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Foreign Direct Investment and Technological Change in India

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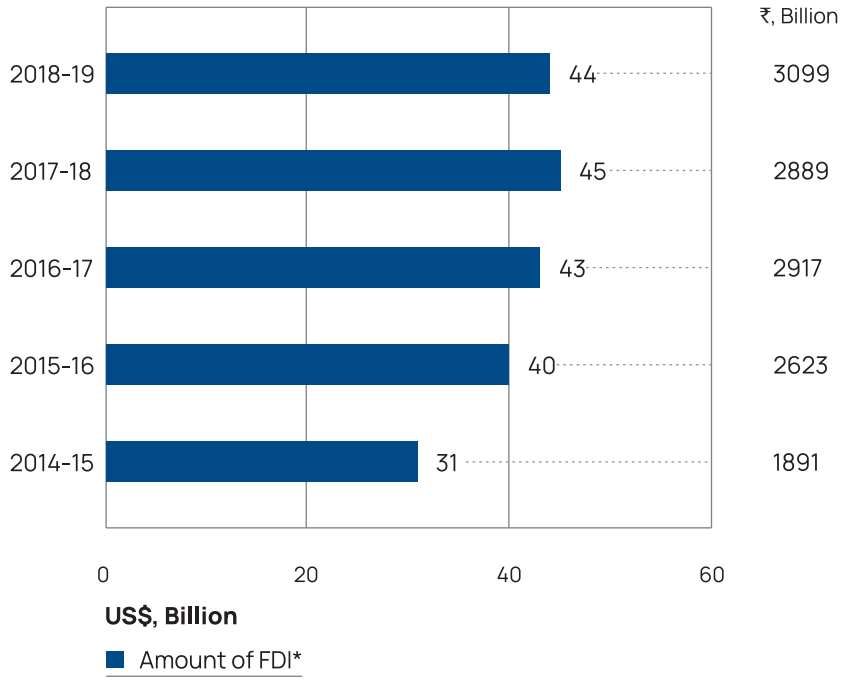
This piece leverages data contained in this volume to raise some issues relating to FDI and technological change. The core arguments are essentially based on the analysis undertaken by the author for a forthcoming book tentatively titled Innovation and Public Policy – Imperatives for India to be published by Penguin Random House. The book provides a review of the literature relevant for the issues raised here. In order to avoid cluttering the text, only those references are cited here which provide additional data that complements the information contained in this volume.

Foreign direct investment (FDI) flows into India have increased dramatically in the last two decades. Even during the last five years, the increase in flows has been significant: the FDI inflow in 2018-19 was USD 44 billion as compared to USD 31 billion in 2014-15.

Figure 1 Annual Foreign Direct Investment Equity Inflows into India (2015 - 2019)

