CHAPTER—2

REVIEW OF LITERATURE

The economic growth of every nation is inextricably linked to the successful international transfer of knowledge. Substantial resources are required to make a new process or product feasible (Mansfield, 1968). This resource requirement enhances the role of technology transfer in the economic growth of developing countries who are generally financially starved and scarce in human capital (the two basic inputs required for the inventive process). Developing countries need not reinvent-the-wheel but adopt the technology as most of the technologies are available off-the-shelf. The adoption of technology also involves substantial costs to the recipient (Tuma, 1987). This high cost of the technology adoption is because of the tacitness or disembodied form of the technology. Literature on FDI and trade has mainly concentrated on export-substituting or export-complementary nature of foreign direct investment (FDI). However, the relationship between FDI and trade has become far more complex in the current WTO regime wherein several developing countries have initiated import liberalization and entered into trading arrangements. These policy have drastically reduced trading costs, encouraged trade and improves productivity. With the growing volumes of trade, the focus of policy makers in the developing countries has now shifted from whether FDI causes trade or whether trade can boost FDI inflows and in particular, what kinds of trade can boost FDI inflows or productivity enhancement. This research adds to the existing literature by investigating the impact of liberalization policies associated with cross-border vertical integration and intra-industry trade on FDI flows for the Indian Manufacturing industry in the pre and post reforms period.

The studies on productivity of Indian manufacturing sector can be classified broadly as follows: (i) studies that provide estimates of productivity growth either for
aggregate manufacturing sector or at various levels of disaggregation (states/industries), using alternative databases and methodologies for different time-spans; (ii) studies that test the sensitivity of productivity growth estimates to the alternative proxies for output, viz., real gross output (O) or real value added obtained by single deflation method (RVASD) or real value added obtained by double deflation method (RVADD); (iii) Studies that deal with the turnaround of productivity growth, if any, in response to policy reforms undertaken in the Indian economy; and, (iv) studies that attempt to ascertain the determinants of productivity.

Chart- 2.1
Classification of Studies on Productivity on Indian Manufacturing Sector

- Measurement of Productivity/Efficiency
- Determinants of Productivity
- Database and Coverage
  - NAS
  - ASI
  - PROWESS (CMIE)
  - NSS
  - RBI
- Measures of Output
  - Gross Output (O)
  - Real Value Added (RVA)
    - Single deflation (RVASD)
    - Double deflation (RVADD)
- Output-Input Framework
  - RGO-K, L, M (N)
  - RGO-K, L, E, M (N)
  - RGO-K, L, E, M (N), S
  - RVASD-K, L
  - RVADD-K, L
- Methodologies
  - Production (Cost) Function
    - Cobb-Douglas (CD)
    - Translog (TL)
    - Stochastic Frontier PF (SFPF)
  - Growth Accounting
    - Solow Index (SI)
    - Kendrick Index (KI)
    - Tornquist Index (TI)
  - Data Envelopment Analysis
    - Distance functions
    - Malmquist index (MI)
- Policy Reforms
  - Domestic liberalisation
    - Capacity creation and expansion
    - Dismantling of Procudural hurdles
    - Fiscal incentives
  - External Sector Liberalisation
    - Tariff reductions on imported inputs
    - Removal of quantity restrictions of imported inputs
    - FDI norms relaxation
- Infrastructure
  - Physical
    - Roads, Electricity
  - Social
    - Education and health
- List of Abbreviations
  - ASI: Annual Survey of Industries
  - CMIE: Centre for Monitoring Indian Economy
  - E: Energy
  - FDI: Foreign Direct Investment
  - K: Capital
  - L: Labor
  - M: Material Inputs
  - N: Total Inputs
  - NAS: National Accounts Statistics
  - NSSO: National Sample Survey Organisation
  - O: Real Gross Output
  - RBI: Reserve Bank of India
  - S: Services
In the preceding section we have categorized studies on productivity of manufacturing industry into two parts. Further we would review the studies as per our study used the measures for liberalisation and technological change in manufacturing industry.

