FDI in R&D in India: Policy Implications

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ISTIP (Indian S&T and Innovation Policy): First Study of its kind focusing on various dimensions of innovation activity in India; aiming at providing valuable inputs for S&T and Innovation decision making.

Contents

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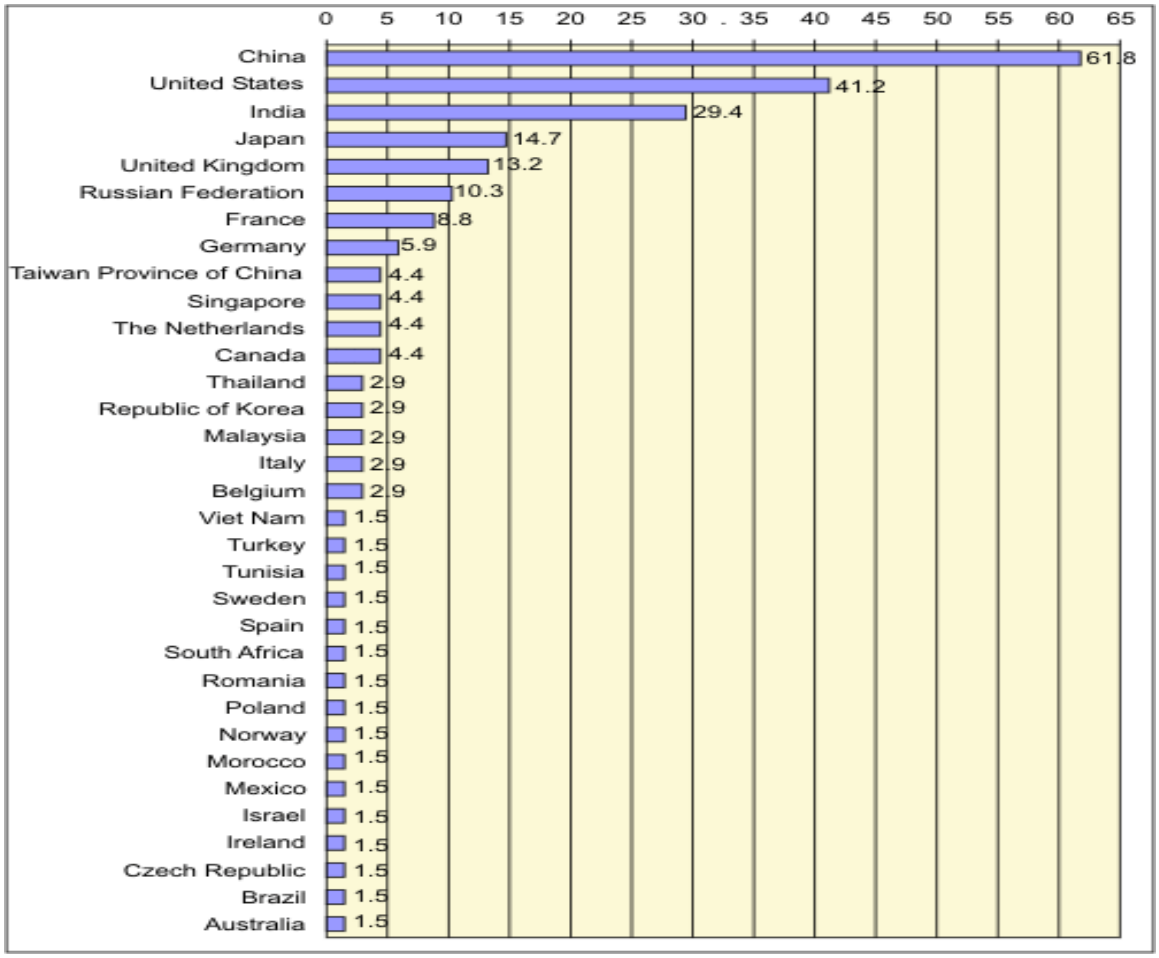
Introduction

R&D Internationalization has brought to forefront the complexities associated with the activities of firms at various global locations. Firms choose a global location to maximize their benefit. The home country or the host country can derive benefit depending upon their strategy and the policies they adopt. A new trend has emerged in the scenario of R&D internationalization, since late 90's, where the world leaders in high tech areas started looking at Asian developing countries, especially India and China as destinations, for setting up their dedicated R&D centres. The UNCTAD survey (Figure 1) shows that India is the third most sought after destination for MNCs R&D investments.

