from zero this imply that the variable Y has a unit root i.e. it is nonstationary. The study also used the Phillips-Perron test for a unit root (Phillips and Perron, 1988). These two tests differ from each other with respect to the treatment of higher order serial correlation in a series. The ADF test corrects for higher order serial correlation by adding lagged differenced terms on the right-hand side of the regression whereas the PP test use a nonparametric method for controlling higher-order serial correlation. The latter nonparametric approach is robust to heteroskedasticity and autocorrelation of unknown form.

After determining the stationarity of our series, the study as indicated before, conducted the Granger causality test to determine the link between growth and changes in the pattern of FDI, which involves estimating the following two regressions:

$$Growth_t = \xi_1 + \sum_i^n \lambda_{1i} \Delta Share_{t-i} + \sum_i^n \gamma_{1i} Growth_{t-i} + u_{1t}$$

$$\Delta Share_t = \xi_2 + \sum_i^n \lambda_{2i} \Delta Share_{t-i} + \sum_i^n \gamma_{2i} Growth_{t-i} + u_{2t} \qquad (1.2)$$

Already we have mentioned that the above test is essentially a test of precedence. To determine whether changes in the sectoral pattern of FDI (Δshare) Granger causes growth, the test proceeds to estimate how much of the current

growth can be explained by its own past values and then to estimate whether adding past values of Δshare significantly contribute to the explanation. If the contribution is found to be statistically significant as determined by the traditional F test, then we can say that Δshare Granger causes growth, otherwise not. One limitation of this test is that it is highly sensitive to the lags chosen in the regression. The study has employed both the Akaike information criterion (AIC) and the Schwarz criterion (SC) to determine the number of lags to be used in the analysis.

It should be noted at the outset that this study has examined the existence of cointegration at the levels of chosen variables as all are found to be integrated of order one, I(1). However, results from Johansen's maximum likelihood approach, indicates no long run relationship between log GDP and share of the primary sector/manufacturing sector and the share of technology sector whereas the cointegration found in the case of service sector is highly sensitive to the length of the VAR (Vector Autoregressions). Therefore, the above standard Granger causality test was adopted for investigating the short run dynamics between the variables.

Our data requirements confined to two sources only. The sectoral composition of FDI stock was obtained from RBI Bulletin various issues and the GDP at factor cost (1980-81 constant prices) was collected from CSO, special supplements, 1998. From 1981-85, RBI had not conducted any census on foreign investment and hence average share for the years 1978-1980 and 1986-88, were substituted for these years. The variable growth is the annual rate of growth of GDP and yearly change in the percentage share of the concerned sector was employed to measure change in the pattern of FDI.

3.Empirical Results

Results from unit root test using one-period lagged difference term indicate that the series growth and Δshare of the service sector are stationary and the null hypothesis of unit root has been rejected by both the ADF and PP-test at 1% level (table-3.6). For Δshare of the manufacturing sector the rejection of the hypothesis of non-stationarity can only be at the 10 % level. In the case of Δshare of tech-intensive sector, we found that the rejection of the unit root by the ADF test is at 10% level but that is at 1% level by the PP-test. The divergence between these two test statistics was extreme in the case of Δshare of primary sector. In contrast to the ADF test, which suggests that the series is inherently non-stationary, the PP-test indicate that at 5 % level, we can reject the null hypothesis of unit root. Given the non-parametric approach of the PP-test in correcting higher order serial correlation in the error term we opt for this test in this context. That means all our variables are integrated of order I(0) and therefore the classical hypothesis testing procedure remains valid. As the data for the different segments of manufacturing sector is available from 1964 onwards, the analysis with respect to this measure of the pattern of FDI has been carried out for the period 1965-95.

Findings from the Granger causality test have been provided in the table-3.7. By both the criterion, namely, AIC and SC, the optimal lag length was found to be one in all the cases. Theoretical expectation that the changes in the structure of FDI in favor of the manufacturing sector and later to the service sector will have beneficial impact on growth, seems to be strongly supported by the empirical exercise. Results suggest that the change in the share of the primary sector and growth are Granger independent. None of the F-values are statistically significant and thus indicates that neither growth nor change in the pattern of FDI as measured by the change in share of primary sector precedes one another. This finding is

perfectly in agreement with the theory that the FDI located in the primary sector rarely contributes to the growth.

Table-3.6: INDIA: Unit Root Tests With Constant And Trend, Sample Period 1961-95

Variables/Tests	Levels	*1% critical Value**	*5% critical Value*	*10% critical value*
Growth				
ADF-Test	-5.823642	-4.2605	-3.5514	-3.2081
PP-Test	-7.903577	-4.2505	-3.5468	-3.2056
$\Delta Share_t$ –Primary				
ADF-Test	-2.893423	-4.2605	-3.5514	-3.2081
PP-Test	-4.158310	-4.2505	-3.5468	-3.2056
$\Delta Share_t$ -Manufacturing				
ADF-Test	-3.448875	-4.2605	-3.5514	-3.2081
PP-Test	-3.448875	-4.2505	-3.5468	-3.2056
$\Delta Share_t$ -Services				
ADF-Test	-5.027659	-4.2605	-3.5514	-3.2081
PP-Test	-6.445739	-4.2505	-3.5468	-3.2056
(Sample: 1965-95)				
Growth				
ADF-Test	-5.335688	-4.3082	-3.5731	-3.2203
PP-Test	-7.302022	-4.2949	-3.5670	-3.2169
$\Delta Share_t$ -Tech Intensive				
ADF-Test				
PP-Test	-3.489783	-4.3082	-3.5731	-3.2203
Growth	-4.364253	-4.2949	-3.5670	-3.2169

Note: *MacKinnon critical values for rejection of hypothesis of a unit root.

The same statistical independence of growth and the pattern of FDI stock have also been observed in the case of manufacturing sector. This finding has appeared to cast some doubt on the theoretical proposition that increasing FDI location in the manufacturing sector have beneficial impact on the growth of developing country. Nevertheless, a little economic intuition reveals that, this finding is still in accordance with theory. Putting this intuition in a statement: growth is more likely to be directly linked with the high technology-intensive segment oriented FDI rather than the total manufacturing FDI stock. Low technology-intensive consumer goods sector is the production surface where developing countries have required local knowledge and entrepreneurship. Entry of FDI firms merely results in crowding out of the existing domestic productive

capability due to the ownership specific edge of the former over the latter. In contrast, location of FDI in the high technology intensive segment, in which developing countries generally lacked effective local capability, leads to growth due to high technology being transferred to the economy and resultant crowding in of domestic investment. Interestingly, the above intuition has been evidenced by the empirical exercise as discussed below.

The link between growth and the pattern of FDI stock as measured by the change in the share of the technology-intensive sector has not disappointed theoretical postulation and lends empirical support to the existence of one-way causality flow. The null hypothesis that the pattern of FDI stock as measured by the change in the share of the technology-intensive segment does not Granger cause growth has been rejected at less than 5 percent level. At the same time, the hypothesis of growth does not Granger cause the pattern has not been rejected. This suggests that the location of FDI in the technology-intensive sectors of the economy affects its economic growth and causality is not the other way round.

Table-3.7: India: Granger Causality Test

Null Hypothesis	*Observations*	*Lags*	*F-Statistic*	*P-Value*
$\Delta Share_t$ -Manufacturing				
$\Delta Share_t$ -Manufacturing does not Granger cause Growth	34	1	3.17310	0.08466
Growth does not Granger cause $\Delta Share_t$ -Manufacturing	34	1	0.10676	0.74606
$\Delta Share_t$ -Primary				
$\Delta Share_t$ -Primary does not Granger cause Growth	34	1	2.78507	0.10522
Growth does not Granger cause $\Delta Share_t$ -Primary	34	1	0.07668	0.78369
$\Delta Share_t$ -Services				
$\Delta Share_t$ -Services does not Granger cause Growth	34	1	5.99953	0.02016
Growth does not Granger cause $\Delta Share_t$ -Services	34	1	0.04791	0.82817
$\Delta Share_t$ -Tech Intensive				
$\Delta Share_t$ -Tech Intensive does not Granger cause Growth	30	1	5.22911	0.03028
Growth does not Granger cause $\Delta Share_t$ -Tech Intensive	30	1	0.94426	0.33981

The above empirical findings can be better understood with respect to the policy framework that India has adopted over time. Before the 1990s, the FDI

policy was cautious and welcomed foreign investment on a selective basis, discouraging projects in the low technology areas where indigenous knowledge was available. Consequently, foreign investment, bringing in highly sophisticated technology and export orientation, were encouraged only in the selected technology-intensive sectors like basic industrial chemicals, drugs and pharmaceutical, non-electrical machinery, dry cells and batteries, machine tools, automotive components, and the like where domestic knowledge was either inadequate or unavailable. This selective approach seemed to yield positive results over negative impact and led to growth.

The finding that the concentration of FDI in the technology intensive sector causes growth has also been reached by another study although from a micro perspective. Results from this study suggests that the presence of foreign R&D capital stock have potential for the productivity growth of local firms in the high technology segments provided the latter are making required efforts but that potential is virtually insignificant in the low technology-intensive sectors (Kathuria, 2000).

After 1990s, India has been following a liberal FDI policy and as actual data indicate the share of the technology intensive sector is drastically falling. The trend from approval data over August 1991 to August 1999 also suggests that the consumers goods industries has accounted nearly 13 percent of the total amount approved, a significant proportion of the manufacturing FDI approval (Economic survey, 1999-2000). These trends are converse to the empirical finding that FDI in the high technology-intensive sectors have a significant impact on growth but not in the case of total figure including FDI in the low technology segments.