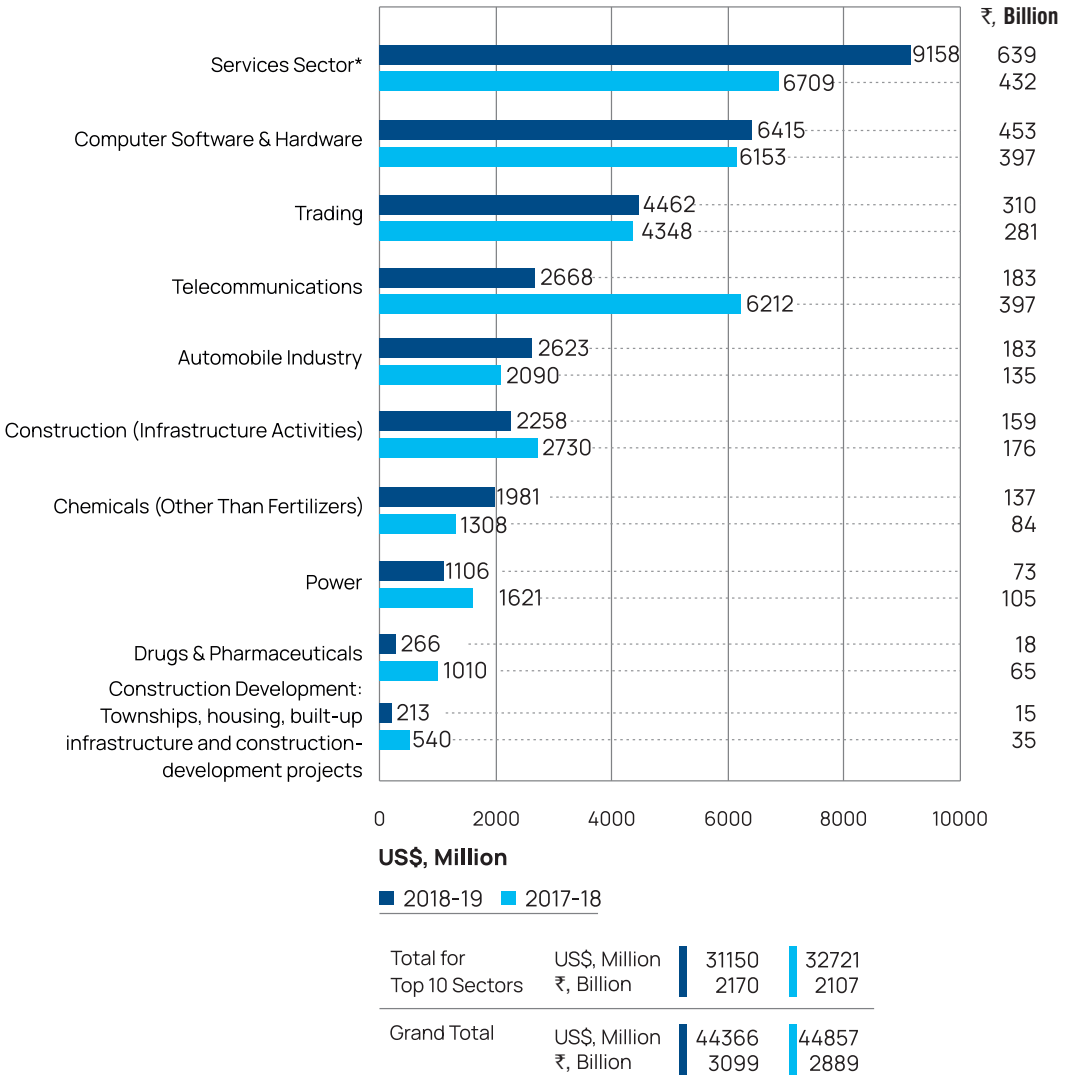


*Does not include reinvested earnings and other capital. This amounted to around 17.6 billion in 2018-19

Source: Department for Promotion of Industry and Internal Trade (DPIIT), Government of India, Quarterly FDI factsheet, June 2019; Center for Technology, Innovation and Economic Research (CTIER)

FDI is expected to provide productivity benefits to the host economy through a variety of processes. Entry of multinational corporations (MNCs), typically associated with liberalization of FDI policy, provides an additional source of competition for the host country firms. Such competition effects can drive host country firms to undertake innovation and other productivity enhancing measures to meet the competition. Apart from enhancing competition, the entry of MNCs can also result in flows of new knowledge as the multinational firms bring with them new technology and advanced managerial practices as they begin their operations in the host economy. As host country firms get exposed to this new knowledge, they can learn from it and improve their own technological capabilities. This technology spillover driven process of learning is often referred to as contagion effect. Since FDI affects both

Figure 2 FDI Equity Inflows into India by Sector (2017-18 and 2018-19)



Total for Top 10 Sectors	US$, Million	31150	32721
	₹, Billion	2170	2107
Grand Total	US$, Million	44366	44857
	₹, Billion	3099	2889

Source: S&T Indicators Tables, Research and Development Statistics 2019-20 available at https://dst.gov.in/sites/default/files/S%26T%20Indicators%20Tables%2C%202019-20.pdf; Department of Science and Technology (DST), Government of India, Research and Development Statistics 2017-18, December 2017; Centre for Technology, Innovation and Economic Research (CTIER)

Note: (i) Figures in rupees were converted to dollars using the USD-INR exchange rate of 61.1 calculated as an average for the fiscal year 2014-15, and USD-INR exchange rate of 64.46 calculated as an average for the fiscal year 2017-18 based on data from Federal Reserve Bank of St Louis.