Figure 1: Most attractive prospective R&D locations, 2005–09 (per cent of respondents mentioning the location)



Source: UNCTAD (2005)

What factors have really influenced the firms in their choice for location? The following table (Table 1), which presents the choice of 500 executives on what factors influence them in choosing a particular location, shows that India tops the preference list when it comes to 'access to highly skilled labour force, R&D activities and new opportunities in outsourcing'.

Table 1: Destination of FDI: Choice of the 500 executives

	China	**Euro area**	**Japan**	**Russia**	**USA**	**UK**	**India**	**New EU entrants**	**Brazil**
New consumer markets	49	9	2	5	7	2	9	15	4
Low-cost Labour	**50**	2	0	3	1	0	**29**	12	3
New partnership possibilities	20	22	5	5	14	4	12	14	3
New corporate markets	23	22	3	5	17	3	7	15	4
Access highly skilled labour force	**6**	22	7	3	14	6	**30**	10	2
New opportunities in outsourcing	**16**	9	1	3	7	2	**46**	12	4
Acquisition opportunities	15	20	2	5	13	5	8	22	9
Research and Development activities	**11**	20	5	4	22	7	**24**	6	3
Greater efficiency in supply chain	17	26	6	2	22	5	10	9	3

Source: Economist Intelligence Unit (2004)

This new trend has raised questions about the impact of MNCs R&D activities on host country's innovation system, especially in the context of the emerging economies.There are two distinctly differing views on MNCs R&D activities impact on the host country innovation system:

1. The foreign R&D centres can be into high-end R&D and through activities and linkages with the local institutions can transfer new knowledge and help the host country in enhancing its technological capabilities. They can also facilitate the entry of the host country institutions into the global R&D network. In this process MNCs can have access to the host country's knowledge system, where the firm gains knowledge for its benefit.

2. The other view is that the MNCs R&D activity in the host country is not significant in comparison to its global R&D activities. They have their R&D centres in the host country to have access to the human resource and other S&T infrastructure to cater to their global R&D requirements. They may not be linked to the host country institutions for long term-collaborative R&D activities.

India, being one of the most sought after destination for MNCs R&D centres, raises several issues pertaining to what attracts MNCs to Indian soil for setting up their R&D centres? What are those new favorable factors that have made India one of the most attractive destinations for the MNCs to set up their R&D centres? Is it the market, the S&T infrastructure, the policy or the human resource? Are these centres integrated with the Indian institutions? What type of R&D activity is undertaken in India by the MNCs R&D centres?

From the perspective of the host country, the issues that need attention are- how India as a host country can maximize its benefit from the R&D activities of the MNCs? How the R&D activities of MNCs can be channelized to integrate with the Indian innovation system? What are the policy implications? This Bulletin presents insights in this regard. The Bulletin begins with an overview of FDI flow for R&D in section 1 followed by the direction of flow in section 2. Section 3 presents highlights on the gains of India from FDI in R&D and section 4 is on the most important aspects of knowledge spill over through linkages and finally the section 5 deals with issues for policies to maximize gains from MNCs R&D.

1 FDI Flow for R&D in India

In India, in 2003, the number of MNCs R&D centres were 100, which has increased to 706 by the end of 2009 (TIFAC 2003, CSIR-NISTADS-TIFAC 2011). A total of 706 firms have brought FDI investments to India for R&D activities during 2003-2009.

1.1 Investment for R&D – large Number of Small Investments

The following table (Table2) presents the investment range of the total number of MNCs investing in India for their R&D activities. It clearly shows that there are large numbers of small investments. Almost 86% of the investments are less than US$50mln. R&D in the high Tech areas is associated with very high expenditure. The developing economies may not have resources enough to enter into such research areas. The small size investments from MNCs in R&D in India are also not adequate to augment the Indian R&D resource in the high tech areas.

Table 2: Number of firms in various investment Range during 2003-2009

Investment Range in MlnUS$	No of Firms
0-<1	60
1-10	186
10-<20	177
20-<30	117
30-<40	52
40-<50	17
50-<100	37
100<500	53
500and above	7
Total	706

Source: CSIR-NISTADS –TIFAC STUDY 2011

1.2 Is the flow of FDI for R&D in India significant in the context of FDI inflow?

The following table (Table3) gives the distribution of FDI for R&D investments, as a percentage share of total FDI inflow over the years. Overall share is around 8.25. Total number of FDI investments for R&D received during 2003-2009 was 964 from 706 firms.