**Trade Liberalisation and Economic Growth**

In the recent past, researchers have devoted considerable attention to investigate the linkage and the degree of relationship between export and productivity at both macro and micro level. Export participation is viewed as one of the major factor that makes some firms more productive or efficient than other firms who do not export. The influential works of Bernard and Jensen (1999, 2004a, 2004b) and Bernard et al. (2003) have brought into focus the exceptional performance of exporting firms in terms of labour productivity and firms heterogeneity within sectors. And this initiated a new debate on the issue that whether exporting leads to productivity growth and are exporters more productive than non-exporters. Melitz (2003) made the debate more interesting and added a new dimension by showing that productive firms self-select into export market. And further Helpman, Melitz and Yeaple (2004) show that under the condition of within sectors equal trade and investment opportunity, the least productive firms operate only in domestic market and most productive serve international markets through export as well as foreign direct investment (FDI). Some careful studies, just to name a few, by Aw and Hwang (1995) for Taiwan; Bernard and Jensen (1995, 1999) for US; Clerides, Lach and Tybout (1998) on Colombia, found that firms that export are more productive than non-exporters.
Aradhna Aggarwal\textsuperscript{18} analyses the Indian experience during the 1990s. It attempts to answer two questions. \textbf{First}, Do MNE affiliates export more than the domestic firms in the open regime of the 1990s in Indian Manufacturing? \textbf{Second}, do MNE affiliates have comparatively greater advantage in high-tech than in low-and medium-tech industries? Tobit model estimations conducted on all the sample firms pooled together supported the first hypothesis. However, the evidence of the better performance of MNEs is not strong enough to suggest that India is attracting efficiency-seeking outward-oriented FDI.

The study of Levy and Nolan\textsuperscript{19} investigates the role of trade policy in market structures characterized by imperfect competition. It provides a unified treatment of the effects of trade and foreign investment policy under imperfect competition using a model easily accessible to non-specialists. They examine the circumstances under which trade and Direct Foreign Investment (DFI) are immersing, and identify the appropriate forms of intervention by a welfare maximizing government. Their positive analysis show how depending on parameter values, monopoly or duopoly situations arise as equilibrium market structures, possibly involving DFI. Their normative analysis shows that while free trade and unrestricted DFI may be welfare reducing, neither tariffs nor restrictions on DFI are first-best instruments to increase welfare. They conclude with an assessment of the lessons of the new literature for trade and DFI policy formulation in developing countries.


The study done by Jung and Marshall\textsuperscript{20} performs the causality tests between exports and growth for 37 developing countries. The result casts considerable doubt on the validity of the export promotion policy.

The study done by Veeramani\textsuperscript{21} investigates the effects of trade liberalization (Measured by tariffs and QRs) and the extent of multinational presence on Intra-Industry Trade (IIT) in a panel of India's manufacturing industries. He leads to the conclusion that liberalization is likely to cause greater intra-industry trade because of increased specialization opportunities at the level of finer product varieties within the narrowly defined industries. Other factors, which can exert influence on the intensity of IIT, include the extent of multinational involvement in the industry and the degree of product differentiation and scale economies. The regression analysis provides strong support to the hypothesis that trade liberalization causes higher levels of IIT. He suggests that trade liberalization should continue if multinationals have to augment the process of integrating the Indian industry with the fragmented structure of global production activities.

The study done by Kusum Das\textsuperscript{22} reviewed the literature on the impact of trade liberalization on productivity growth for developing countries. In particular, it focuses on three regions; Latin America, Africa and Asia. In this study along with theoretical arguments and econometric methodologies; it assess the rate of trade policy reforms in bringing about productivity improvements for the industrial sector. It leads to the


\textsuperscript{22} Das Kusum Deb (2002), ‘Trade Liberalization and Industrial Productivity: An Assessment of Developing Country Experiences,’ \textit{ICRIER} working paper No. 22.
conclusion that though most countries have replaced quantitative restrictions with tariffs and rationalized the tariff structure, yet only Latin America effected large reductions in tariffs during the 1980s. The impact of trade liberalization on productivity growth was mixed.