(ii) Total Central Government R&D Expenditure includes R&D Expenditure by Select Major Scientific Agencies and R&D Expenditure by Central Ministries/Departments other than Major Scientific Agencies.

(iii) Total National R&D expenditure for 2014-15 has been updated as per the latest figures released by DST.

competition and contagion conditions in the host economy and changes in these conditions have the potential to influence domestic firms' decisions with regard to technology, one needs to understand which activities of MNCs are important for affecting these conditions and how.

One obvious proposition can be that impact of FDI is likely to be more in those sectors wherein the flows have been significant. For example, in 2018-19, the FDI flows were the highest in the service sector, followed by computer software & hardware, trading, telecommunications and the auto-sector. But FDI flows fluctuate from year to year. In 2017-18, for example, the size of flows was not very different for the services sector, computer hardware & software and telecommunications while in 2018-19, the service sector was significantly ahead of others in attracting FDI. Therefore, the cumulative flows of the last few years would provide a better indication of the sectors that have been affected more by MNC entry. In general, contagion effects are contingent on the new technology or knowledge flows that are associated with investment flows. Thus, if the sectors are technology intensive or hi-tech, the chances of MNCs bringing new technology with investment are high; low tech sectors may not obtain such technology flows. As such, many segments within the top 10 sectors in India receiving FDI inflows in recent years are likely to be technology intensive but a more disaggregated analysis of flows within each sector would be needed to get a clearer picture.

As is the case for sectors, one can argue that the impact of FDI would be more significant in regions where the investment flows are concentrated. This is so because proximity of domestic firms to MNCs also helps in observing firm practices, building linkages and therefore in the overall learning process. In 2018-19 Maharashtra was the top recipient of FDI inflows, followed by the Delhi region and Karnataka.

Once again, annual inflows of FDI may vary across states as is evident from the fact that in 2017-18, Karnataka received more inflows than the Delhi region which was not the case in 2018-19 Cumulative FDI inflows during a recent period into a region would provide a measure of the potential of contagion and competition effects of MNC entry in various regions as well.

Table 1 FDI Equity Inflows into India by Sector - Top 10 based on 2018-19

No.	Sector	2017-18 (₹, Billion)	2017-18 (US$, Million)	2018-19 (₹, Billion)	2018-19 (US$, Million)
1	Services Sector*	432	6709	639	9158
2	Computer Software & Hardware	397	6153	453	6415
3	Trading	281	4348	310	4462
4	Telecommunications	397	6212	183	2668
5	Automobile Industry	135	2090	183	2623
6	Construction (Infrastructure Activities)	176	2730	159	2258
7	Chemicals (Other Than Fertilizers)	84	1308	137	1981
8	Non-conventional Energy	78	1204	101	1446
9	Information & Broadcasting (Including Print Media)	41	639	89	1252
10	Power	105	1621	73	1106
	Total for top 10 sectors	2126	33013	2327	33370
	Grand total	2889	44857	3099	44366