Table 3: Number of R&D investments by MNCs and its Percentage share in the total FDI inflow

Year	Number of Investments	Number of Source countries	R&D Investment (In bln US$)	Share in Total FDI Inflow	Number of sectors getting the investments
2003	103	13	2.18	11.02	19
2004	182	15	3.19	8.68	17
2005	140	13	2.66	9.68	13
2006	192	23	10.63	11.93	22
2007	131	16	3.37	5.93	17
2008	114	23	3.61	4.48	23
2009	75	13	3.56	9.45	22
Not Specified	27	16	0.02		13
Total	964		29.22	8.25	

Table 4: Relative sectoral share of FDI in R&D in total FDI

Sector	Sectoral share of Total FDI in R&D	Sectoral share of FDI in total FDI
Aerospace	12.52	3.26
Auto industry	9.27	8.7
Pharma Biotech	9.72	1.4
Real estate const	0.00	11.33
Mach and equip	3.01	1.86
Chemicals	1.25	1.54
Electronic Components	2.56	1.99
Engines & Turbines	0.35	2.4
Services	2.62	5.16
Tourism and entertainment	0.14	3.1
Metal and mineral	0.18	27.01
Software and IT	50.36	13.79
Transportation	0.00	6.62
Warehousing & Storage	0.00	5.1

Sector	Sectoral share of Total FDI in R&D	Sectoral share of FDI in total FDI
Others	7.02	6.73
Total	100	

Source: CSIR-NISTADS TIFAC Study 2011

Table 4, reveals a few interesting features of FDI in R&D in India. The table compares the share of a sector in total FDI with share of the same sector in FDI in R&D. What we get is that the Aerospace sector which has 3.26 % share of total FDI has share of 12.52% of total FDI in R&D. Software and IT sector which has 13.79% share in FDI also has a 50.36%. Share of total FDI in R&D. Highest FDI inflow sectors aremetal and minerals (27.01%), and real estate and construction (11.33%). These sectors, however, do not have any R&D investment from MNCs.

2 Direction of FDI in R&D: Are MNCs chasing growth?

Table 5 throws light on the sector preference of the MNCs investing in R&D. As expected Software and IT sector attracted most of the FDI in R&D, this was followed by US$3.62 bln in Aerospace industry. Other significant sectors are Auto industry and Pharma-Biotech industry. These sectors and clusters (mainly, Bangalore, Hyderabad, Chennai, Mumbai/Pune etc) are high growth areas in India. The relative share of FDI in total FDI in R&D is high for Software and IT services sector, followed by Pharmaceuticals/Biotechnology and Automotive industry sectors. Roughly 70 % of the inflow has come in these three sectors (Table 5). The direction of the flow of this FDI is in certain select clusters such as Bangalore, Hyderabad, Chennai, Mumbai/Pune and Delhi/NCR accounting for around 88% of inflow in these sectors. During the span of six years from 2003 to 2009, out of a total number of 706 MNCs investing in R&D in India, 560 are in these three sectors, of which 495 are in the select clusters.

It therefore, appears that MNCs investing in R&D in India are mainly chasing the sectors witnessing high growth, namely, Software and IT, Pharma-biotech, and Auto industry.

Table 5: Sectoral pattern of FDI in R&D (Bln. US$)

Sector	2003	2004	2005	2006	2007	2008	2009	Total
Aerospace	0.02			3.25	0.02	0.23	0.1	3.62
Auto industry	0.08	0.12		0.47	0.66	0.59	0.76	2.68
Pharma Biotech	0.04	0.12	0.45	1.11	0.31	0.43	0.35	2.81
Mach and equip	0.11	0.15	0.13	0.18	0.2	0.1		0.87
Chemicals	0.03		0.01	0.02	0.22	0.02	0.06	0.36
Electronic Components	0.33		0.05	0.03	0.03	0.15	0.15	0.74
Engines & Turbines	0.02			0.02	0.02	0.01	0.03	0.10
Services	0.009	0.37	0.02	0.009	0.09	0.03	0.23	0.76
Metal and mineral	0.03	0.08		0.13	0.02	0.01	0.07	0.34
Software and IT	1.43	2.21	2.12	4.96	1.7	1.74	0.4	14.56
Others	0.09	0.13	0.04	0.15	0.03	0.2	1.39	2.03
Total	2.19	3.18	2.86	10.33	3.3	3.51	3.54	28.91