The case of economic growth and FDI in the service sector has also strongly supported one-way causation form the latter to the former. As the FDI concentrates in the provision of basic infrastructure services including power, roads,

telecommunications and civil aviation and finance, this helps in increasing efficiency of private investments and hence leads to growth.

4.Conclusions

Employing Granger causality test, the study has sought to empirically verify the theoretical postulation that there exists bi-way causation between the pattern of FDI and growth. The findings for Indian economy indicate that as the FDI concentrate in the high technology-intensive sectors, this lead to growth but growth does not precede the pattern of FDI in favor of the technology intensive-sectors. This finding is plausible in the sense that the concentration of FDI in the technology-intensive sector of the Indian economy is a result of conscious govt. policy rather than in response to the market opportunities available in the economy. Further, the study finds that building basic infrastructure services with foreign participation is an essential ingredient for rapid economic growth.

Our policy prescription is in the line of the above findings. The FDI policy which deliberately discriminate FDI flows in favor of the high technology-intensive sectors and basic infrastructure services would be more optimal in the long run than across the board liberal FDI policy as pursued today. This active discriminatory policy prescription is also recommended by another study investing crowding in or crowding out from FDI (Agosin and Mayer, 2000). Therefore, the relevance of an effective discriminatory policy is still intact; but does the red tapism and non-pragmatist politics in India leave any such policy to be effective and efficient?

C. FDI And Economic Growth In India: A Production Function Analysis

For economic growth, the criticality of capital accumulation can hardly be exaggerated. Inadequate resources along with low level of governance can well explain the underdeveloped infrastructure, low human development and stagnant industrial base that characterize many developing countries until today. The role of FDI as a source of capital formation is thus critical in this context. By supplementing saving constrained domestic investment to reach a higher level otherwise not possible, FDI can directly contribute to economic growth. FDI can also contribute to growth indirectly. It's role as a vehicle of new technology and its spillovers to domestic firms in the economy has been verified by many empirical studies. However, the objective in this section is very limited one. This section focuses on the direct contribution of FDI to the economic growth of India by being a source of capital formation. The methodology adopted is the growth accounting framework where we have included FDI stock as an additional input in the production process.

This exercise although similar to that of developing countries is deemed necessary for more than one reasons. First, for developing countries reliable domestic capital stock series is not available until now. Hence, most of the empirical works in this field of research have used domestic investment (% of GDP) figure instead. This substitution was based on the restrictive assumption of a fixed capital-output ratio, which in turn results in both misspecified relationship and significant measurement errors (Alexander, 1994; Ramirez, 2000). The problem may further rise with the use of FDI inflows data in the place of FDI stock data.

In the case of India, the above problems can be overcome. From CSO, NAS, we have a consistent and reliable net fixed capital stock data for the economy at

constant prices 1980-81. Net FDI stock data was obtained from R.B.I. Bulletin. The obtained series of FDI stock was in current prices. We have expressed this series in the constant prices (1980-81) utilizing the deflator derived from the current and constant price gross fixed capital formation (GFCF) as given in NAS. It should be noted that the R.B.I. provides data on FDI stock up to 1995 and thereafter net FDI flows has been added to obtained subsequent period FDI stock. NDP at the constant price has been chosen as a measure of output. This data was also collected from CSO. About labor input, there exist no time series data compatible with the NDP. Therefore, we have used the decennial data as provided by census, 1971,1981 and 1991. Annual estimates of the labor force has been worked out by a linear interpolation of these census work force, and from 1991 to 1997, we have forecasted on the basis of interpolated series of the earlier years. The analysis has been carried out for the period 1970-71 to 1998-99.

5.The Contribution Of FDI Stock To Domestic Capital Stock

The contribution of FDI stock to the net fixed capital stock (NFCS) of the Indian economy is not critical so far. It hardly accounts for one percent of the NFCS over the post-liberalized period 1992-1997. Nevertheless, in comparison to its past share in the seventies and eighties, it has shown a rapidly increasing trend. The average amount of net FDI stock at 1980-81 prices was estimated to be only Rs. 582 crores over the period 1970-80. This average figure nearly doubled to Rs. 1045 crores in the period 1981-91 and further estimated to be an impressive amount of Rs.4727 crores in the period 1992-97 (see, table-1 & figure-1).

Table-3.8: India: Average Amount of FDI stock, 1980-81 prices (Rs. Crores)

Period	*FDI stock*	*% Of Net Domestic Product*	*% Of Net domestic fixed capital stock*
1970-80	581.49	0.01	0.24
1981-91	1043.78	0.01	0.28
1992-97	4727.03	0.02	0.81

The faster rise in the average FDI stock in the eighties and nineties as compared to the seventies clearly resulted from policy liberalization that started since mid-eighties. Apart from that the size of domestic market, exchange rate, and a set of sound macroeconomic fundamentals are the crucial determinants of FDI inflows in the Indian context (Radhakrishnan and Jaya prakash, 2000). It is expected that increasing openness of Indian economy to FDI with strengthening macro fundamentals will further the economic role of FDI in the future.

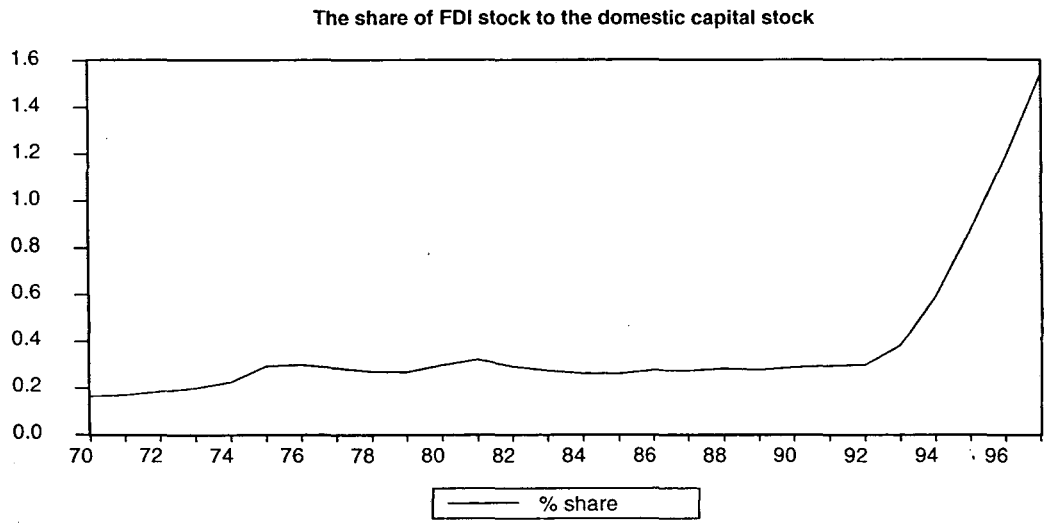

Figure: 3.2

6.Methodology

The study has estimated the following relation for the Indian economy:

$$\log y_t = \beta_0 + \beta_1 \log K_{d,t} + \beta_2 \log K_{f,t} + \log \beta_3 \ln L_t \qquad (1.1)$$

Where y, K_d, and K_f are respectively net domestic product (NDP), domestic capital stock and FDI stock in the economy. The stock of domestic capital has been obtained by subtracting FDI stock from the total capital stock of the economy. L is the labor input. The coefficient attached to each of the independent variable represents respective output elasticity.

Theoretically, β_1 and β_3 are expected to be positive. The sign of β_2 is anticipated to be positive as far FDI as a source of capital formation is concerned. However, this estimation does not have any mechanism to distinguish this direct effect of FDI stock to many other externalities that is being generated by it. If the negative effect of FDI outweigh positive then β_2 may even appear with a negative sign. Hence, the sign of β_2 is indeterminate.

7.Empirical Results

Table-2 provides the estimated production function for the Indian economy over three periods – 1969-70 to 1996-97, 1969-70 to 1984-85 and 1985-86 to 1996-97. Results for the total sample 1969-70 to 1996-97, indicate that the estimated partial output elasticities with respect to domestic capital stock and labor have anticipated positive sign and are statistically significant. The output elasticity of domestic capital stock is 0.8735 and thus, over the study period, a 1 percent increase in the domestic capital stock led on the average a 0.9 percent increase in the output, holding FDI stock and labor input constant. The output elasticity with respect to labor (0.2446) is lower than that for the domestic capital stock and suggests that the contribution of domestic capital accumulation to output is relatively larger than that of labor. Over the same period, the output elasticity of FDI stock was observed to be positive (0.0178) but statistically insignificant. In other words, even though the contribution of FDI stock to output is positive over the sample period, it is not substantial. This is understandable given the fact that FDI stock accounts for less than 1 percent of the domestic capital stock and is obviously not able to significantly contribute to the economy's output. In terms of the F-statistic, the estimated model is highly significant. That means, all the estimated slope coefficients are jointly significant. Further, in terms of overall fit as indicated by the adjusted R-squared these estimates are remarkable.

Table-3.9: Estimation of Cobb-Douglas Production Function, India, 1970-97

Independent Variables	*Cobb-Douglas production function (GLS Estimation)*					
	Period: 1970-97		*Period: 1970-85*		*Period: 1986-97*	
	Coefficients (Standard Errors)	*P-values*	*Coefficients (Standard Errors)*	*P-values*	*Coefficients (Standard Errors)*	*P-values*
lnK_d	0.8735	0.0000	0.9436	0.0000	0.8801	0.0000
	(0.0124)		(0.0233)		(0.0222)	
lnK_f	0.0178	0.4417	0.0390	0.4384	0.0376	0.0508
	(0.0227)		(0.0486)		(0.0164)	
lnL	0.2446	0.0238	-0.01983	0.9127	0.1453	0.7220
	(0.1013)		(0.1770)		(0.1453)	
constant	-0.0501	0.0003	-0.1507	0.0076	0.0748	0.0700
	(0.0120)		(0.0471)		(0.0358)	
Adjusted R-squared	0.9983		0.9938		0.9990	
F-statistic	5147.4250		802.7762		3668.298	
Prob(F-statistic)	0.0000		0.0000		0.0000	
Durbin-Watson stat	2.1216		2.3884		2.0429	
Number of observations.	28		16		12	

Note: The Theil-Nagar modified d for small sample has been used to transform the data to correct for autocorrelation and the Prais-Winsten transformation to avoid loss of degree of freedom. Estimates presented over are thus OLS on the transformed data.