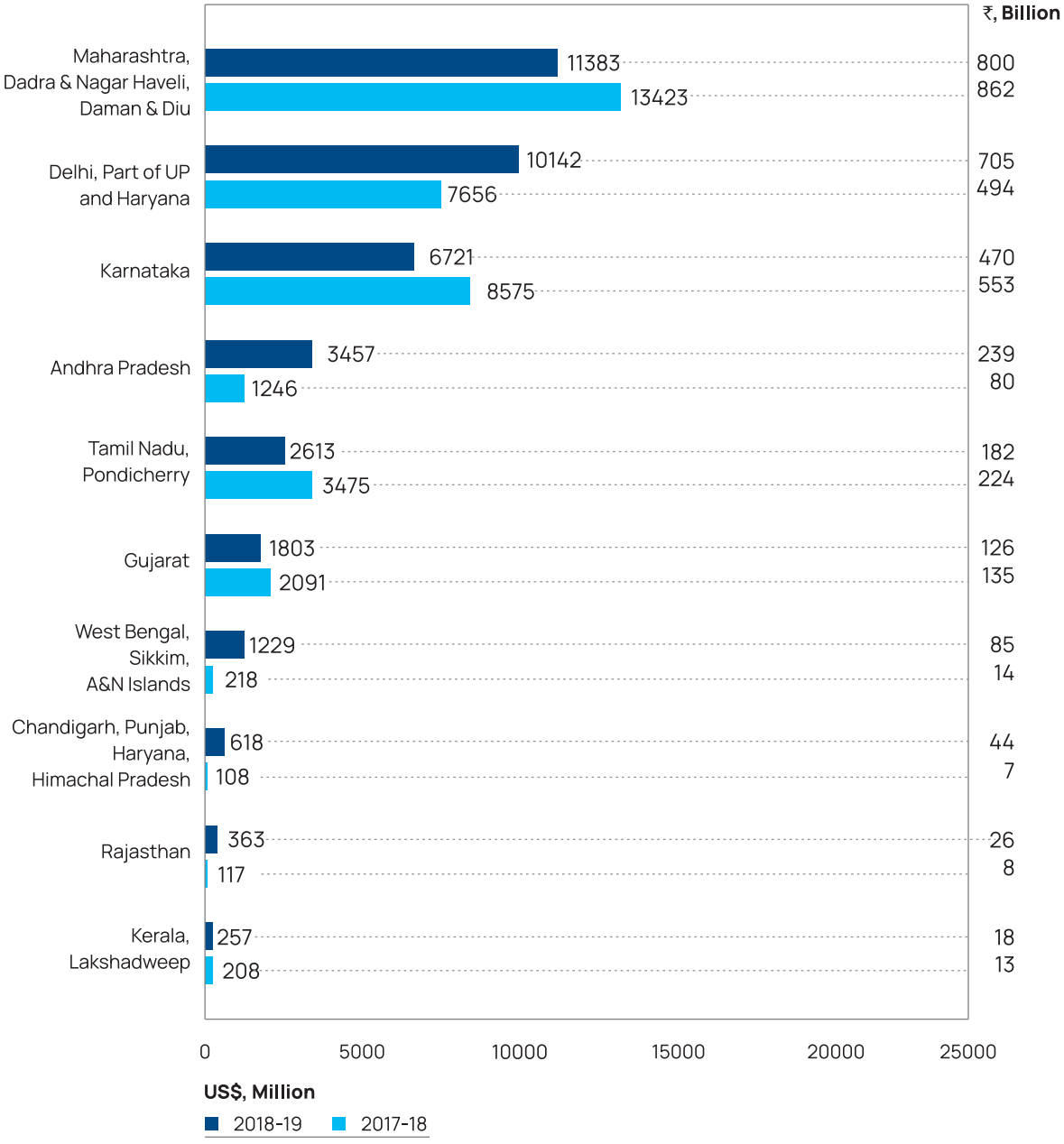
*Services sector includes Financial, Banking, Insurance, Non-Financial / Business, Outsourcing, R&D, Courier, Tech. Testing and Analysis

Source: Quarterly FDI factsheet, Department of Industrial Policy and Promotion (DIPP), (various years); Center for Technology, Innovation, and Economic Research (CTIER)

If contagion effects are dependent on geographical proximity as is the case in situations when MNC practices need to be observed closely or when knowledge flows take place through local linkages, states with higher FDI may benefit more from such spillovers than others. This will be particularly the case when the knowledge is tacit in nature and difficult to transfer through non-personal market interactions. Competition effects may, however, be more widespread and not restricted to the host state as markets for MNC products are likely to be national. Of course, knowledge spillovers from MNC activity may also cross state borders if they build linkages with entities in other regions and knowledge gets disseminated through other processes like employee turnover.

