

MULTINATIONAL FIRMS – ESTABLISHING LOCAL R & D - PRODUCTION LINKAGES IN THE INDIAN CONTEXT

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Abstract

A primary motivation for monetisation of knowledge is the development of suitable linkages that enable commercial exploitation of the utility embodied in an inventive product or process. While much has been said about what monetisation is and its significance, relatively less is said of the interdependencies that produce it and the mechanisms underlying it i.e. knowledge transfer. A current shift of Innovation activities towards emerging economies has highlighted the importance of the value chain processes and the elements that support monetisation. Undoubtedly, Multinationals have emerged as key actors, but questions remain whether domestic firms and the Informal Sector comprising the bulk of Industrial output in India have been able to move up the value chain ladder or not. This is attributed to piecemeal technological upgrading efforts, together with a relatively reduced emphasis on employing innovative products and processes, seen in practice. The latter is on account of excessive dependence on external sources of information, with limited learning opportunities. The Paper seeks to identify the missing links to enable the benefits derived from participation in global value chains.

Keywords: *Global Value Chains, Linkages, Technological Capability, Learning Opportunities, Technological Effort and Upgrading.*

EXTENDED SUMMARY

A key motivation accorded to monetization of knowledge assets is the formation of linkages to actualize various stages of the technological value chain, namely innovation and production. Ironically, in the real world, the inventor is often not the one who commercializes the invention. An understanding has also emerged that the transaction costs for the same and spillovers of the globalization process needs to be managed in a manner, conducive to the economic system of the country. The onslaught of Foreign Direct Investment has been there for local Industries to overcome this global competition and survive. Thus, innovation has become more and more crucial for them, as opposed to low technology and labour intensive production. Here, the classical dilemma surrounding knowledge flow, both in terms of codification and the tendency of firms to evolve on the same attains importance. A view emerges that knowledge- both codified and uncoded can move through the mechanism of local “buzz” and global “pipelines”. In short, the global needs to converse with the local and vice versa. This can be done, in the short and medium term (through generation of complementary assets) by focusing on production, as a means to internalize monopoly asset advantages of foreign players, by integrating into value chains. But this is easier said than done. The Informal sector in this country accounts for a majority of the Industrial output and therefore it’s being able to leverage the Knowledge assets is essential to it’s success and yet the most

difficult to achieve. In this context, multinationals emerged as important actors since the 1980s. However, today as we move forward in providing two way technology transfer, as opposed to a unidirectional one, we need to reflect on the efficiency with which policy is enhancing the creation of value among small and medium enterprises, which are not well placed to Innovate, as their developed countries counterparts do (National Innovation Survey, 2014). Several empirical studies during early liberalization have outlined that foreign ownership does not play an influential role in building technological capability, domestic R&D and improving export performance in manufacturing Industries. Later, however, a trend of increasing technological intensity of export performance was observed in Asian countries from 1985 to 1998 (Lall, 2000). The mode of foreign direct investment, despite its criticisms is here to stay, due to firm movement from the import substitution to export orientation paradigm, since the need for finance is still considerable in development and commercialization of technologies . It was however observed that static economies of scale under neo classical trade theories, do not explain the dynamics of knowledge transfer and that learning was to be understood more closely, in order to understand the building of technological capability. Thus, the focus on building capacity for actualizing Intellectual property is crucial in the context of the National Intellectual Property Policy, 2016. The current decentralized R & D has shifted attention to the emerging countries, in terms of their climb up the value

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chain from production to innovation. In order to leverage the Innovation potential through monetization, it is essential that networks of learning integrate with appropriability regimes. In order to truly understand the institutional underpinnings, the “untraded interdependencies” underlying this are increasingly important, as is the creation of codified knowledge. Thus, the paper examines the importance of the R & D Linkages and Production Linkages for Developing country firms, in achieving the goals of technology generation and commercialization.