In a survey done by Winters\(^{23}\) on trade liberalization and economic growth, there are serious methodological challenges and disagreements about the strength of the evidence, the most plausible conclusion was that liberalization generally induces a temporary (but possibly long lived) increase in growth. A major component of this is an increase in productivity. It stresses the importance of other factors in achieving growth, such as other policies, investment and institutions, but argues that many of these respond positively to trade liberalization. It also considers the implementation of liberalization and notes the benefits of simple and transparent trade regimes.

The study done by Dijkstra\(^{24}\) aims to what extent trade liberalization effects an economy like Latin America. He assess what happened to domestic prices for importable and exportable, if the exchange rate is overvalued, or if there is an oligopolistic market for exportable and importable. It also take into account the comparisons of labour and capital productivity before and after the trade liberalization. He leads to the conclusion that the short term positive effects are hampered if there is oligopolistic competition in the domestic market, be it in production or in trade. The net improvements on the efficiency of manufacturing industry depend on the relative importance of import


competing, exporting and imported-inputs-intensive branches of manufacturing. If domestic markets allow for changes in relative prices to occur and if other supportive factors are available, allocative efficiency will generally improve from trade liberalization. Short term effects are larger for small countries than for large countries. However, the potential adjustment costs are also larger, so welfare may decrease in the short run. Long run effects will occur in countries that already have a firm industrial base as that are far ahead in the process of getting it, countries which have low industrial base are expected to miss out on these long run effects.

The estimates of Goldar and Anita Kumari\textsuperscript{25} on total factor productivity growth were presented for Indian Manufacturing and major industry groups for the period 1981-82 to 1997-98, i.e.; the post reform period, with that in the 1980s. This was followed by an econometric analysis of inter-temporal and inters industry variations in productivity growth rate, aimed at assessing the effect of import liberalization on productivity growth in Indian industries in the 1990s. Another aspect was the effect of capacity utilization on measured productivity growth. The result showed that total factor productivity growth in Indian manufacturing decelerated in the 1990s econometric analysis presented in the paper indicated that the lowering of effective protection to industries favorably affected productivity growth. The result suggests that gestation lags in investment projects and slower agricultural growth in the 1990s had an adverse effect on productivity growth. The analysis revealed that underutilization of industrial capacity was an important cause of

\textsuperscript{25} Goldar, Bishwanath and Anita Kumari (2003), ‘Import Liberalization and Productivity Growth in Indian Manufacturing Industries in the 1990s, ’The Developing Economies, XLI-4, December, , pp. 436-460
the productivity slowdown. With corrections for capacity utilization, the estimated productivity growth in the 1990s was found to be about the same as in the 1980s.

The study of Chow\textsuperscript{26} investigates the causal relationship between export growth and industrial development in eight Newly Industrializing Countries (NICs). Results of small causality test showed that for most of the NICs there was a strong bidirectional causality between the growth of exports and industrial development. These findings support the export growth strategy, expansion in exports not only promote the growth of national income but also lead to structural transformation of the developing countries.

The study of Feder\textsuperscript{27} analyses the sources of growth in the period 1964-73 for a group of semi-industrialized less developed countries. An analytical framework was developed, incorporating the possibility that marginal factor productivities were not equal in the export and non-export sectors of the economy. Econometric analysis utilizing this framework indicates that marginal factor productivities are significantly higher in the export sector. The difference seems to drive, in part, from intersectoral beneficial externalities generated by the export sector. The conclusion was that, the growth can be generated not only by increases in the aggregate levels of labor and capital, but also by the reallocation of existing resources from the less efficient non-export sector to the higher productivity export sector.

Kavoussi\textsuperscript{28} investigates the sources of growth of export earnings in developing countries and examined the association between export-orientation and economic

performance. The result showed that, when international markets are depressed, export oriented policies were not apt to produce extra ordinary results. It is shown that during an upswing in global economic activity, demand for primary products could be strong enough to generate a respectable rate of growth in export earnings of developing countries if they simply maintain a constant share in their traditional markets, of course, those that are capable of gaining a larger share of their old markets and diversifying their product mix could achieve very high growth rates of exports and GNP.