It is well established that the process of economic liberalization that started since mid-eighties and particularly 1991 onwards led to substantial inflows of FDI into the economy. In fact, during the post liberalization period 1992-93 to 1998-99, the amount of inflow was an impressive figure of Rs. 36208.6 crores (in nominal term). Therefore, it is expected that the contribution of FDI stock over this liberal policy phase (1986-1997) to be definitely different from that in the previous dirigistic period (1970-1985). The study accordingly estimated the production function for these two periods and following significant findings were obtained.

The output elasticity of FDI stock has been consistently positive over different period estimations. Importantly, this is observed to be statistically significant over the period 1986-97 but is not so in the case of 1970-85. A 1 percent increase in the FDI stock in the economy, on an average, results in 0.04 percent increase in the output over the period 1986-97. Therefore, the contribution of FDI stock to the economy's production is significantly positive during the liberalized phase of FDI regime. Over these two periods, domestic capital stock has significantly positive output elasticity but the labor input indicates sign reversal although statistically insignificant. In terms of overall fit and F-statistic, the estimated coefficients are jointly explaining the maximum variation in the dependent variable and together their contribution is significant across these two periods.

8.Conclusions

The economic role of FDI is increasingly becoming significant in the Indian economy with the transition of FDI policy from a restrictive phase of seventies and early eighties to a relatively liberal phase of late eighties and nineties. In this context, it is essential to investigate whether FDI contributes positively to the production process, or negatively. Estimation of production function for the Indian economy suggests that FDI stock had contributed positively to the national production. The positive impact was consistent across different periods. Although the impact was not significant for the overall period, bifurcating the sample indicate a significant impact for the relatively liberal policy phase. The study concluded that FDI stock has largely beneficial impact on the economy. However, the deficiency of this aggregate analysis is obvious, as it cannot bring out sectoral dynamics of FDI in the Indian economy. Future research addressing this aspect of the problem can further contribute to the FDI-development debate in India.

CHAPTER IV

FDI SPILLOVERS AND LOCAL PRODUCTIVITY GROWTH: EVIDENCE FROM INDIAN PHARMACEUTICAL INDUSTRY

The study tests the FDI spillover hypothesis in the Indian Pharmaceutical industry using panel data for a sample of firms over the period 1988-2000. The study estimates total factor productivity growth for domestic firms and relates the same to a set of attributes that reflect technological capabilities of the firm along with the variables of foreign presence and export orientation. Results confirm that the productivity of domestic firms increased significantly with the presence of FDI firms in the industry. Operation of competitive and linkage effects seem to be the important channels for this FDI spillovers. The study suggests several policy options to enhance local productivity growth, which include: encouraging competition by liberalizing FDI policy, strengthening local linkages, providing incentives to develop in-house R&D capabilities and acquire new technology and purchase new equipment, and lastly, encouraging skill content in the workforce.

In previous chapters we dealt with FDI induced developmental effects in a macro econometric framework and looked FDI as a source of aggregated countrywide learning process along with domestic capital formation, outward orientation and imports of capital goods. This approach of analyzing FDI led efficiency growth in the host country is, however, too aggregative in nature. In contrast, many recent empirical studies emphasized that efficiency is essentially a firm-specific outcome. It is a function of a set of attributes namely in-house R&D efforts, technology licensing, imports of capital goods, worker training, or enhance organizational capabilities which are in turn observable only at the firm level

(World Bank, 1997; Barba Navaretti and Tarr, 2000). Therefore, the process of FDI spillovers in the host country can be better examined at the firm level rather than at macro level. In the present chapter, the study had attempted to examine whether the presence of foreign firms generate spillovers on the productivity growth of domestic firms; thus supplements findings from previous macro studies.

A. Measuring FDI Spillovers

FDI offers a number of benefits to the host country. It can bring in investible financial resources, modern technologies, technical expertise, and access to export markets, foreign exchange, employment, skills and management functions. Apart from these potential direct benefits, host economy may also gain indirectly from FDI. This occurs when firm specific intangibles brought in by the FDI firms is transferred to the domestic firms, thus contributing to the latter productivity growth. In the literature, the existence of spillovers from FDI is by now well established. However, what is still debated is the nature and magnitude of spillovers.

FDI spillovers may be positive or negative. Net result therefore depends upon the relative strength of these two effects. This is the overall conclusion that emerged from the numerous empirical studies of past two decades devoted to quantify and estimate the FDI spillovers. Further, the impact of FDI firms on the productivity growth of domestic firms is not only sector specific but also firm specific as postulated by the technology gap hypothesis. Hence, the spillover impact of FDI is ambiguous in nature.

The positive spillovers that FDI firms may generate in the development process can occur through many channels but important are the followings:

- *Competitive effect*: This is the most important indirect benefit that FDI firms may generate in the host economy. Entry of FDI firms leads to competitive structure of an industry. This increased competition forces domestic firms to improve their productivity by using more efficiently existing resources, shifting to sophisticated and advanced technology, providing training to workers, and undertaking R&D expenditure to develop indigenous technologies. Therefore, FDI may results in the improved productivity levels of domestic firms (Caves, 1974).
- *Human capital effect*: An educated, well-trained and skilled workforce generally characterizes FDI firms. When these well-trained workers migrate to domestic firms or start their own enterprises, this results in local productivity growth (Blomström and Persson, 1983; WIR, 1999).
- *Demonstration effect*: The presence of FDI firms in the host economy may also lead to diffusion of information on new technology, production process, quality control techniques and marketing strategy to the local firms and latter may emulate the same so as to improve their productivity levels.
- *Linkage effect*: Efficiency spillovers can further operate through subcontracting relationship between foreign and local firms. These vertical interfirm linkages are beneficial for both the FDI and non-FDI firms. For FDI firms subcontracting certain production activities to specialized local firms and concentrating on their core lines of production is a means of achieving cost reduction and efficiency improvement. Subcontracting is also beneficial for local subcontractors as it provides these firms new markets along with exposure to new forms of production and management organization and further access to technical assistance and training support to upgrade their technological capabilities (World Bank, 1997).

While FDI is associated with these positive externalities, this does not rule out negative externalities from it. This aspect of spillovers is often discussed in the

context of crowding out from FDI, which can occur through one or both of the following two channels:

- *Product market*: FDI firms with ownership specific advantages such as superior technological capabilities, skill, new management techniques, marketing networks, and others, not only overcome entry barrier but also have an edge over domestic enterprises. Further, due to their large entry size and trans-border operation they enjoy scale and scope economies. All these factors contribute to the increased market power of FDI firms and consequent market concentration. On the contrary domestic firms characterized by low technological capabilities, high cost, and inefficiency face negative scale effect as a result of their declining market share. Negative scale in turn raises cost of production of domestic firms and as a result further declining market share of the same. This cumulative impact of the entry of FDI firms on the market position of domestic firms led to crowding out of many small size domestic firms. Therefore, entry of FDI firms may adversely affect learning and growth of local firms in competing activities (Markusen and Venables, 1997; WIR, 1999).
- *Financial market*: FDI firms, given their size and other advantages of being a part of a global system of production, usually have a preferential access to host country local savings through financial institution. This may lead to credit rationing for small size local firms by reducing their access or raising costs of borrowing for them (WIR, 1999).

The study has used three proxy variables for the presence of FDI spillovers to local firms in the industry. These are:

a) Share of sales of FDI firms to total industry sales (spillover1).
b) Share of R&D expenditure of FDI firms to total industry R&D expenditure (spillover2).

b) Share of R&D expenditure of FDI firms to total industry R&D expenditure (spillover2).

c) Share of local raw materials expenditure by FDI firms to total industry local raw material expenses (spillover3)

In comparison to the first and second measures, which respectively capture foreign participation in the product market and technological efforts in the industry, the third captures the extent of backward linkages that FDI firms generate. This vertical inter-firm linkages of FDI is critical for the growth of local ancillary industries and hence have a bearing on the development of host economy.

If we find a significant positive relation between the total factor productivity growth in domestic firms in the industry and the spillover variable, we can conclude that there exist positive FDI spillovers. A significant negative relation, on the other hand, will suggest that negative spillovers from FDI outweigh its positive spillovers.

B. The Model

The model for testing productivity spillovers from FDI is a two-step procedure. In the first step, the study has estimated TFPG for each domestic firm based on the panel data estimation of production function. Next step consists of an equation relating firm level TFPG to a set of firm's attributes.

1.Specification of Production Function

A simple two-factor Cobb-Douglas production of the following form has been adopted in the study:

$$\log VAD_{it} = \beta_{oi} + \alpha \log K_{it} + \beta \log L_{it} + \varepsilon_{it} \qquad (1.1)$$

Where VAD, K and L respectively denote value added, capital and labor. • and • are elasticity of output with respect to these two factor inputs. i is the i-th domestic firm and t is time.