INTRODUCTION

A key motivation accorded to monetization of knowledge assets¹ is the formation of a rich variety of linkages to actualize various stages of the technological value chain, namely innovation and production. The information embodied in technical documents do not of themselves comprise, a sufficient means to commercialize the invention, especially where the technology is developed in another country. The factors behind this shall be examined later. But, this is crucial because of buyer’s uncertainty² is a major risk that impedes technology transfer and this can arise from the utility to the consumer, as perceived by them. This, in turn impacts whether technology can be engaged with at all successfully to create revenue. For deconstructing this underlying assumption (that trade in technology takes place and ultimately contributes to economic development), we have to understand the overall role, technology can play in economic development and how participation in global value chains (as a form of industrial organization) can be leveraged to create desirable outcomes for firms and countries. As

technology has traditionally been recognized as a transformation of capital and labor requirements, in terms of a production function³, the role of the same has for long not been understood, as a factor of production in itself⁴. Later, attempts have tried to study the contribution of technology as a factor of production⁵. But today, there is recognition that technology plays an important role in economic growth and development, which justifies most policy efforts aimed at improving industrial productivity, through innovation. Countries like India were not traditionally understood to have a comparative advantage like the Global South in generating technological innovation. This led to an “acquiescence” that we cannot feasibly deal with trade in technology.

From the era of import substitution, when the idea was to replace as much of the domestic produce from foreign inputs, we have moved towards an export oriented economy. This notion of comparative advantage was also for long considered to be a constraint in prompting intensive technological efforts to promote economic development in such countries till trade theories, emphasizing resource endowments as basis for international trade were influential (Heckscher Ohlin theory). However, when export competitiveness, based on advantages arising from price imposed constraint on the capacity of developing countries to commercially sell their manufacture, a need was felt for leveraging innovative processes and expanding product lines, in order to create value. The initial intuition being the advantage viewed in terms of static efficiencies of scale, cost etc. This was not only aimed at gaining technological specialization, in certain areas of strategic national interest but that of global trading opportunity, exemplified by the policy documents of

¹ Monetisation as a concept means commercial exploitation for generation of revenue of technology products, whether in a disembodied form or otherwise. Section 83 of the Indian Patents Act, 1970 states that the guiding principles in deciding working of an invention, being sufficient or not is the impact it has on the formation and establishment of industry. It is the argument in this paper that actors cannot actualise this potential on their own, due to capacity constraints at both ends, namely domestic firms and multinationals. Trade paradigms like comparative advantage run counter to any attempts to leverage technology by developing countries which traditionally do not enjoy ownership of technology. The failure of technology transfer or knowledge flows as a paradigm has exacerbated the dependence of developing countries on Developed regions for technology. Further, the transaction costs of entering into alliances, technological collaborations, foreign direct investment has for long understood as a key constraint.

² Buyer’s uncertainty is a term used to refer to the potential value of the product under sale in terms of its product characteristics, in terms of consumer perception. In technology trade terms, it refers to the inventive content of the Patent which can generate value. In Developing countries, codified information alone in the form of Patents, technical documentation etc. is not considered enough to use technology developed elsewhere. This consideration weighs in the mind of the consumer at the time of purchase and can signify a sceptical perception of the value embodied in the product or process.

³ Production Function refers to a term in economics, which visualises technological change, as operating through changes in more traditional factors of production i.e. inputs, namely capital and labour.

⁴ Romer, an economist was of the view that the contribution of technology as a factor of production was endogenous to capital and labour employed. It was not until Robert M. Solow (1957) gave his Residual Model that the remainder of the contribution not attributable to capital and labour was recognised as attributable to technological change. See Solow, Robert M.(1957), “Technical Change and the Aggregate Production Function”, *The Review of Economics and Statistics*, Vol. 39, No. 3, pp. 312-320, Available online at : <http://www.jstor.org/stable/1926047> , <http://faculty.georgetown.edu/mh5/class/econ489/Solow-Growth-Accounting.pdf> (Last Accessed on October 27, 2016).

⁵ See Abramovitz, M. 1956. “Resource and Output Trends in the United States since 1870”. *American Economic Review* 46 (May): 5-23.

Abramovitz (1967) studied what is known as Total Factor Productivity, which recognises the contribution of technology as distinct from capital and labour. He studied the Total Factor Productivity of most industrialised nations during different time periods in History.

centrally planned economy that earlier characterized India.