The study of Nagesh Kumar\(^{29}\) examined the influence of technology imports on levels of company financed or in-house R&D spending in forty three Indian Manufacturing Industries. The findings of the regression analysis revealed that nature of influence of the two modes of technology imports on R&D intensity was quite different. FDI had a negative association with R&D intensity implying that, other things being same, industries dominated by foreign controlled firms spent lower on R&D per unit of income than the rest. The substitution dominated the influence of FDI on local R&D. On the contrary the licensing was found to be having positive association with R&D intensity implying complementarities dominated relationship between this mode of technology imports and local level of R&D spending.

The study carried by Shirazi and Manap\(^{30}\) examined the Export Led Growth (ELG) hypothesis for five South Asian countries through co-integration and multivariate granger causality tests. Strong support for a long-run relationship among exports, imports, and real output for all the countries except Sri Lanka were found. Feedback


effects between exports and GDP for Bangladesh and Nepal and unidirectional causality from exports to output in the case of Pakistan were found. No causality between these variables was found for Sri Lanka and India, although for India GDP and exports did induce imports. A feedback effect between imports and GDP was also documented for Pakistan, Bangladesh, and Nepal, as well as unidirectional causality from imports to output growth for Sri Lanka.

**FDI and Technological Change**

Technology diffusion at the industry level for host-country firms is one of the beneficial impacts of FDI. FDI brings new kinds of innovative ideas and generates benefits in the form of technology transfer, management know-how transfer, exchange of knowledge, and export marketing access. Many developing countries are trying to attract FDI to reduce their technological gap in comparison to the advanced nations, upgrade their managerial skills and develop their export markets. Proponents offer three explanations for how technology spillovers occur from multinationals to domestic firms. First, local firms may be able to learn the technological know-how from the foreign counterparts. Second, employees may leave multinational firms to set up own firms or join existing domestic firms of a particular region. Third, multinational investment may encourage the entry of international trade brokers, accounting firms, consultant companies and other professional services which thereafter become available to the local firms contributing to their productivity.

Nagesh Kumar\(^{31}\) investigated the share of Foreign Controlled Enterprises (FCEs) in the large private corporate sector at the overall level as well as in individual branches

of manufacturing. The existing estimates of FCEs in the country were reviewed and fresh estimates for the overall industrial sector and for 54 three-digit manufacturing industries were provided. His findings suggest that the sales or assets of organized corporate sector were nearly 23 percent in 1980-81. Their share showed a declining tendency over the period 1972-73 to 1980-81. The shares of 54 individual industries were found to be varying.

The study done by Chandra\textsuperscript{32} throws light on related issues like the magnitudes of foreign capital inflows in the recent past, the importance of the foreign sector in private corporate manufacturing, and the significance of the latter in organized manufacturing as a whole. From the standpoint of appropriation of the overall economic surplus, it is significant that in the mid-1980s foreign firms paid out over three-fifths of private corporate sector, or about two-fifths of factory sector, dividends. These ratios are close to or exceed those in the pre-FERA years. And if the very high levels of capital inflow since then are taken into account, the picture today is still more gloomy. For all its deficiencies, the FERA did succeed in curbing to some extent the growth of the foreign sector in the Mid-1970s, but the liberalization after 1980 put the clock back. In the recent spell continues, a Latin American type of 'denationalization' of indigenous industry cannot be far off.

The study carried by Uchikawa\textsuperscript{33} examined the reason for the investment boom and why it was over in the mid-1990s. It was found that, industrial licensing might have encouraged investment on the basis of entrepreneurship. The five main investing industries led investment in the manufacturing sector. Their contribution rates to total of

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Gross fixed capital stock between 1991-92 and 1997-98 was 63.3 per cent. As it was 64.4 per cent in the 1980s, concentration of investment in the five industries did not accelerate after economic reforms. The reasons of investment boom were three. Firstly, demand was expanding in the first half of 1990s. Growth rate of gross value added is a good indicator of market conditions. Secondly, India had a stock boom between 1992-93 and 1994-95. The boom was created by a small number of companies with good performance. Thirdly, increase of internal financing was advantageous to investment.