After obtaining estimated output elasticity denoted by $\hat{\alpha}$ and $\hat{\beta}$, we have estimated TFPG of i-th domestic firm as follows:

$$TFPG_{it} = \Delta \log VAD_{it} - [\hat{\alpha} \Delta \log K_{it} + \hat{\beta} \Delta \log K_{it}] \qquad (1.2)$$

2.The Total Factor Productivity Growth Relation

Firm-level productivity growth is a composite measure of the efficiency improvements in the firm including technical progress, learning-by-doing, improved skills, and enhanced utilization of capacities, etc. The study has specified this TFPG relation as a multiple regression model relating productivity growth to a set of attributes that reflect technological capabilities of the firm. These factors are discussed below:

R &D Investment. This can be viewed as a measure of the current level of knowledge of the firm and hence a significant determinant of its productivity growth (Griliches, 1973; Griliches and Litenberg, 1984; Griliches, 1988; Coe and Helpman, 1993). However, the importance of local knowledge creating capabilities in developing countries is largely limited by the non-availability of skill labor, the poor quality and the uncertainty in the supply of local resources and more importantly the capital market failures. The little R&D conducted in a developing country is rarely of the Schumpeterian frontier moving type. Whatever may be the case, the relation between TFPG and R&D expenditure is likely to

Technology Imports. Firms of developing countries tend to have limited research capabilities to develop their indigenous technology. For these firms imported knowledge from abroad is crucial in this case. A domestic firm can import technological inputs like plant and machinery and further it can acquire knowledge through technology and know-how agreements. Both these embodied and disembodied channels of technology imports are significant for the productivity growth of domestic firms (Fransman, 1985; Lall, 1993). As in the case of R&D, this study also has used one period lag of this variable.

Interaction. Any international transfer of technology requires a degree of technological capability on the part of the receiving firm. This is essential for the efficient use of an imported technology by adapting the same to local conditions. The greater the extent of this capability the more likely is a successful transfer. The import of foreign knowledge may in turn stimulate the development of local knowledge-creating capabilities (Fransman, 1985). A study on India also found that the foreign technology use and local inventive activity are complementary to each other (Deolalikar and Evenson, 1989). To take account of this relationship between technology imports by the domestic firms and its R&D expenditure, the study has constructed an interaction variable. The interaction variable is the interaction term between R&D intensity and technology import intensity. Theoretically, this variable is expected to have positive impact on the productivity growth of local firms.

Exports. Domestic firms can also access the endowment of foreign knowledge through the channel of exports. By exporting, they can obtain crucial information about foreign markets, technologies, skills and products and this may even accompany by technical and organizational assistance (Westphal, Rhee and Pursell, 1984; Dahlman and Westphal, 1982). Evidence from many empirical studies suggests that firms with export linkages are more productive than firms

Pursell, 1984; Dahlman and Westphal, 1982). Evidence from many empirical studies suggests that firms with export linkages are more productive than firms exclusively serving domestic markets (Pack, 1993; Aw, Chung, and Roberts, 2000). Thus, it is expected that the export intensity would result in an improved productivity of the domestic firm.

Foreign Presence. As already mentioned, entry of FDI firms into under-developed industries of developing countries have both positive and negative spillovers to the growth and learning of the local enterprises. On one hand, FDI results in productivity and technology spillovers to the domestic firms by information diffusions, induced competition, local linkages, and skilled labor migration to local firms. On the other hand, it may also result in crowding out of local capabilities through blocking information flows, less local linkages, market and credit rationing for domestic firms. Hence, the impact of spillover variable on the productivity growth of local firms is theoretically ambiguous.

Determinants of firm-level productivity growth is thus specified by the following model:

$$TFPG_{it} = \chi_{oi} + \chi_1 EXPOIN_{i,t} + \chi_2 TECHIM_{i,t-1} + \chi_3 R\&D_{i,t-1} + \chi_4 INTER_{i,t-1} + \chi_5 SPIL_t + \varepsilon_{it} \quad (1.3)$$

Where

$TFPG_{it}$: Total factor productivity growth of ith domestic firm in the year t.

$EXPOIN_{it}$: Exports of ith domestic firm as a proportion of its sales in the year t.

$TECHIM_{it}$: Imports of capital goods plus royalties and technical fee paid abroad by ith domestic firm as proportion of its sales in the year t.

$R\&D_{it}$: Total R&D expenditure of ith firm as a proportion of its sales in the year t.

$INTER_{it}$: It is equal to ($R\&D_{it}$*$TECHIM_{it}$)

share of local raw materials expenditure by FDI firms to total industry local raw material expenses in the year t).

3.Data Source

The study is to examine whether the presence of foreign firms in Indian pharmaceutical industry led to productivity improvement in the domestic firms or not. The test is based on 264 firms in Indian pharmaceutical industry consisting of an unbalanced panel data covering 1636 observations over the period 1988 to 2000. Of the 264 firms, 236 are domestic firms with 1387 observations. The distinction between domestic and FDI firms is determined on a cutoff point of 25 percent foreign equity participation or more. Firms below 25 percent are classified as the domestic firms. The data has been drawn from the Prowess Data Base of the Centre for Monitoring Indian economy (CMIE).

C. Comparing FDI And Domestic Firms In Indian Pharmaceutical Industry

The impact of behavioural and structural differences between FDI and domestic firms on the development of host country has been a crucial issue in the FDI-development debate. Important areas like technology, exports, import dependency, wages, local linkages and productivity have received rich empirical attention in the literature. Evidence from these cross section studies, however does not give a clear picture about the differences in the behaviour of foreign subsidiaries and locally owned firms. What researchers now have generally agreed is that the case studies of specific industries based on panel data are likely to throw more light on these aspects (Jenkins, 1990).

In the present section, we have tried to analyze the behavioural difference of FDI and local firms in the Indian pharmaceutical industry based on an

unbalanced panel data. The study approaches to compare average indicators of local integration, factor proportion, export intensity, technology import intensity, R&D intensity, TFPG and wage share in total sales for the two groups of firms in the industry. Following implications were obtained from the study:

Local integration. The development impact of FDI, *inter alia*, largely depends on how closely they integrate in the local production chain through sourcing raw materials locally. The extent of local purchasing of inputs by foreign firms is important for stimulating local entrepreneurship and improving efficiency in local contractors by assisting them with investment, technology, and quality control. Local integration of FDI and domestic firms are constructed as the share of local raw material expenditure to the total raw material expenses incurred by these groups respectively. Results suggest that FDI firms usually have lower local linkages than domestic firms. Except for one year, 1995, domestic firms consistently had a higher local integration ratio, implying that on the average local sourcing of raw materials by FDI firms was less than that in the case of domestic firms. Of greater concern is that the local integration ratio of FDI firms is declining in the post reform period. It has declined from 78.16 percent in the year 1995 to 70.13 percent in 1997 to lowest ever 55.89 percent in 2000 (table-4.1).

Factor proportions. Differences in the factor proportions of FDI and domestic firms have important implications for development of the host country. This aspect of the FDI-development debate is more discussed in the context of choice of techniques by the domestic and foreign firms and its appropriateness for the resource endowments of host developing country. It is argued that FDI firms uses relatively capital-intensive techniques than domestic firms and hence have less employment potential for a labor abundant host developing country. The measurement of capital intensity for firms in India is particularly problematic as the total number of workers employed is not available. Instead, the total expenditure of firms on wages and salaries has been used in the study. Our

measure of capital labor ratio is thus the ratio of gross fixed assets to total wage bill. It can be observed from table- that FDI firms are less capital intensive than domestic firms across different years except for the year 1998[1]. As, on the average the wages (as a share of total sales) paid by the domestic and FDI firms do not show significant differential as discussed later, this indicates that the domestic firms are more capital intensive than FDI firms. It is important to note that the FDI firms have shown a secular rise in the average factor proportions indicating increasingly capital-intensive technology used by them. On the contrary, while the domestic firms have a rising factor proportion up to 1995, thereafter it is declining indicating rising employment potential in the industry (table-4.1).

Technology Imports. For developing country firms, import of technology is an important determinant of productivity growth. It is measured as the capital goods imports plus remittances on account of royalty and technical fees as a proportion of sales. It can be seen from table-4.1 that the average technology import intensity of domestic firms is higher than that of FDI firms for ten years out of total thirteen years of study. This finding suggests that the local firms are more inclined to technological up-gradation through technology imports than foreign firms in the Indian pharmaceutical industry. This may be due to increased competition that the domestic firms have to face due to policy reversal that took place in 1986 and 1994. This policy changes include reducing span of price controls, liberalizing import regime, scraping of various production control measures and allowing greater profitability. Because of these, it seems that domestic firms are making efforts to keep pace with technological changes in frontier areas to compete with MNCs in an increasingly liberalized policy era. This is in fact a positive trend in the Indian pharmaceutical industry.

[1] For this particular period, the average K/L ratio of FDI firms has shown a suddenly abnormal jump in relation to rest of the periods. That's why a caution has to be made.