While estimates of cumulative inflows of FDI in recent (say 3-5) years in a region or an industry provide an indication of the potential impact of MNC entry in a sector or a region, other features of MNC entry may also influence the nature of contagion and competition effects. Typically, Greenfield investments by MNCs are more likely to result in higher competition and contagion effects as compared to brownfield ones or

Figure 3 Foreign Direct Investment into India for Select States (2017- 18 and 2018- 19)



Source: Department for Promotion of Industry and Internal Trade (DPIIT), Government of India, Quarterly FDI factsheet, March 2019; Centre for Technology, Innovation and Economic Research (CTIER)

MNC entry through mergers and acquisitions (M&A). This is so because Greenfield investments create new productive capacity that increases market supply and new vintages of technologies are more likely to be brought in if MNCs use this mode of entry. This does not mean that MNCs will not bring in new knowledge if the investments are being made in brownfield projects or entry is taking place through M&A. New knowledge may be necessary to address local competition if competition provided by host country firms and their technological capability is high. The decision to bring in new technology may also vary with type of MNC ownership as foreign firms may worry about their technology getting leaked to local competitors. In general, the potential of such knowledge leakages is low if a MNC is operating through a wholly owned subsidiary as compared to a joint venture or equity alliance as the MNC may have more control over its knowledge in the first case as compared to the latter two. Thus, more knowledge may get transferred to a wholly owned subsidiary due to lower appropriability concerns and JVs or equity alliance may provide more opportunities for the domestic partners to learn, even though learning (spillover) potential may be less, given the lower quantum of knowledge flows.

The available data suggests that share of greenfield investments in FDI into India showed a declining trend after 2000 till about 2013 and M&As were the preferred mode of entry by MNCs during this period. (Rao and Dhar, 2018) There seems to be some movement towards greenfield projects since 2014 and about 40 percent of FDI came through this route during the last six years. (Anand, 2020) While the share of FDI in manufacturing increased in 2000s, a large part of these inflows were through M&A. However, the share of FDI in high-tech manufacturing sectors was only about 27 percent of total FDI in manufacturing during 2003-14 and more than 80 percent has come through the M&A route. The situation has not changed in recent years. (Rao and Dhar, 2018) Moreover, even within manufacturing, often the focus seems to be on assembly of products for sale in the domestic markets with little interest in exports.

The knowledge flows associated with FDI and the resulting learning opportunities are also dependent on the activity in which the MNC is involved. These activities can be quite diverse and include setting up an R&D facility, undertake contract R&D in the host nation, assemble products or set up manufacturing facilities. MNC involvement can also

be restricted to marketing and distribution. In all these activities, the contagion effects would depend the nature of linkages that MNCs build with the host nation agents. Typically, a focus only on marketing and distribution is less likely to entail significant knowledge spillovers. Such contagion potential increases with MNCs undertaking manufacturing and R&D activities, although foreign firms may make efforts to reduce leakages of knowledge especially from their R&D activities. Broadly then, MNC participation in 'low-end' activities would typically result in limited knowledge flows to the host country adversely affecting the learning potential of their entry. Very little, however, is known about the linkages the MNCs have built within India in recent years and their involvement in training and other capability building activities is also not known. Given this lack of information, it is difficult to ascertain if knowledge flows through FDI have facilitated capability building among domestic firms.