The study carried by Mohd Noor, Clarke and Driffield34 examined the hypothesis that foreign MNEs are the driving force behind technological development in developing economies, it examined the determinants of local firms decisions to undertake technological effort, not only in isolation, but also in the context of linkages between domestic firms and MNEs. There was evidence of linkages between MNEs and local firms; these were important in explaining technological effort by local firms but direct technological assistance from MNEs does not seem to play a major role in fostering increased technological effort by local firms.

The study done by Laiz R. De Mello Jr35 examined the impact of Foreign Direct Investment (FDI) on capital accumulation, output and Total Factor Productivity (TFP) growth in the recipient economy. Time series and panel data evidence are provided for a sample of OECD and non-OECD countries in the period 1979-90. Although FDI was expected to boost long run growth in the recipient economy via technological upgrading

and knowledge spillovers, it was shown that the extent to which FDI growth enhancing depends on the degree of complementarity and substitution between FDI and domestic investment.

Goldar and Veeramani\textsuperscript{36} investigate the various dimensions of Investment Climate (IC) in determining Total Factor Productivity (TFP) in the manufacturing sector across the major Indian States. The study assumes that India's overall economic progress during the reform period has been leaving some of the states behind. They undertake a regression analysis to investigate the effect of IC on TFP. They found that a market friendly investment climate was important for achieving higher levels of productivity. A market friendly investment climate, however, does not mean that the regulatory function of the government should be done away with, government regulation was crucial to address market failures and to protect social interests, but the policies and practices of the government should be transparent and designed without distorting the incentives of the firms to invest and grow.

**Liberalisation and Technological Change**

Today innovation or technological change is seen as a prime motive force behind economic growth. The innovation in a given country may be conducted by domestic entities and/or foreign entities resident there. For many countries, the latter or the research and development activities of multinationals may be a notable source of both technology transfer as well as technology diffusion.

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The study of Goldar\textsuperscript{37} supplements the analysis of productivity trends in the pre- and post-reform periods, the paper takes a close look at growth in employment and output in India's organized manufacturing sector in the period since the Mid-1990s. The analysis revealed that the trend rate of growth in employment in the period 1997-98 to 2001-02 was significantly negative, at about - 3.3 per cent per annum. The trend growth rate in real value added in the period 1996-97 to 2001-02 was very low at about 0.5 per cent per annum. This was much lower than the trend growth rates in real value of output and the Index number of industrial production (manufacturing) in the period, both exceeding 5 percent per annum.

The study carried by Iyer, Saranga and Seshadri\textsuperscript{38} analyzed the links between firm level externally validated changes in quality such as certificates, awards etc. and their impact on productivity. They use a Data Envelopment Analysis (DEA) approach to estimate productivity change for each year during the eleven year period 1993-2003 for a sample of 50 firms in the Indian Automobile component industry. They decompose productivity improvements into gains due to technical change and improvement in relative efficiency. Result showed that the average productivity of the industry increased by nearly 40% over this period, which was essentially due to technical gains of 40.5% and a negative contribution from relative efficiency change of - 0.5% during this period.


The study of Bhaumik, Gangopadhyay and Krishnan\textsuperscript{39} using 3-digit industry level data from India for the 1984-97 period examined the effect of entry on productivity in the Indian context. Their empirical result suggests that during the 1980s industry level factors largely explained variations in entry rates, but following the economic federalism brought about by the post-1991 reforms, variations in entry rates during the 1990s were explained largely by state level institutional and legacy factors. However, they did not find evidence of net entry rates on industry level productivity growth.

Jenn-Hwan Wang\textsuperscript{40} analysed the divergent models pursued by South Korea and Taiwan in regard to technological catching-up and their ongoing transition towards innovation-based economies. It was found that South Korea's former high-debt and chaebol-dominated model inclined it to pursue a Schumpeterian scale based technological development, while Taiwan's former pro-stability, Small and Medium-sized-Enterprise (SME) based model tended to favor its emphasis on a Neo-Marshallian network-based technological development. It was argued that the state's approach to economic liberalization and firms demand for capital and technological upgrading are the major factors which underpinned the adjustment efforts of these two countries.