Table: 4.1
The Comparative Behaviour of FDI And Local Firms
In Indian Pharmaceutical Industry, 1988-2000

Indicators	Local Integration		(Wages/sales)* 100		K/L		Export intensity		*Tech Import intensity*		R&D intensity		*TFPG*	
Year	FDI	DF	FDI	DF	FDI	DF	FDI	DF	FDI	DF	FDI	DF	FDI	DF
1988	76.59	78.79	14.04	9.95	1.71	8.31	1.89	0.55	0.15	0.36	0.00	0.00	-0.20	-0.10
1989	71.53	74.23	12.75	12.34	2.19	6.46	3.80	4.31	0.14	0.15	0.03	0.00	-0.02	-0.02
1990	85.77	94.69	11.80	11.52	2.37	5.52	6.21	6.37	0.12	0.45	0.14	0.03	0.03	0.02
1991	81.09	87.54	11.82	12.06	2.66	8.55	5.48	9.59	0.22	0.27	0.08	0.07	0.00	0.01
1992	77.44	81.50	11.58	11.06	2.53	10.79	5.50	9.73	0.05	1.00	0.21	0.10	-0.02	0.00
1993	80.96	81.24	10.85	10.81	5.54	44.59	3.06	10.62	0.49	0.27	0.44	0.20	0.02	0.04
1994	77.20	83.06	10.08	7.97	5.11	19.62	3.58	12.09	0.20	4.62	0.45	0.25	0.03	0.04
1995	78.16	67.31	10.50	9.69	4.01	24.02	6.46	12.83	0.39	0.93	0.45	0.23	0.00	0.01
1996	77.21	81.41	10.62	9.54	3.79	23.85	10.20	13.33	0.44	3.10	0.46	0.29	-0.04	-0.04
1997	70.13	79.93	10.12	12.05	4.03	26.59	7.29	13.69	0.59	1.10	0.41	0.58	0.01	-0.05
1998	65.83	77.52	9.96	30.43	79.49	16.75	8.40	15.12	1.88	0.62	0.42	0.92	0.04	-0.03
1999	65.98	77.91	10.76	10.16	6.65	16.47	10.12	16.23	0.60	0.61	0.41	0.40	-0.01	0.03
2000	55.89	80.10	18.14	10.50	9.51	14.75	9.10	21.40	0.68	0.55	0.32	0.64	0.04	0.00

Note: i) FDI & DF respectively denote FDI and domestic firms.
ii) TFPG for FDI and domestic firms has been calculated from panel data estimation of separate production functions for these two groups.

R&D intensity. The average level of R&D spending in the Indian pharmaceutical industry is found to be very low irrespective of ownership characteristics. It is hardly one percent of the sales. If this is the situation in an industry, which is supposed to be highly R&D intensive and represent one of the success stories of India in developing an indigenous, self-reliant industry one can very well imagine the condition of other industries. This negligible local-knowledge creating investment is surely a matter of concern for policy makers. Considering from the ownership view, FDI firms are found to have more R&D intensity than local firms. Out of twelve years, the average R&D intensity of foreign firms was observed to be greater than that of domestic firms for seven years. This low R&D intensity of the domestic firms may be reflective of their greater reliance on technology imports for their technological backup. Their little in-house R&D activity is limited to the extent of local adaptation and absorption of imported knowledge. However, from 1997 onwards their average R&D intensity was found to be higher than that of FDI firms (table-4.1). It seems that domestic firms are preparing themselves by building indigenous technological backup to face a new

patent regime supposed to be much harder for them than the existing softer regime.

Export intensity. Generally, it is expected that FDI firms are more export oriented than domestic firms presumably because of their access to the distribution networks of their parents, brand names, product quality, productivity, and other firm-specific advantages enjoyed over their domestic counterpart. However, evidence from Indian pharmaceutical industry suggests that the domestic firms are more export oriented than the FDI firms. The average export intensity of domestic firms is consistently higher than FDI firms for all the years except 1988. This differential developmental contribution can be explained by the fact that domestic firms are at the frontier of technological development in the industry although through technology imports and are the low-cost producer of essential drugs. On the other hand, it seems that FDI firms are more inclined to domestic market rather than exporting. However, in the post reform period, particularly since 1994 the average export intensity of FDI firms is observed more or less to be rising and relatively at a higher level than the previous years (table-4.1).

TFPG. Comparing TFPG of domestic and FDI firms in Indian pharmaceutical industry over the study period reveals trend that contradicts normally held view that FDI firms have productivity growth higher than that of their local counterpart (table-4.1, figure-4.1). Over the period 1988-96, the trend in productivity growth of both the FDI and domestic firms are highly correlated as indicated by the synchronized movement of the TFPG curves of the two groups of firms. For the same period, excluding 1990, domestic firms reported productivity growth higher than FDI firms. This fact is understandable in the context of focused policy interventions in the industry and consequent emergence of an indigenous domestic sector operating on the frontier level technology. Interestingly in the post reform period, 1996-2000, the trend in the productivity of these groups diverges from each other. Over this period FDI firms reported positive TFPG for two years

where as domestic firms witnessed positive TFPG for only one year. It appears that in the post-reform period, on the one hand, domestic firms are exposed to stiff competition from foreign firms and on the other hand, productivity growth of firm is increasingly being internationalized owing to accelerated process of liberalization.

Average Total Factor Productivity Growth, 1988-2000

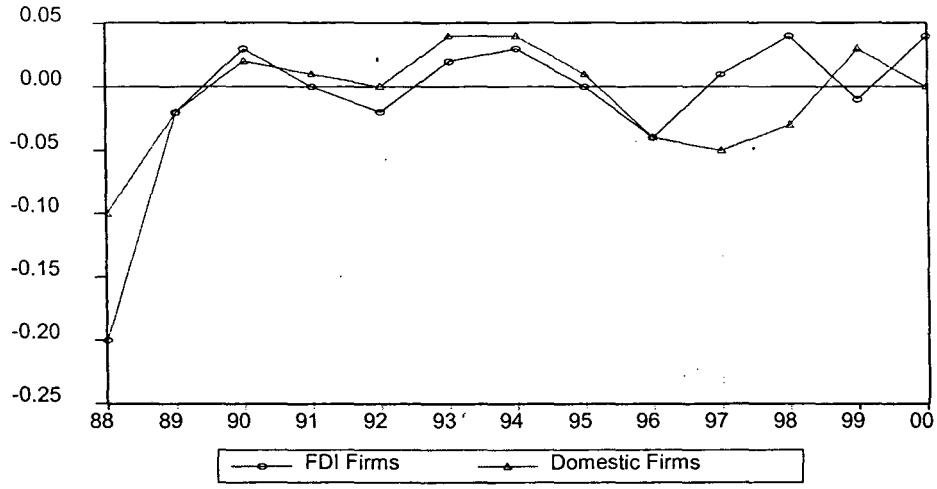

Figure 4.1

Wages. The behavioural difference between foreign and domestic firms has been a well-observed area in the literature. Evidence suggests that, on an average, FDI firms pay higher wages than local firms (Jenkins, 1984,1990; Dunning, 1981). Dunning (1981) listed a number of factors like skill composition of the work force, the productivity of individual workers, the need to reduce labor turnover, the bargaining power of organized labor, and the state intervention for this wage differential. Findings from Indian pharmaceutical industry, however suggests that the average share of wage in total sales of the FDI and domestic firms do not show large difference except for three years (table-4.1). It seems that Indian domestic firms in the pharmaceutical industry are paying wages and salaries (as a percent of sales) not largely different from that in the case of world-class multinationals in the industry.

The above analysis brings out that FDI firms in the Indian pharmaceutical industry have less local integration and on the technology front, they import relatively lesser. However, in the R&D efforts of industry, their contributions are marginally better and are characterized by less factor proportion. In terms of the export performance criterion, FDI firms are lagging behind domestic firms and hence their contribution to the national exchequer is relatively less. On productivity and wages, the study does not find any larger difference between these two sets of firms.

D. Results of Spillover Analysis

The first step in our analysis is the firm level estimation of production function to derive total factor productivity growth for domestic firms. Table-4.2 gives the fixed effects estimation of the Cobb-Douglas production function for 236 domestic firms. The estimated elasticity of output with respect to capital and labor are 0.30 and 0.58 percent respectively. Both these partial elasticity coefficients are highly significant and suggests that over the study period for 1 percent increase in the capital input, holding the labor input constant, led on average to about 0.30 percent increase in the output and that in the case of labor the increase in the output is 0.58 percent. In terms of overall R-square, the estimated model is quite satisfactory and as suggested by the F-value the model is highly significant.

After obtaining the output elasticity of capital and labor, the study proceeds to estimate firm level productivity growth for domestic firms as indicated by the relation (1.2). Finally, the productivity growth relation as specified by the relation (1.3) has been estimated.

Table: 4.2
Fixed-effects estimation of the Cobb-Douglas Production Function
For domestic firms in Indian Pharmaceutical Industry
An unbalanced panel data over 1988-2000

Independent Variables	Regression	
	Coefficients (Standard Errors)	P-values
logK	0.289382 (0.032524)	0.0000
logL	0.5747281 (0.0349855)	0.0000
Constant	0.2450481 (0.0300023)	0.0000
R-square (within/overall)	0.5927/0.8149	
F-value	836.16	0.0000
F-Value (all u_i =0)	7.09	0.0000
Observations	1387	
Number of groups	236	

Before we proceed to discuss the results obtained from TFPG growth relation, it is relevant to look at the trend of various spillover variables used in the study. It can be observed from the figure-4.2 that all the three measures have shown a continuously declining trend. In 1988-89, FDI firms were contributing more than one-half of the industry sales but their share has fallen to one-fourth by the end of 2000-2001. More dramatic decline in the foreign participation was noted in the case of R&D efforts of the industry. In the year 1989-90, FDI firms, which reported to have 100 percent participation, declined to 32 percent by the year 1994-95 and mere 15 percent in 2000-01. Measurement of this variable, however, is marked an important limitation. This is that the firms in India are required to report their R&D expenditure only if it exceeds one percent of total sales. Therefore, firms might be spending on R&D but not reporting. This fact is more real given the fact that R&D activity in both the domestic and foreign firms are only confined to local adaptation and absorption. Foreign spending on local raw material is also continuously declining reflecting weakening inter-firm linkages from FDI. In 1988-89, FDI firms were spending 44 percent of total industry expenditure on local raw materials. By 1998-99, it became 15 percent and

thereafter, increased to 20 percent in 2000-01. Descriptive statistics of these spillover variables have been presented in the table-4.3.