As the integration of innovative activity took place with commercial enterprise, organized forms of corporate ownership were seen namely, firms, more particularly, multinationals in the 1990s. This occurred because of their success in replicating the production of the same products at different locations. However, the motivations were primarily home base exploiting⁶. These emerged as key actors not only, in terms of their motivations but that innovation decision-making by these firms has indicated the impact of location and ownership of assets to be key variable/s⁷. However, over time, it is the internalization of *competitive advantage* that these foreign firms have, in terms of technological know-how that has attained crucial significance. Seen thus, learning and capability formation has become extremely important. Today, it is crucial for firms, traditionally left out from this fruitful value chain transition to participate and flourish. The question is how and under what circumstances. Monetization of knowledge assets, by integration of downstream commercial activities like marketing etc. with innovation has to keep in mind, the industrial and economic structure of activities in our country. Certain constraints emerge in this case for countries like India. We were for long understood as the hub of low cost, labor-intensive production activities hived off from developed regions, based on factor price differentials⁸. Also, the entire discourse of globalization of productive activities, realizes that there is a lag between production and innovation and the linearity between innovation and its commercialization is thus not a straight forward proposition as Vannevar Bush's

Industrial model⁹ would have us believe. Here, the supportive role of learning in integrating value chain processes with R & D becomes crucial. As we shifted from an import substituting nation to an export oriented one, the role of mechanisms to facilitate and leverage knowledge transfer between countries and regions became important, yet not so well understood. An understanding has also emerged that the transaction costs of the process and spillovers¹⁰ of the globalisation process needs to be managed in a manner, conducive to the economic system of the country. Thus, a look at the Indian economy is necessary to contextualise the same.

MANUFACTURING AND SERVICE SECTOR PERFORMANCE IN INDIA- TRENDS AND PERSPECTIVES

Here, the sectoral breakup and the nature of economic activity, namely export or import denotes the level of economic development achieved through economic activity. While this can be criticised for overlooking social development and inclusiveness, development of capabilities used to enable the social transformation, it provides some indication as to the orientation of the economic activity profile of a country. We are primarily now becoming dominated by investments into services sector¹¹(See Table 1 below) and have for long depended on export performance¹². However, the

⁶ Patel and Pavitt (1999), "Patterns of Internationalisation of corporate technology: location versus home country advantages", *Research Policy*, Volume 28, Issue 2-3, pp. 145-155.

⁷ Dunning, John H. (1976), "The Eclectic Paradigm Of International Production: A Restatement And Some Possible Extensions", available online at : http://www.rcmewhu.com/upload/file/20150527/20150527105330_5707.pdf (Last Accessed on October 31, 2016). This is the key premise of Dunning's eclectic OLI Paradigm i.e. ownership location-internalisation to explain international investment decisions. Also see Vernon, Raymond (1966), "International Investment and International Trade in the Product Cycle", *The Quarterly Journal of Economics*, Vol. 80, No. 2, pp. 190-207, available online at : <http://www.sba.muohio.edu/dunlevja/Course%20Links/EC441/Vernon.pdf> , <http://www.jstor.org/stable/1880689> (Last Accessed on October 28,2016). This model called the Product Life Cycle model given by Vernon stated that firms tend to undertake overseas activities based on the life cycle stage of the product. As a result of the earlier theory, the preponderance of mature technologies in developing countries could be explained but certain other factors could not be accounted for.

⁸ Factor Price Differentials refers to the difference in the cost of Labour and Capital, used to produce a certain no. of units of manufactured goods.

⁹ Bush, Vannevar (1945), "Science-The Endless Frontier", available online at: <https://www.nsf.gov/od/lpa/nsf50/vbush1945.htm> (Last Accessed on November 3, 2016) .Vannevar Bush, Director of the Office of Scientific Research and Development proposed his model in the report to the President of the United States. This model views investments in basic science research to yield industrially applicable products or processes in a linear fashion. This assumes a costless model where access to technology is not impeded at all. However, the diffusion of innovations is not freely accessible to all and the process of diffusion is beset with constraints.

¹⁰ Spillovers are considered to be unintentional effects arising from economic processes. However for Developing countries, learning and technological capability acquired from know-how is considered as a desirable outcome.

¹¹ See FDI Statistics, available online at : http://dipp.nic.in/English/Publications/FDI_Statistics/2016/FDI_Fact_Sheet_JanuaryFebruaryMarch2016.pdf (Last Accessed on November 1,2016).