While the discussion above regarding the potential role of FDI in creating technological change in host countries makes intuitive sense, empirical results on the impact of various characteristics of FDI, have not been always consistent across studies, even among the few that have focused on India. Apart from differences in host country contexts and methodological issues, one of the key reasons for these inconsistent results is the non-availability of appropriate data. As mentioned, information on the nature of linkages (backward, horizontal, forward) is usually not available. Besides, the role of FDI also varies with time and analysis of dynamic relationship between FDI and technological change in the host country is even more complex and data intensive than short-term analyses. But one result that has been consistent across studies in various countries has been that absorptive capacity of the host country firms is critical for benefiting from MNC entry. If the technology gap between the host country firms and the MNC is very high, both the contagion and competition effects work against the host country as its firms are neither able to learn from nor compete with the multinationals. A corollary of this argument is that while MNCs can provide opportunities for transfer of technological information in the host country through their activities, they may not build technological capabilities to understand this information well. Building of such capabilities require local technological efforts. The available data on India suggests that its R&D intensity (R&D expenditure to GDP ratio) is lower than developed nations and many emerging economies like Brazil, Taiwan, South Korea, Israel and China.1 It has also not seen any significant increase in recent

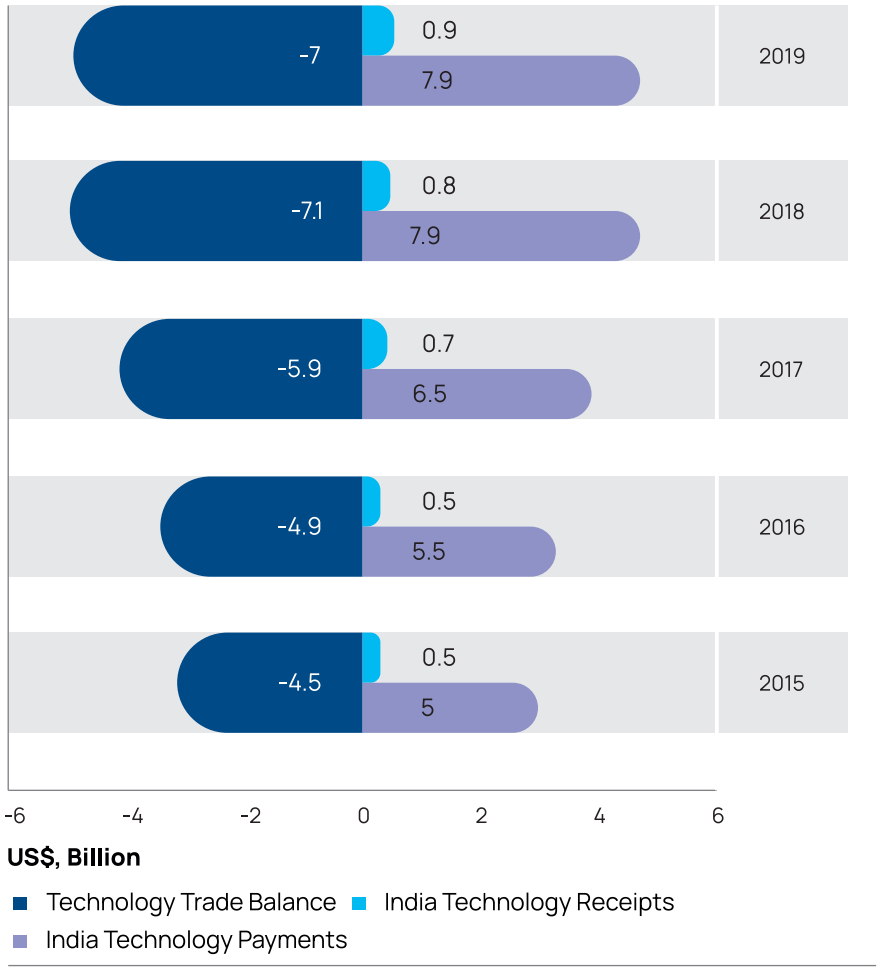
years. Besides, the business enterprises contribute a significantly lower share in India's R&D as compared to other nations.