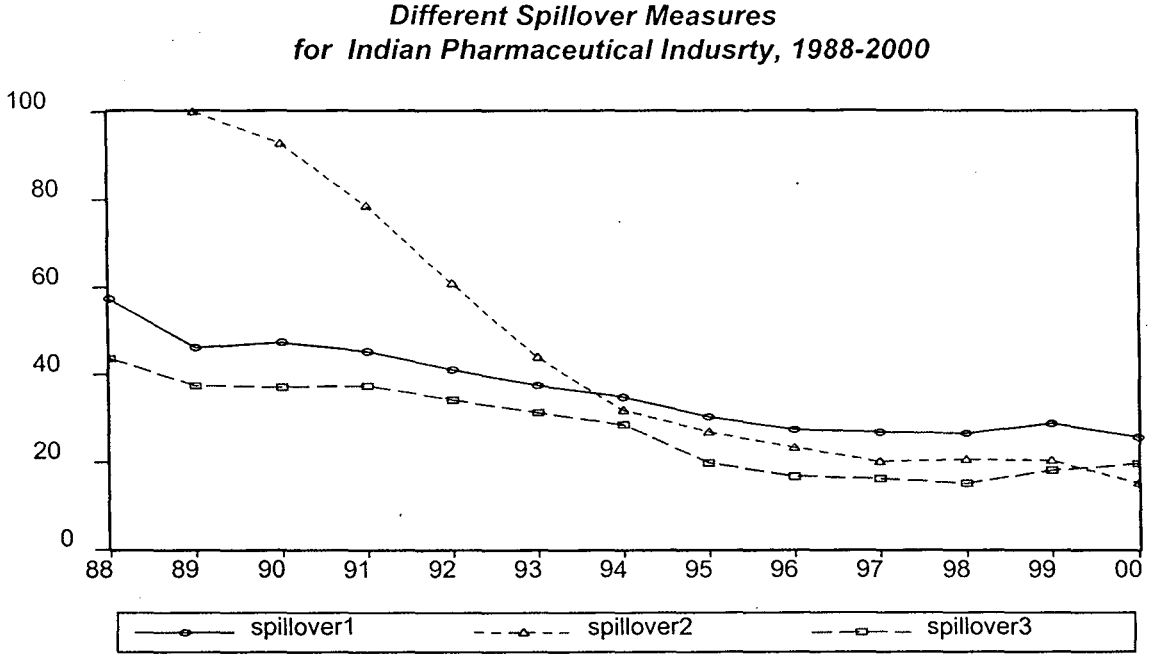

Figure-4.2

Table-4.3: Descriptive statistics of spillover variables

Statistics	*Spillover1*	*Spillover2*	*Spillover3*
Mean	36.60	44.53	27.31
Maximum	57.34	100.00	43.59
Minimum	25.69	15.12	15.09
Std. Dev.	10.15	30.70	10.08
Observations	13	12	13

The results from the panel data estimation of TFPG relation for domestic firms have been presented in the table-4.4. Equations 1.1, 1.2 and 1.3 correspond to the use of three different measures of FDI spillovers. Respectively these are the share of sales of foreign firms in total industry sales, the share of R&D expenses of FDI firms in total industry R&D expenditure and the share of local raw materials expenditure by FDI firms in total industry local raw material expenses. Results indicate a number of interesting implications. First, of all the determinants

of firm level productivity growth technology imports by the domestic firms have played a significant role across the three regressions. R&D intensity although positively correlated with firm's TFPG, its impact is nonetheless not significant in any of the regression. These findings corroborates the argument advanced that domestic firms in the Indian pharmaceutical industry depend more on imported knowledge than in-house R&D efforts to build their technological capabilities. Their R&D effort is an offshoot of local adaptation and absorption of imported knowledge. The same insignificant impact of own R&D on the productivity growth of private firms in the light and petrochemical industries also has been obtained by another study on India (Raut, 1995). Interestingly, this study also has adopted panel data approach and this industry grouping includes firms from pharmaceutical industry. There are three ways to interpret this weak R&D-productivity result. First, and frequently emphasized, the problem of non-reporting, i.e., some of the firms in our sample might be incurring R&D expenditure but may not have reported as it might be less than the statutory requirement of more than one percent of total sales. Second, firms who have reported R&D may have been induced by the exorbitant tax incentives granted to them to classify their many routine maintenance and repair activities as R&D (Ferrantino, 1992). Third, the result may just be driven by the weak technological capabilities of most local firms to conduct their own R&D.

The interaction effect meant for capturing the interaction between technology imports and R&D efforts of domestic firms is observed to be positive but statistically insignificant. The export-TFPG relation is also found to be positive across different estimations, although statistically not significant. This result is in conformity with several cross-country studies as surveyed by Pack (1988), who conclude that that there is no strong evidence linking productivity and openness.

Table: 4.4
Random-effects estimation of the Total Factor Productivity Growth relation
For domestic firms in Indian Pharmaceutical Industry
An unbalanced panel data over 1988-2000

Independent Variables	GLS Regression					
	1.1 (Spillover1)		*1.2 (Spillover2)*		*1.3 (Spillovers3)*	
	Coefficients (Standard Errors)	P-values	*Coefficients (Standard Errors)*	*P-values*	*Coefficients (Standard Errors)*	*P-values*
EXPORTIN	0.0003726 (0.0004001)	0.352	0.0003189 (0.0003997)	0.425	0.000384 (0.0003785)	0.310
TECHIM (t-1)	0.0001987 (0.0000508)	0.000	0.0001964 (0.0000509)	0.000	0.0002081 (0.0000474)	0.000
R&D (t-1)	0.0002588 (0.0020154)	0.898	0.0002226 (0.0020196)	0.912	0.0002023 (0.0019025)	0.915
Interaction (t-1)	0.0016547 (0.0034251)	0.629	0.0015414 (0.0034322)	0.653	0.0017389 (0.0031893)	0.586
SPILLOVER	0.0027398 (0.0011583)	0.018	0.0005374 (.0003672)	0.143	0.002136 (0.0008014)	0.008
Constant	-0.0928496 (0.0383768)	0.016	-0.0228496 (0.0157832)	0.148	-0.051499 (0.020507)	0.012
R-square (overall)	0.0179		0.0149		0.0176	
Wald χ^2_{df}	21.21	0.0007	17.52	0.0036	26.67	0.0001
HST (χ^2_{df})	7.80	0.1676	7.17	0.2086	7.15	0.2094
Observations	1025		1022		1227	
Number of groups	219		219		244	

The spillover variable as measured by the share of sales of foreign firms to total industry sales and the share of local raw materials expenditure by FDI firms to total industry local raw material expenses have verified the FDI-local productivity growth linkage. They both have significantly positive coefficient in the TFPG relation of domestic firms. However, the participation of FDI firms in the industry R&D efforts seems not to affect the productivity of domestic firms as the latter are found to be depending heavily on technology imports. It can be argued that there is hardly any spillover from R&D activity of FDI firms to domestic firms in Indian pharmaceutical industry as these activities are more oriented to local absorption and adaptation than to develop innovative capabilities. Very recently, particularly from last two years, it has been observed that FDI firms are setting up their own R&D facilities in India and this process needs some time to have its impact on the productivity growth of domestic firms.

In the context of the finding that the share of sales of foreign firms to total industry sales has significant positive impact on the productivity growth of domestic firms, we can speculate that this is largely due to the operation of competitive effect. As the domestic firms are already active on the frontier level of technology in the industry, it limits any scope for technological spillover from the presence of FDI. Another channel might be due to human capital effect and migration of skilled workers from FDI firms to local firms as there is hardly any wage differential between these two sets of firms. Further, the local linkage of FDI firms as measured by the spillover variable2 has indicated that strengthening FDI-local linkage is also another channel of local productivity growth in the presence of foreign firms.

Finally, it should be mentioned that there are many limitations to the above study. However, important one is that the study was not able to make allowance for human skill and learning by doing at the firm level. Future studies including these crucial variables would enhance our understanding of the subject better.

E. Findings And Policy Implications

On the comparative behaviour of FDI and domestic firms in Indian pharmaceutical industry, the empirical evidence indicates that FDI firms are on average characterized by the following attributes: (i) they are relatively less locally integrated and hence provide less inter-firm linkages; (ii) they have low technology import intensity as compared to domestic firms and hence technology transfer by them is relatively on the lower side; (iii) they exhibited R&D intensity higher than domestic firms, although the objective seems to be local adaptation and absorption rather than building innovative capacities; (iv) their technology is more likely to be less factor intensive than domestic firms and hence larger potential for employment opportunities; (v) they have relatively less export

potential as compared to the domestic firms; and (vi) their productivity and wage payments do not reveal any better indication than that in the case of domestic firms. It is also found that the presence of FDI firms as measured by spillover variable1 and 2 have significantly contributed to the local productivity growth. The spillover channel may be due to competitive and human capital effect with deepening of FDI-local linkages.

Overall, these results suggest several policy options to enhance local productivity growth with foreign participation in the Indian pharmaceutical industry:

(i) Encourage competition in the industry by liberalizing FDI policy with respect to it. However, competition should not be at the cost of an uneven playing field for domestic firms vis-à-vis foreign firms.

(ii) Strengthen local linkage of FDI through specific tools and incentives to address the problem of high cost, poor quality and unreliability associated with local suppliers. This is essentially to encourage local supplier of raw materials to respond efficiently to the demand of foreign firms which in turn depend upon supplier networks, support institution, development of local skills and technological capabilities (WIR, 1999; Baranson, 1967).