¹² Mukherjee, Shameek and Mukherjee, Shahana (2012), "Overview of India' Export Performance: Trends and Drivers", Working Paper No. 363, Indian Institute of Management, Bangalore, available online at: <https://www.iimb.ernet.in/research/sites/default/files/WP%20No.%20363.pdf> (Last Accessed on November 1, 2016). For a discussion of trends on exports in manufacturing sector, see Lall, Sanjaya, " *The Technological Structure and Performance of Developing Country Manufactured Exports, 1985-1998*, Working Paper No. 44, QEH Working Paper Series-QEHWPS44. Also see Francis, Smitha (2015), "India's Manufacturing Sector Export Performance During 1999-2013: A Focus on Missing Domestic Inter-Sectoral Linkages", Working Paper No. 182, Institute for Studies in Industrial Development, available online at : <http://isid.org.in/pdf/WP182.pdf> (Last Accessed on November 2, 2016).

technological structure of export performance, cannot be inferred for manufactured exports on a long term basis. In the Services Sector, however India ranks 9th globally in terms of services growth rate, share of services, Services export growth¹³ for a period from 2001-2014. In terms of gross value added, however these knowledge sectors do not contribute significantly¹⁴(6.7%) compared to the total contribution of 53.3% overall.

Table 1 – Sectorwise FDI Equity Inflows for Top 10 sectors (2000-2016) in US \$. (Source: Department of Industrial Policy and Promotion, Government of India).

S.no.	Sector	Amount of FDI Inflows (US \$)	% age of Total flows
1	Services Sector	50792.42	17.6
2	Construction Development	24187.94	8.38
3	Computer Software and Hardware	21017.77	7.28
4	Telecommunications	18382.35	6.27
5	Automobiles	15064.59	5.22
6	Drugs and Pharmaceuticals	13849.50	4.80
7	Chemicals (otherthan fertilisers)	11900.29	4.12
8	Trading	11872.47	4.12
9	Power	10476.15	3.63
10	Hotel & Tourism	9227.33	3.20

The export performance of R & D Services is 0.8% and the value is 1.26 Billion US\$ with a growth rate ranging from 24 in 2013 to 22.9 in 2016¹⁵, computer services have a 46 % share and value at 73.1 Billion US\$. In terms of revenue, IT-BPM and telecom services lead in value. In terms of the Global Competitiveness Index 2015-16, India ranks 50th, with China above it¹⁶ for R & D Innovation based on series of parameters, including company investments in R & D. Thus , it is not entirely the case that the Service Sector has achieved paramount importance, compared to manufacturing but that it's role is growing. Having said that the trend of participation in Global value chains has to be assessed from current developments. The same have huge implications for technology upgrading and building capabilities that ultimately

impact monetisation of Patents and the technology they codify.

GLOBAL VALUE CHAINS- RISE OF EMERGING ECONOMIES IN THE AFTERMATH OF THE 2008-09 FINANCIAL CRISIS AND IT'S IMPLICATIONS

In the wake of the financial crisis of 2008-09, the developed countries are no longer the locus of innovative activity and the attention has shifted to emerging economies¹⁷ and a return to industrial policies, post Washington consensus has taken place. For these countries, the rapid diminishing of Northern markets has made them turn inward towards domestic markets and even foreign firms have targeting these end markets. The great transformation this entails is a major process of accumulation of knowledge and capabilities, both at individual and organisational level. Part of such capabilities builds upon education and formally acquired skills (“human capital”). Equally important, capabilities have to do with “problem solving” knowledge, embodied in organisations concerning production technologies, marketing, labour relations, as well as dynamic capabilities of search and learning. That sectors and products matter, in terms of learning opportunities and differences in income elasticities of demand is well recognised¹⁸. Accumulation of knowledge and capabilities includes but is not limited to upgrading of skills of workers and technicians. The organisational dimension is also involved, as outlined in business economics literature, inspired by the capability approach. It is also not primarily an issue of entrepreneurship, which is not peculiar to underdevelopment. A key bottle neck is the persistent ‘inability to seize opportunities’. This productive manipulation of knowledge, (especially when it has a complex, collective dimension), involving intra-organisational co-ordination of various actors undertaking diverse species of knowledge and most often diverse interests on entrepreneurship and intrapreneurship between incumbent firms, which is difficult to achieve.

This transformation that has shaped global capitalism and global value chain governance structures is that of value chain concentration arising in the global supply base, coupled with geographical consolidation. This has

¹³ Union Budget 2015-16, Economic Survey, Volume 2, Chapter 7- Services Sector, Table 7.1, available online at : <http://indiabudget.nic.in/es2015-16/echapvol2-07.pdf> (Last Accessed on November 2,2016).

¹⁴ *ibid* at Table 7.2.

¹⁵ *ibid* at Table 7.4, Table 7.5.