Source: CSIR-NISTADS-TIFAC Report 2011

Table 6: Sector and cluster-wise Breakup of the FDI in R&D inflow

Number of MNCs investing in R&D	706
Number of MNCs in select sectors	560
Total number of MNCs in select clusters and sectors (IT, Pharma and automotive sectors)	495
Share of the select sector in total FDI in R&D	69.47%
Share of the select clusters in the total FDI in R&D	88%

Source: CSIR-NISTADS-TIFAC Report 2011

3 Is FDI in R&D elevating India's R&D output?

To see the productivity in MNCs R&D, a comparative scenario of their global and Indian patents is presented in Table 7. It is to be noted that out of 706 companies investing in India, only 74 companies have patents. Again the software and IT sector has the major share (54 companies). These 74 companies together have 214686 global patents. And only 1166 of those patents are from India. Again software and IT sector

shares 749 of 1166 patents from India. Another interesting revelation from the table is that 63 firms out of 74 have less than 5% share of Indian patents vis-a-vis their global patents. Table 7 suggests that MNCs Indian R&D initiatives till now do not see much importance given the scale of their global activities.

Table 7: Patenting behavior of firms brining FDI for R&D

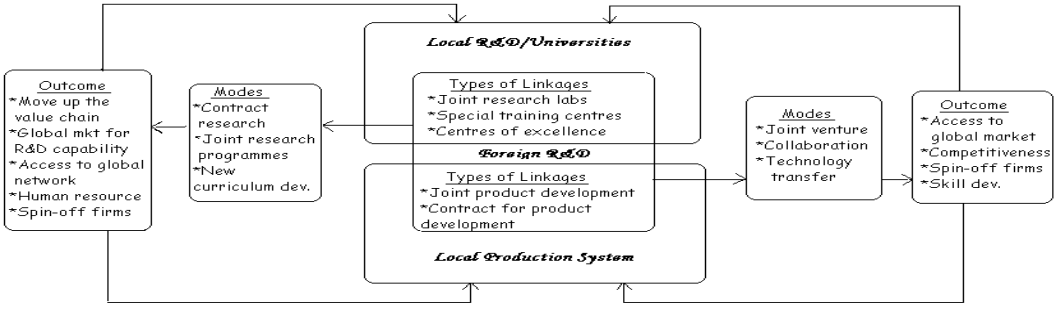
Sectors	No. of R&D FDI Cos	Patent from India	Global patent	No. of Cos having % share of patent from India in respective total global patent				
				<1	1<5	5<10	10<50	>50
SW and IT	54	749	129385	22	21	4	3	4
Pharma and Bio	4	19	3413	3	1			
Auto	3	5	12460	3				
Mach and Equip	5	47	12583	4	1			
Electronic components	1	1	338	1				
Metals and minerals	1	5	1992	1				
Chemical	3	4	6285	3				
Others	3	336	48230	2	1			
Total	74	1166	214686	39	24	4	3	4

Source: CSIR-NISTADS-TIFAC Report 2011

4 MNCs Linkages with Indian Institutions- Integration or isolation?

The nature type and extent of linkages between MNCs R&D centres and the host country institutions provides the clue to understanding the impact of MNCs R&D activities on host country innovation system. The following fig (Figure 2) is the stylized presentation of the impacts of FDI in R&D, as reflected in literature. Why a firm chooses one mode of linkages and how it leads to the outcome are unknown territories. By outcome we mean outcome in favour of the host countries, which happens only when it ensures MNCs' own benefits, which is not known.

Figure 2: Desirable flow of benefits from foreign R&D centers to host countries



Source: Mrinalini N and Sandhya Wakdikar (2008): "Foreign R&D centres in India: Is there any positive impact?" Current Science, 91(4), p452-458.

The overlap space is the linkages between the MNCs R&D centres and the Indian R&D and Production system. The efficacy of the foreign R&D is finally to be justified by its spill over to the remaining space outside the overlaps. It is essential to probe the linkages and to delineate the process of change that is taking place in the Indian innovation system. The direct benefits that are accruing to the institutions and organizations having linkages with foreign R&D centres and the extent of the spill over effect need to be investigated.