Evidently, enterprises in India are not making enough investments in building local capabilities so that they can benefit from MNC presence and effectively compete with them. It is possible that the Indian corporate sector is trying to build such capabilities through foreign technology imports which have become easier after the onset of the economic reforms. The aggregate data suggests significant increase in such imports in recent years. Overall, however, it is difficult to discern a clear pattern in the strategies followed by the Indian business enterprises to deal with contagion and competition effects unleashed by the entry of MNCs. More research with better data is needed to understand this area better.

While R&D intensity and other technological activity may not be very high in India, there is ample evidence of research capacity which has attracted MNCs to set up R&D centers in India. Such MNC presence has increased significantly in recent years and their R&D investments have been on the rise Usually, MNCs create overseas R&D facilities to adapt their products for local markets, benefit from local research expertise and build global networks of research collaboration. The nature of activity undertaken by the R&D labs in the host country affects the flows of knowledge and the consequent impact on local innovation capabilities. Typically, an adaptation focus might link the work of the MNC lab to local markets and result in local knowledge flows. If the R&D lab is an important component of the MNC's global R&D efforts, the level and complexity of R&D activity may be high but flows of knowledge within the host economy may be low if the R&D activity is only integrated with the core R&D efforts of the parent company with no local linkages.

Some evidence suggests that till recently the projects performed in these R&D centers in India were small and of short duration, focusing on the labour intensive tasks relating to the MNC's global R&D needs. The linkages of these centers with local entities were limited and they mainly sought support from the global business units of the MNC. (Basant and Mani, 2012) Consequently, knowledge spillovers for the local economy may have been rather limited due to the limited interaction with local entities. Recent developments, however, suggest that the centers in India are not only used for its low cost of operations but also for developing technologies for markets like India. (Nabar, 2018) It is not yet

Figure 4 India's Technology Trade Balance (2015 - 2019)



Source: Reserve Bank of India (RBI) Balance of Payment (various years) available at https://rbi.org.in/scripts/SDDS_ViewDetailsaspx?Id=5&IndexTitle=Balance+of+; Centre for Technology, Innovation and Economic Research (CTIER)

Note: Figures reported above are calculated for calendar years. The Reserve Bank of India (RBI), Balance of Payment, captures fiscal year data on Charges for the Use of Intellectual Property (CIP). CIP for the fiscal year 2018-19 was USD 8 billion and for the fiscal year 2019-20 was USD 7.7 billion.

known if this shift in the market orientation of the research undertaken by the MNC R&D centers has resulted in changes in the nature of their domestic linkages. Limited evidence that is available does not suggest that such a shift has taken place. (Mani, 2020) Besides, no information is available on the circulation of R&D personnel from these centers to other enterprises.

Overall, it is very difficult to assess the impact of MNC activity on technological change in India. Till recently, MNCs have not entered in high-tech areas in any significant manner, nor have they been very active in creating state of the art green-field projects. One can argue, therefore, that the opportunities to learn through contagion effects, have been somewhat limited. The competition effects of MNC entry, however, are likely to be high. The ability of domestic firms to respond to this competition through innovation is unknown but no significant increase in R&D efforts suggests that the response of domestic firms to MNC competition is not built around enhancing research capacity through own research efforts. Since most studies show that good absorptive capacities of domestic firms and of the regions where MNCs are located are preconditions for benefits to accrue from competition and contagion effects, lack of such efforts does not augur well.

Table 2 Global MNCs having R&D Presence in India

Firms	Total R&D Expenditure (US$, Billion)	Share in Total of Top 2500 (%)
Top 2500 global R&D firms	947	100
Top 100 global R&D firms	497	52
92 global R&D Spenders (in top 100 with presence in India*)	465	49
65 global R&D Spenders (in top 100 with R&D centres in India)	350	37

*in the form of either an R&D Centre or a subsidiary

Source: EU Industrial R&D Investment Scoreboard (2019); Ministry of Corporate Affairs (MCA); Various News reports; Company Websites; Centre for Technology, Innovation and Economic Research (CTIER)

Note: Exchange rate used for calculation is from EU Industrial R&D Investment Scoreboard (2019) as on 31st December 2018; 1 EUR = 1.15 USD

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