¹⁶ *ibid* at Table 7.8. For a specific overview of India's Services sector and the factors attributed to it's growing significance, see Mukherjee, Arpita (2013), “The Service Sector in India,” Working Paper No. 352, Asian Development Bank Economics Working Paper Series, available online at :

<https://www.adb.org/sites/default/files/publication/30285/ewp-352.pdf> (Last Accessed on November 2, 2016).

¹⁷ Gereffi, Gary , “Global Value Chains in a Post Washington Consensus World”, *Review of International Political Economy*, 21:1, pp. 9-37, available online at : DOI: 10.1080/09692290.2012.756414 (Last Accessed on October 31, 2016).

¹⁸ Edquist, Charles (2006), “Systems of Innovation- Technologies, Institutions”, Science, Technology and the International Political Economy , Series Editor: John de la Mothe”. See Chapter 6 by Breschi, Stefano and Malerba, Franco, “Sectoral Innovation Systems: Technological Regimes, Schumpeterian Dynamics and Spatial Boundaries”, pp 130-156.

shifted the bargaining power to large suppliers in developing countries, as opposed to lead firms in global value chains. A shift in the end markets of many such value chains has been witnessed post 2008-09 crisis, which has redefined geographies of investment and trade and newer forms of strategic co-ordination among value chain actors¹⁹. Today, the organisation of the global economy is going through a major “inflection point”, which could have dramatic implications for economic and social upgrading and downgrading among countries, firms and workers. The global value chain literature challenges the traditional way of measuring export performance of countries and international competitiveness and it suggests that the post-crisis futures of advanced industrial and developing economies are interdependent in an unprecedented manner²⁰.

It shows that governance²¹ is at the core of this analysis of value chains, whereby actors who shape the distribution of profits and risks in an industry are identified. At the firm level, this power can be exerted by the lead firm or suppliers. In producer driven chains²², seen mostly in technology and skill intensive industries, power is held by final product manufacturers.

In the various forms of Global value chain governance structures, lead firms exercised varying degrees of power, through the coordination of suppliers without any direct ownership of firms. The role in upgrading also varies based on characteristics of suppliers in developing countries, the requirements of lead firms and the kinds of international professional standards utilised in these chains²³. The need of multinational lead firm is to rationalise, wherein newer suppliers are

expected to be bigger, more capable and strategically located to access large markets. On the other hand, the priority of home countries like ours is that we leverage learning from such asset advantages these multinationals have, yet depend largely on labour-intensive processes. Evidently, these are at cross-purposes. Exactly, where does the Informal sector fit in this sector is not clear. Over and above, developing various types of capabilities like financial, linkage etc. which may take some time, there is growing concern that the economic gains from such participation does not translate into stable employment and does not ensure simultaneity of economic and social upgrading. In this sort of export oriented industrialisation, countries may neither develop the institutions, nor the know-how, and consumer markets to create and sustain entire industries.

For this conceptual clarity, as regards the concept of upgrading is essential. Another issue is the concept of upgrading²⁴ itself i.e. is whether it is the innovation itself or the outcome thereof²⁵. There is a view that upgradation is a descriptive concept without any empirically verified model to support it²⁶. A current typology of value chains is either modular, relational or captive by nature and the cooperation patterns are framed in light of the governance structure²⁷. The factors influential in a particular governance structure are complexity of the transaction, possibility of codifying information and the existing level of supplier competence. The social context in which the value chain is embedded is a contextual factor in constituting a framework for the norm-building processes in a value chain. An understanding of the advantages small, medium enterprises represent in this context needs to be analysed before a suitable model can be provided for their participation.

SMALL AND MEDIUM ENTERPRISES AND INFORMAL SECTOR- ROLE AND INTERACTIONS WITHIN VALUE CHAINS

Informal sector tends to adopt risk averse strategies in by avoiding the formation of links. This is particularly because of the costs associated with more formal mechanisms of linkages like Patents. Similarly, those firms in the Small and Medium Enterprises sector which do so, face costs of integration with value chain, however it is their commitment to long-term relations in value chains and that provides relative stability to

¹⁹ *supra*18.

²⁰ *supra*1.