4.1 The Indian Scenario

Extent and nature of linkages of MNCs R&D with Indian Agencies are as follows (refer table 8):

- Out of 706 firms, only 117 (16.57%) firms have various forms of linkages with the actors in Indian innovation and technology/knowledge generation system, namely, educational institutions, R&D institutions and domestic firms.
- Out of 117 firms 96 (82.05%) are from the three selected sectors, i.e., Software and IT industry (62, 13.84% of the total FDI in R&D firms), Pharma and bio-technology industry (29, 33.72% of total FDI in R&D firms) and Auto industry (5, 19.23% of the total FDI in R&D firms).

Table 8: Linkages of MNCs with Indian actors

Sector	Educational Institutions	Research Institutions	Indian firms	Total
Aerospace	-	2	2	4
Auto Industry	2	1	5	8
Chemicals	-	2		2
Electronic components	-	1		1
Machine and equipment	-	1	1	2
Others			2	2
Pharma-BioTech	1	3	27	31
Software and IT services	43	8	47	98
Total	46	18	84	148

Source: CSIR-NISTADS-TIFAC Report 2011

Nature and Type of such linkages are as follows:

- ✓ All the MNCs have linkages with educational institutions; recruitment of manpower remains the most visible reason.
- ✓ The firms in Software and IT services sector have more intensive interactions with educational institutions in comparison to Pharma-Biotech and Auto industry sector.
- ✓ MNCs in Software and IT services: Formal collaborations with premier educational institutions for students' capability enhancement, collaborative research work, internships and fellowships to meritorious students, hand on experience with tool kits, joint centres for research work and students training, curriculum development, professorial chair.

- ✓ With local educational institutions (mainly engineering colleges), Curriculum development, Training programmes to both the teachers and students, setting up certain specialised courses, distribution of tools and kits to students for hand on experience.
- ✓ MNCs hardly have linkages with the research institutions, the academic institutions are preferred for research collaborations.
- ✓ Apart from funding research projects there are cases of MNCs investing in R&D institutions for upgradation of research infrastructure and in some cases jointly developing research labs for defined purposes. As expected the Software and IT sector is most active in R&D collaborations. In cases of Pharma-biotech and Auto sectors it is mostly limited to joint research projects.

5 Issues for policies to maximise gains from MNCs' R&D

The policy broadly needs to focus on those parameters that can facilitate to derive maximum benefit to host country innovation system by MNCs R&D activities. The broad understanding that emerges with regard to MNCs R&D activities and their interaction with Indian institutions bring to focus some of the issues which needs to be addressed to arrive at certain policy measures for utmost benefit for the host country, in this case India.

Issues that needs attention from policy perspective

- ➢ There are large numbers of small investments by MNCs for R&D in India. Almost 86% of the investments are less than US$50mln. There is a need for monitoring the purpose of R&D investment by MNCs.
- ➢ A total of 706 firms bring FDI for R&D, which is just 8.25 % of total FDI inflow
- ➢ The linkages pattern reveals that MNCs adopts various modes for accessing the resources – essentially human resources.

- As such linkages that could create gains for the host are rare. Most of the MNCs R&D is working in isolation – so far their R&D activities are concerned. The scope of skill development and knowledge flow is negligible.
- The patent data also supports that the R&D of the MNCs R&D centres is not significant in India.
- The IT sector has produced a few spin-offs by the employees of the R&D centres. A few such firms engaged in chip designing suggested that they cannot grow beyond a point because in the absence of the domestic market their survival and growth depends on the innovations in other countries.
- The impact can be understood as default or as strategic. The default impact is the trickled down positive impact – as has been observed in cases of a few educational institutes and firms becoming more technology conscious. Strategic impact requires close monitoring of FDI and FDI in R&D.
- The negative impact is through creating resource crunch. Resource crunch is mainly felt when the prices of resources (like qualified skilled manpower for R&D for domestic innovation system) increase because of higher demand conditions created through the presence of MNCs.

NOTE: This is based on a Study on "Impact of FDI in R&D on Indian R&D and Production Systems" (2011), By CSIR-NISTADS and Supported by TIFAC

Sources:

1. CSIR-NISTADS-TIFAC Study (2011) on "Impact of FDI in R&D on Indian Production and R&D System"
2. Economic Intelligence Survey, Economist Intelligence Unit, The Economist World Investment Prospects, 2004.
3. UNCTAD, World Investment Report 2005, United Nations.

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