(iii) Provide incentives for domestic firms to develop their in-house R&D capabilities to build indigenous technological capability apart from encouraging them to acquire new technology and purchase new equipment through dissemination of information, expediting processing of licensing agreements, and liberalizing imports for the industry.

(iv) Although this study has not verified it can be suggested from the evidence provided by several other studies that increasing skill content in the workforce of domestic firms through investments in training is also an important way to improve their productivity (World Bank, 1997).

SUMMARY AND POLICY IMPLICATIONS

The study has investigated the role of FDI in the development of developing countries, a long debated concern in the development literature. The need for such a study is essential for three important reasons:

(i) First, continued surge in FDI inflows into developing countries and its increasing share in the capital formation and overall economic activities of the same. This increasing FDI-led economic integration with respect to developing countries makes it critical for investigating the developmental effect of FDI in a proper perspective.

(ii) Second, existing studies on developing countries are either smaller in scope or contradictory to each other in empirical findings. Therefore, this study, which has covered largest number of developing countries through panel data estimation with a broader theoretical framework, may contribute to a better assessment of the process of FDI-led economic growth.

(iii) Third, what policy should developing countries follow relating to FDI to maximize benefits from it and minimize its negative effects? This question is extremely important given the competitive liberalization among developing countries and consequent increase in the economic role that FDI is playing in their economy.

The study began with analyzing regional distribution of global FDI inflows and particularly their economic significance in the economy of host developing countries. It is observed that the role of international production in the world economy is increasingly becoming critical and even more so for the development of developing countries. The global FDI inflows, which was largely a North-North integration process during the seventies, has expanded itself to embrace

developing countries into its production networks faster than ever before. Both in terms of the size and share in global FDI inflows, the developing countries found their economic activities being increasingly internationalized. The increasing share of FDI inflows in the capital formation and overall economic activities of developing countries provides further testimony to this fact. This integration was largely because of rising level of development in the developing region and their pursuance of outward looking strategy marked by further market friendliness. However, not all the developing regions had been equally important to FDI. The unevenness in the distribution of inflows is even more glaring within a given region. Among different regions, Asia and Latin America and the Caribbean were observed to be star performers while Africa remains a long marginalized region with respect to FDI-led economic integration. It is ironic that FDI, which is supposed to be an important input in the development process, is in turn, dependant upon the level of development achieved by the region or country in the question. A region like Africa or an underdeveloped country like Mauritania will naturally be left out of this integration process. Answer to this problem seems to ultimately rest with the ability of underdeveloped countries to developed themselves first (Chapter I, pp. 20).

What growth strategy should developing countries follow to accelerate their growth performance? How FDI fared in this effort of developing countries? Theoretically, FDI can be a catalyst for the development of developing countries as shown by the recent advancement on growth accounting and endogenous growth economics front. It can contribute to the domestic stock of knowledge and its very presence generates a host of externalities enhancing productivity and competitiveness of the host country. It has also been consistently argued that developing countries can maximize benefits from FDI only when they achieve a critical level of human development. The present study has attempted to empirically verify the above role of FDI in the growth process of developing

countries. Panel data evidence, however, does not find any significant role for FDI in the growth of all developing countries. The conclusion remained unchanged even if human development interaction with FDI was included in the model. Estimations for developing groupings, however, suggest that FDI significantly affects the growth of Latin American and the Caribbean countries but not in the case of Africa and Asia. One of the significant observations that this study derived is that the growth effect of domestic investment is relatively more sensitive than FDI to the level of human development. The study also found that the role of international linkages has a major role in the growth process if the country is at a lower level of human development than a country with a higher level. Developing countries have to pursue a human-development-led-growth strategy supplemented by export-led growth if they want to improve their local productivity as well as that from FDI and maintain their competitive advantages in global markets (Chapter II, pp.54-56).

An important issue that frequently emerges in the context of FDI-led economic development is the pattern of FDI and its impact on growth. Theory says that as FDI concentrate relatively more in the secondary and tertiary sectors than primary sector, this enhances growth impact of FDI stock in the economy. The study has examined this proposition for Indian economy from a time series dimension. Results from Granger causality test indicate that as the FDI concentrate in the high technology-intensive sectors, this lead to growth but growth does not precede the pattern of FDI in favor of the technology intensive-sectors. The study also found that building basic infrastructure services with foreign participation is an essential ingredient for rapid economic growth. These findings are critical for developing countries as well. The study conclude that the FDI policy which deliberately discriminate FDI flows in favor of the high technology-intensive sectors and basic infrastructure services would be more optimal in the long run than across the board liberal FDI policy as pursued today (Chapter III, pp. 76).

The developmental role of FDI can be better examined at the firm level rather than at the macro averages. Therefore, the study tests the FDI spillover hypothesis in the Indian Pharmaceutical industry using panel data for a sample of firms over the period 1988-2000. The study estimates total factor productivity growth for domestic firms and relates the same to a set of attributes that reflect technological capabilities of the firm along with the variables of foreign presence and export orientation. Results confirm that the productivity of domestic firms increased significantly with the presence of FDI firms in the industry. Operation of competitive and linkage effects seem to be the important channels for this FDI spillovers. The study suggests several policy options to enhance local productivity growth, which include: encouraging competition by liberalizing FDI policy, strengthening local linkages, providing incentives to develop in-house R&D capabilities and acquire new technology and purchase new equipment, and lastly, encouraging skill content in the workforce (Chapter IV, pp. 102-103).

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Appendix

1.1.List of Countries Analyzed

1) ALGERIA	26) GHANA	51) PAPUA NEW GUINEA
2) ARGENTINA	27) GUATEMALA	52) PARAGUAY
3) BANGLADESH	28) HAITI	53) PERU
4) BARBADOS	29) HONDURAS	54) PHILIPPINES
5) BENIN	30) INDIA	55) RWANDA
6) BOLIVIA	31) INDONESIA	56) SAUDI ARABIA
7) BOTSWANA	32) JAMAICA	57) SEYCHELLES
8) BRAZIL	33) KENYA	58) SENEGAL
9) BURNIKA FASO	34) KOREA REP.OF	59) SIERRA LEONE
10) BURUNDI	35) LESOTHO	60) SRI LANKA
11) CAMEROON	36) MADAGASCAR	61) SURINAME
12) CEN. AFRICAN REP.	37) MALAWI	62) SWAZILAND
13) CHAD	38) MALAYSIA	63) THAILAND
14) CHILE	39) MALI	64) TOGO
15) CHINA	40) MAURITANIA	65) TRINIDAD & TOBAGO
16) COLOMBIA	41) MAURITIUS	66) TUNISIA
17) CONGO	42) MEXICO	67) TURKEY
18) COSTA RICA	43) MOROCCO	68) U.REP.TANZANIA
19) COTE D'IVOIRE	44) MOZAMBIQUE	69) URUGUAY
20) DOMINICAN REP.	45) NICARAGUA	70) VENEZUELA
21) ECUADOR	46) NIGER	71) ZAIRE
22) EGYPT	47) NIGERIA	72) ZAMBIA
23) EL SALVADOR	48) OMAN	73) ZIMBABWE
24) Fiji	49) PAKISTAN	
25) GABON	50) PANAMA	

1.2. List of Domestic Firms Included in the Study

1	A C E Laboratories Ltd.	47	Cipla Ltd.
2	Aarti Drugs Ltd.	48	Colinz Laboratories Ltd.
3	Add-Life Pharma Ltd.	49	Combat Drugs Ltd.
4	Advik Laboratories Ltd.	50	Coral Laboratories Ltd.
5	Ahlcon Parenterals (India) Ltd.	51	Core Healthcare Ltd.
6	Ajanta Pharma Ltd.	52	Croslands Research Laboratories Ltd. [Erstwhile]
7	Albert David Ltd.	53	Curefast Remedies Ltd.
8	Alembic Ltd.	54	Cyclic Chemicals Ltd.
9	Alps Laboratories Ltd.	55	Datt Mediproducts Ltd.
10	Ambalal Sarabhai Enterprises Ltd.	56	Deccan Ayurvedashram Pharmacy Ltd.
11	American Products Co. Ltd.	57	Dee-Pharma Ltd.
12	American Remedies Ltd.	58	Denis Chem Lab Ltd.
13	Amit Alcohol & Carbon Dioxide Ltd. [Erstwhile]	59	Dental Products Of India Ltd.
14	Amol Drug Pharma Ltd.	60	Desh Rakshak Aushdhalaya Ltd.
15	Amrutanjan Ltd.	61	Dey'S Medical Stores Mfg. Ltd.
16	Anand Synthochem Ltd.	62	Dolphin Laboratories Ltd.
17	Anglo-French Drugs & Inds. Ltd.	63	Dr. Reddy'S Laboratories Ltd.
18	Anmol Drugs & Pharmaceuticals Ltd.	64	Dr. Sabharwal'S Manufacturing Labs Ltd.
19	Anuh Pharma Ltd.	65	Dr. Wellmans Homeopathic Laboratory Ltd.
20	Apple Laboratories Ltd.	66	Dujohn Laboratories Ltd.
21	Apte Amalgamations Ltd.	67	Earnest Healthcare Ltd.
22	Armour Polymers Ltd.	68	East India Pharmaceutical Works Ltd.
23	Arvind Remedies Ltd.	69	Ebers Pharmaceuticals Ltd.
24	Astra-Idl Ltd.	70	Elder Health Care Ltd.
25	Astron Drugs & Inds. Ltd.	71	Elder Projects Ltd.
26	Auro Laboratories Ltd.	72	Elegant Pharmaceuticals Ltd.
27	Aurobindo Pharma Ltd.	73	Endolabs Ltd.
28	B D H Industries Ltd.	74	Everest Organics Ltd.
29	Bal Pharma Ltd.	75	F D C Ltd.
30	Bengal Immunity Ltd.	76	Fine Drugs & Chemicals Ltd.
31	Beryl Drugs Ltd.	77	Fredun Pharmaceuticals Ltd.
32	Bharat Parenterals Ltd.	78	Geno Pharmaceuticals Ltd.
33	Bharti Healthcare Ltd.	79	Glenmark Pharmaceuticals Ltd.
34	Bio-Ethicals Pharma Ltd.	80	Godavari Drugs Ltd.
35	Biofil Chemicals & Pharmaceuticals Ltd.	81	Gran Heal Pharma Ltd.
36	Biowin Pharma (India) Ltd.	82	Granules India Ltd.
37	Blue Cross Laboratories Ltd.	83	Group Pharmaceuticals Ltd.
38	Bombay Drugs & Pharmas Ltd.	84	Gujarat Inject Ltd.
39	Brawn Pharmaceuticals Ltd.	85	Gujarat Lyka Organics Ltd. [Erstwhile]
40	Cadila Healthcare Ltd.	86	Gujarat Terce Laboratories Ltd.
41	Caplin Point Laboratories Ltd.	87	Gujarat Themis Biosyn Ltd.
42	Cepham Organics Ltd.	88	Haffkine Bio-Pharmaceutical Corpn. Ltd.
43	Chemech Laboratories Ltd.	89	Harleystreet Pharmaceuticals Ltd.
44	Cheminor Drugs Ltd.	90	Harshita Ltd.
45	Chemo-Pharma Laboratories Ltd.	91	Herren Drugs & Pharmaceuticals Ltd.
46	Chiplun Fine Chemicals Ltd.	92	Hester Pharmaceuticals Ltd.
93	Hindustan Antibiotics Ltd.	139	Nalin Chemicals Ltd.
94	Hiran Orgochem Ltd.	140	Natco Pharma Ltd.