²¹ A focus on the study of governance structures has arisen since the 1990s. Governance in the context of value chains describes the power relationship between actors and participants. This is to be distinguished from coordination, which refers to the transition management of goods and products at the segment interfaces of the value chain. It involves four steps in the value chain namely rule setting, support from actors for ensuring compliance, monitoring compliance and sanction for non-compliance. For a discussion of who sets the norms in value chains, see Brach, Juliane and Kappel, Robert, (2009) “Global Value Chains, Technology Transfer and Local Firm Upgrading in Non-OECD Countries”, Working Paper No. 110, GIGA Research Programme, available online at: www.giga-hamburg.de/workingpapers (Last Accessed On November 3, 2016).

²² Producer driven chains would be those where a largest part of the capital intensive production is done by the producer with the laboratory intensive or standardised tasks are left to subordinate firms. An example of Producer driven chains would be that of final manufacturers as in case of Apple’s iPod. Where the final assembly of the device is done in America, whereas the Chipset is produced in Taiwan, Republic of China. Although a majority of the value addition is attributed to the chip set, a net outflow results for America in selling this product.

²³ *supra*18.

²⁴ Upgrading is a concept used from International trade Theory where it indicates a shift in specialisation towards high technology products within the same sector.

²⁵ Morrison, Andrea et al., “Global Value Chains and Technological Capabilities: A Framework to Study Learning and Innovation in Developing Countries”, SLPTMD Working Paper Series No. 5, University of Oxford, Department of Industrial Development.

²⁶ *supra*22.

²⁷ *ibid.*

planning, which improves learning and synergy effects. Active cooperation reduces transaction costs and creates trust and relational ties. It can be argued what precedes what in the case of emerging economies. The type of value chain, in terms of typology also influences the reduction of costs and risks. The types of interactions namely active support of suppliers needs to be enhanced, which can happen only when capability issues are addressed. The technological regime has to enhance the learning opportunities through spillovers as well.

All said done, the adoption of piecemeal participation by the Informal Sector in global value chains is possible at this stage. In order to move out of this vicious cycle, the firms need to be incentivised to form such linkages, the development of learning and skills, necessary to participate in the same by seizing learning opportunities. The binary of Finance and Technology Support Can Only be bridged once firms are capable and incentivised for such participation. The formation of complementary assets is a step in this direction. However, over a long term, the emphasis must be on technological upgrading. The onus of the same is the bone of contention. Even with a regime of Patenting in place, the actual uptake has not been witnessed. This is because of a lack of operationalising technological upgrading. For most, social upgrading seems to fall behind. It is the enabling force behind the change of cultural, contextual factors that will enable technological capacity building by enhancing learning. Actual learning has to be left relatively unimpeded by strategic patenting. Strategic patenting done by patent centric firms can be damaging to the prospects of commercialisation by other players. Product-centric firms on the other hand, do not pose such a threat. However, given the overall variable level of linkages in different sectors, the learning potential is as such impeded by absence of linkages. Herein, the conversation between local buzz and global pipelines²⁸, can and needs to be established for more specialised sectors, under certain conditions like through network pipelines²⁹, as opposed to local broadcasting alone. Also, the connection between manufacture of products

and underlying services will be required in value chains, even if not in terms of linkages, but “untraded dependencies”, which enable learning opportunities for such marginal players across regions and not specific clusters.

CONCLUSION

The performance of learning from export performance, both for firms, policy makers etc. has been understood to be limited. Similar, has been the case of functional upgrading through the value chain. Greater emphasis has to be placed on capability building through this form of industrial organisation to avoid the systemic atrophy of local firms. Here, firm heterogeneity and economic activity needs to be appropriately accounted for, in terms of the learning opportunities and types of interactions that value chains provide.

The change that the global value chain governance structures brought for emerging economies needs to be assessed for whether the benefits of the same are evenly spread across regions and if so how to maximise them. The complexity of transaction and their codifiability are important factors influential in this context. The latter can be seen from the systematisation of knowledge practices as opposed to merely patenting. Historically, the decentralisation of innovation activity took place (occurring through affiliates of multinational firms), which approached foreign locations, by way of portfolio investments³⁰. The nature of the investment entailed adapting technology to meet local needs. In India, the incentive to innovate has aimed at cost reducing innovations mainly. However, this has changed since the onset of the Information Technology Revolution of the 1980s, when decommodification³¹ of products and dispersion of productive value chains, coupled with increasing relevance of value added (as opposed to export performance³² as a metric for high

³⁰ Portfolio investment is a form of indirect investment prevalent under non-liberalised policy regimes, where foreign participation was effected through investment in Indian entities. The element of control was understood in terms of the Companies Act prevalent at the time, a participation of 25% in terms of voting rights or preferential shares was considered as a cut-off. However, now the element of control is inferred from the decision making authority of the participating entity, over and above the stake held. (Companies Act, 2013)

³¹ Traditionally, technology can be sold both in an embodied form and as distinct from the product embodying it i.e. disembodied form. Decommodification refers to the increasing role of intangibles in characterising what is tradeable. Here intangible knowledge assets or IPRs are delivered through digital modes of delivery. The 2017 IBRD World Bank Development Report talks of the increasing digitalisation of services.

³² See *Subrahmaniam, K.K; Sastry, D.V.S; Pattanaik, Sitikantha and Hajra, Sujan, (1996) "Foreign Collaboration Under Liberalisation Policy-Patterns of FDI and Technology Transfer in Indian Industry since 1991."* In fact the connection between export performance and foreign ownership was found not to be correlated. Also, the role of technological growth and export performance could not be

²⁸ Bathelt, Harald et al., “Clusters and Knowledge: Local Buzz, Global Pipelines and the Process of Knowledge Creation”, DRUID Working Paper no. 02-2012, available online at: <http://www3.druid.dk/wp/20020012.pdf> (Last Accessed on November 3, 2016).

²⁹ *ibid.* Network pipelines are linkages over larger distances and typically do not have shared trust. Establishment of global pipelines consciously builds new trust. The costs of building trust are typically time consuming and high and can be reduced by a set of procedural rules involving a sequence of transactions and interactions, wherein small risks are followed by larger ones and commitments progressively increase. This can be done through upgrading in the value chain. The local buzz is frequent, broad and relatively unstructured and automatic in nature, compared to pipelines.

technology products) has underscored the relevance of activities, other than R & D. Even there as we have pointed out above the position of India, in terms of importance of Services sector is growing, but is concentrated in a few sectors. Also, the value proposition that developing country firms present varied from cost arbitrage to more meaningful processes of adaptation, assimilation and accumulation³³ to Linkage, Leveraging and Learning in certain sectors. The evolution that it involved underwent several structural changes, over and above economic liberalization to effect this shift.

It is a reality in the Indian Context that domestic firms are in the unorganised sector with severe capacity constraints, poor linkages etc³⁴. On the other hand, multinational firms tend to localize knowledge flows regionally, based on geographical proximity etc. The capability approach opens the possibility for true globalization by these actors to move beyond smaller regions to wider geographies. While the static efficiency³⁵ of doing so is understood, it is the dynamics that is crucial to better integrate economies. Further, for multinational firms some sort of relational proximity is necessary to build suitable linkages with domestic firms³⁶. While the trend has been towards engaging with large domestic suppliers in the value chain processes, the bulk of economy comprises small and medium enterprises. Further, even such firms cannot be understood as monolithic, homogenous entities in reality. So the questions on leveraging value chain participation, in terms of high technology products becomes contextualized to the Indian context. This is important because the process has been discontinuous and uneven with countries like China accounting for 86% of the growth in exports as a result of this, whereas India still appears to be a marginal player.

Thus, the real story behind monetization should include these enterprises in achieving technological capability

established in the pre-liberalisation era due to data limitations. See also Lall, Sanjaya. "The Technological Structure and Performance of Developing Country Manufactured Exports, 1985-1998, Working Paper No. 44, QEH Working Paper Series-QEHWPS44.

³⁴ Ernst, Dieter and Kim, Linsu (2000), "Global Production Networks and the Changing Geography of Innovation Systems: Implications for Developing Countries", East-West Centre Working Paper Series, Issue No. 9, available online at : <http://www.eastwestcenter.org/fileadmin/stored/pdfs/ECONwp009.pdf> (Last Accessed on October 31, 2016).

³⁵ Static efficiency considerations like factor costs, locational and other advantages are understood in traditional microeconomic theory, but actual firm level behaviour and evolution over a period of time.