95	Hulta Pharmaceutical Export Ltd.
96	Ind-Swift Laboratories Ltd.
97	Ind-Swift Ltd.
98	Indian Drugs & Pharmaceuticals Ltd.
99	Indian Medicines Pharmaceuticals Corp.Ltd.
100	Intas Pharmaceuticals Ltd.
101	Invinex Laboratories Ltd.
102	Ipca Laboratories Ltd.
103	Ivee Injectaa Ltd.
104	J B Chemicals & Pharmaceuticals Ltd.
105	J K Pharmachem Ltd.
106	Jagsonpal Pharmaceuticals Ltd.
107	Jayant Vitamins Ltd.
108	Jenburkt Pharmaceuticals Ltd.
109	Jupiter Orga Ltd.
110	Kabra Drugs Ltd.
111	Kamron Laboratories Ltd.
112	Kappac Pharma Ltd.
113	Kaprinas Pharmaceuticals & Chemicals Ltd.
114	Karnataka Antibiotics & Pharmaceuticals Ltd.
115	Karnataka Malladi Biotics Ltd.
116	Kerala Ayurveda Pharmacy Ltd.
117	Konar Organics Ltd.
118	Konkan Capsules Ltd.
119	Kopran Ltd.
120	Krebs Biochemicals Ltd.
121	Leopard Investments Ltd.
122	Li Taka Pharmaceuticals Ltd.
123	Lincoln Pharmaceuticals Ltd.
124	Lupin Chemicals Ltd.
125	Lupin Laboratories Ltd.
126	Lyka Labs Ltd.
127	M J Pharmaceuticals Ltd.
128	Magnum Intermediates Ltd.
129	Maharashtra Antibiotics & Pharmaceuticals Ltd.
130	Makers Laboratories Ltd.
131	Malladi Drugs & Pharmaceuticals Ltd.
132	Max India Ltd.
133	Medi-Caps Ltd.
134	Medicorp Technologies India Ltd.
135	Merind Ltd.
136	Mesco Pharmaceuticals Ltd.
137	Morepen Laboratories Ltd.
138	N G L Fine-Chem Ltd.
141	Natural Capsules Ltd.
142	Network Dyechem Ltd.
143	Neuland Laboratories Ltd.
144	Nicholas Piramal India Ltd.
145	Omega Laboratories Ltd.
146	Orchid Chemicals & Pharmaceuticals Ltd.
147	P C I Chemicals & Pharmaceuticals Ltd.
148	Paam Pharmaceuticals (Delhi) Ltd.
149	Pan Drugs Ltd.
150	Panacea Biotec Ltd.
151	Parenteral Drugs (India) Ltd.
152	Pearl Organics Ltd.
153	Penam Laboratories Ltd.
154	Perk Pharmaceuticals Ltd.
155	Pfimex Pharmaceuticals Ltd.
156	Phaarmasia Ltd.
157	Phar-East Laboratories Ltd.
158	Pharmaids Pharmaceuticals Ltd.
159	Pharmed Chemicals Ltd.
160	Piramal Holdings Ltd.
161	Plant Organics Ltd.
162	Pradeep Drug Co. Ltd.
163	Prudential Pharmaceuticals Ltd.
164	R P G Life Sciences Ltd.
165	Rajasthan Drugs & Pharmaceuticals Ltd.
166	Ranbaxy Laboratories Ltd.
167	Raptakos, Brett & Co. Ltd.
168	Recon Ltd.
169	Rekvina Laboratories Ltd.
170	Relish Pharmaceuticals Ltd.
171	Romeda Chemicals Ltd.
172	Roopa Industries Ltd.
173	Rubra Medicaments Ltd.
174	S O L Pharmaceuticals Ltd.
175	S S Organics Ltd.
176	Samrat Pharmachem Ltd.
177	Sandu Brothers Pvt. Ltd.
178	Sandu Pharmaceuticals Ltd.
179	Sangam Health Care Products Ltd.
180	Sanjivani Parenteral Ltd.
181	Sarvodaya Labs Ltd.
182	Senbo Industries Ltd.
183	Shasun Chemicals & Drugs Ltd.
184	Shilpa Antibiotics Ltd.

185	Shilpax Laboratories Ltd.
186	Shree Dhootapapeshwar Ltd.
211	Triochem Products Ltd.
212	U B Pharmaceuticals Ltd.

187	Shrishma Fine Chemicals & Pharma. (Kar.) Ltd.
188	Sidmak Laboratories India Ltd.
189	Siris Ltd.
190	Smith Stanistreet & Pharmaceuticals Ltd.
191	Smruthi Organics Ltd.
192	Solus Pharmaceuticals Ltd.
193	Southern Herbals Ltd.
194	Span Diagnostics Ltd.
195	Sumitra Pharmaceuticals & Chemicals Ltd. [Erstwhi
196	Sun Pharmaceutical Inds. Ltd.
197	Sunil Synchem Ltd.
198	Supriya Pharmaceuticals Ltd.
199	Suven Pharmaceuticals Ltd.
200	Synbiotics Ltd.
201	Syncom Formulations (India) Ltd.
202	T T K Healthcare Ltd.
203	Tamilnadu Dadha Pharmaceuticals Ltd. [Erstwhile]
204	Taulis Pharma Ltd.
205	Themis Chemicals Ltd.
206	Tonira Pharma Ltd.
207	Torrent Gujarat Biotech Ltd.
208	Torrent Pharmaceuticals Ltd.
209	Trans Medicare Ltd.
210	Transmedica (India) Ltd.
213	U P Drugs & Pharmaceuticals Co. Ltd.
214	U S V Ltd.
215	Unichem Laboratories Ltd.
216	Universal Capsules Ltd.
217	Unjha Formulations Ltd.
218	Vardhaman Laboratories Ltd.
219	Vera Laboratories Ltd.
220	Veronica Laboratories Ltd.
221	Vikram Thermo (India) Ltd.
222	Vitara Chemicals Ltd.
223	Vitara Merven Ltd.
224	Vorin Laboratories Ltd.
225	Vysali Pharmaceuticals Ltd.
226	Wander Ltd.
227	Welcure Drugs & Pharmaceuticals Ltd.
228	Wockhardt Health Care Ltd.
229	Wockhardt Ltd.
230	Yenkey Drugs & Pharmaceuticals Ltd.
231	Yogi Pharmacy Ltd.
232	Zandu Pharmaceutical Works Ltd.
233	Zenith Health Care Ltd.
234	Zim Laboratories Ltd.
235	Zora Pharma Ltd.

1.3.List of FDI Firms Included in the Study

1	Abbott Laboratories (India) Ltd.
2	Alpha Drug India Ltd.
3	Biddle Sawyer Ltd.
4	Burroughs Wellcome (India) Ltd.
5	Ciba Ckd Biochem Ltd.
6	Croydon Chemicals Works Ltd.
7	Duphar-Interfran Ltd.
8	E Merck (India) Ltd.
9	E P I C Enzymes, Pharmaceuticals & Indl. Chemical
10	Fulford (India) Ltd.
11	Geoffrey Manners & Co. Ltd.
12	German Remedies Ltd.
13	Glaxo India Ltd.
14	Global Remedies Ltd.
15	Hoechst Marion Roussel Ltd.
16	Infar (India) Ltd.
17	Intercare Ltd.
18	John Wyeth (India) Ltd. [Erstwhile]
19	Knoll Pharmaceuticals Ltd.
20	Meghdoot Chemicals Ltd.
21	Novartis India Ltd.
22	Parke-Davis (India) Ltd.
23	Pfizer Ltd.
24	Rhone-Poulenc (India) Ltd.
25	Roussel India Ltd. [Erstwhile]
26	Smithkline Beecham Pharmaceuticals (India) Ltd.
27	Strides Arcolab Ltd.
28	Wyeth Laboratories Ltd. [Erstwhile]