³⁶ Blanc, Helene and Sierra, Christopher, (1999) "The internationalisation of R&D by multinationals: a trade-off between external and internal proximity", Cambridge Journal of Economics, Volume 23 pages 187-204.

through upgrading and "moving up the value chain" in functional terms³⁷. To allow this to happen not only is an intensive, long term technological effort is essential, but attaining functional and chain upgrading, through small and medium enterprises and the Informal Sector. This requires pushing the latter out of the inertia of minimalist and risk averse strategies. In doing so, the impact on employment generation and also needs to be accounted for enabling the social upgrading and avoiding negative effects of such participation in value chains. The role of learning opportunities also arises as an ongoing agenda. The sources of information to actualize this process can be external and internal. Due to power dynamics involved, multinational firms have formed an important, yet underexplored source of external information, with special emphasis on codified knowledge. While this is instrumental, it has understated aspects of tacitness that interfere with their full exploitation. Further, the process within firms by which information is behaviouralised, standardized, embodied and codified is a complex, evolutionary one. Domestic firms in India as a matter of culture, do not document the practices involved and prefer operating manuals etc. at best to record the standardized procedures they undertake. Recognizing the incremental from the breakthrough thus is a key challenge. Further, the standards applied for some product or process to qualify as patentable involve relative novelty and the standard of assessment is that of a man skilled in the art. This can be criticized for not addressing the appropriability regime to local needs and the heavy influence of multinationals on policy making. Be that as it may however, exploiting codified sources of external information, even for the limited purposes of undertaking production and or usage is a big challenge. It is for this reason, the learning processes in countries like India have not adequately leveraged value chains, linkages to support functional upgrading. Here, the role of complementary assets attains importance for domestic firms to gain foothold in the International market over and above pure market based considerations. While demand side factors have for long influenced policy making, we now need to concentrate on supply side factors like skilled manpower, specialized workforce, technology driven factors to kick start the technology process for these severely constrained firms. Often with financial and subsidy support, the efficiency has been dismal and it points to a lack of other factors of importance, necessary to actualize the monetization of intellectual property assets, through a wide ranging dialogue

³⁷ Functional upgrading refers to acquiring new functions to increase overall skill content of activities. Another form of upgrading under global value chains is chain upgrading i.e. movement into new but often related industries.

between foreign technology and indigenous production or service delivery mechanisms. For this, the enterprises must realise and seek to work towards providing complementary assets, in order to participate even as marginal players in the global value chain.

The processes involved in research and development dictate changes to the division of labour. It is here we are confronted with dilemma of using labour intensive processes to effect employment generation or to go in for high-end technological means of production, often riddled with labour displacing effects. But is also necessary to provide the workforce with greater skill sets. This can again happen with greater focus on developing stronger ties with foreign partners and providing value to them in terms of capacities and in turn, leverage the learning derived from such interactions. These interactions need to intensify over longer periods of time to yield the desired learning curve that most emerging economy firms seek. For the processes to start the structural elements of the institutionalisation of global value chains, as they relate to innovation must be in place.

It is often assumed that public science (represented by government institutions, research and development institutes) is globalised to a greater extent than that of private players. As we are aware that 0.8% of our gross domestic product is devoted to such research and development efforts, there is no basic structure facilitating innovation. More so, our technological development has been through leapfrogging and piecemeal by nature. While the calls for integration economically are yielding mixed results, it is particularly in trade related to technology, where this disjointed development has its own problems. The conversation of global pipelines and local buzz has to be enhanced to better integrate economic and learning opportunities, generated by the learning opportunities that codified information in the form of Patents presents for producers of intermediate products. Here, the market structure of monopolies poses considerable constraint on domestic capacity development, yet it does not ensure actual working of inventive products and processes, in fact impedes the formation of typologies aimed at reducing transaction and learning costs.

The market failure in knowledge arises from externalities for these private players, which prevents them from engaging in the first place, with firms that have disparate capabilities. While we have addressed the incentives aspect by multilateral agreements, the balance with learning opportunities has yet to take off the ground. Certain knowledge intensive sectors however contribute to growth by tapping learning opportunities by continuing to diversify. Pharmaceuticals, for instance has given rise to

biotechnology products, similarly electronics has resulted in material science advances like nanotechnology etc. This has come on the back of developing strong linkages, through which knowledge transfer of tacit knowledge could take place. The importance of codified information is not minimized, but actually enhanced by filling the gaps, as it were leading to successful commercialization.

Finally, for this informal networks need to worked upon as the transaction costs of more formal alliances has, despite economic liberalization not yielded adequate results. The strength of weak ties has demonstrated their utility in tapping local opportunities to generate global products. More formal alliances, are not hitherto motivated by technology driven factors in sectors like automobiles. This is a scenario that needs modification to ensure technology driven growth. But for enabling the same, firstly the knowledge flows must be incentivized to these local producers on a cost efficient basis.

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