Chakraborty\textsuperscript{41} examined the time series properties of foreign capital inflows into India in the 1990s, particularly in the period that followed certain liberalization measures in the financial sector. The analysis of quarterly data for the period 1993 to 2003 showed

\begin{itemize}
\item Bhaumik Kumar Sumon, Shubhashis Gangopadhyay and Shagun Krishnan (2008), ‘Reforms, Entry and Productivity: Some Evidence from the Indian Manufacturing Sector.’ October 27, paper available on the site www.google.com
\end{itemize}
that net capital inflow have been volatile though not all components of aggregate inflows have moved in a similar fashion. It further analyses how capital inflows adjusted to changes in the real exchange rate and other macroeconomic variables in India since 1993. The econometric results indicated that an error-correction mechanism was operating between net inflows of capital and the real exchange rate. Macro economic fundamentals did not have any significant effect on the dynamic adjustment of capital inflows, and a co-integration relationship exists between the net inflows of capital, real exchange rate and interest rate differential. It was argued that co-movement in these variables was due to the intervention of Reserve Bank of India in the foreign exchange market, which helped in preventing the volatility of the real exchange rate inspite of the volatility in net inflows of capital.

Puran and Jayant\textsuperscript{42} surveyed the available literature on productivity growth and technical change in six energy intensive industries in India covering the period 1947-1998. It assesses the magnitude of the Autonomous Energy Efficiency Improvements (AEEI) parameter for India's industrial sector. The survey revealed productivity growth to be an active area of research in India, both at the aggregate level as well as the industry level. It indicates wide inter-and intra-industry variation in estimates of partial and total factor productivity due to differences in methodology, levels of aggregation, sources of data, time periods of analysis, and reporting procedures. The overall impression was positive imperceptible growth in productivity overtime. The policy implication was that little reliance can be placed on the AEEI factor as the moderating influence on growth of energy demand.

Joseph and Abraham\textsuperscript{43} investigated, how India faced in terms of harnessing Information technology for enhancing manufacturing productivity. They analyzed an unpublished data set on the investment in computers and software at the industry level made available by CSO. The study finds that IT investment does have a positive and significant impact on both partial and total factor productivity. Findings of the paper suggests policy measures and an institutional intervention towards promoting IT diffusion in the manufacturing sector, and is likely to give rich dividends.

Berhanu Abegaz\textsuperscript{44} used cross-country panel data on three digit manufacturing to test for progressive structural convergence in industrial output mix between industrializing and industrialized economies. Regression based on logistic and almost ideal models show that industrial deepening entails share losses for light and selected heavy manufacturing, and share going for engineering and consumer durables. While semi-industrial economies manage to shift into petrochemical and engineering industries, the least industrialized nurture a broad spectrum of non-traditional manufacturing. Diversity in factor endowments and policy not with standing, growing similarity in demand and technological diffusion appear to produce weak convergence of industrial structures between developing and developed countries.

The study carried by Neelam Singh\textsuperscript{45} examined the firm level determinants of R&D, import of technology and (merchandise) trade intensities along with their interdependence for a sample of primarily pharmaceutical manufacturing companies

\textsuperscript{45}Singh Neelam (1997), “R&D, Import of technology and Trade Intensities, A simultaneous equation micro-level examination”, EPW.
operating in India. Export orientation, import substitution and in-house technological effort are closely linked to the development of an industry, subsuming the technological development. They took sample of 35 large and medium-sized private sector pharmaceutical companies operating in India covering the period 1988-89 to 1991-92. They found strong interdependencies among the exogenous variables of the model. R&D and technology import intensities strengthen each other. While capturing the simultaneity, the simulative (consistently positive) effect of import of technology on R&D intensity holds, indicating a complementarily high R&D intensity and boosts the export sales ratio, some what more for local firms considering the large favorable effect of export intensity on R&D intensity.

Asplund and Sandin\textsuperscript{46} investigated about the positive correlation between market size, number of firms and competition was more intense in larger markets. They test these on a sample of 250 Swedish regional markets by estimating the relation between the number of firms, production capacity, and market size. The number of firms increases less than proportionally with market size. Market size per capacity unit 1% smaller in large markets. Since firms produce fairly homogenous goods; they argue that this is evident that profits per capita are decreasing in market size.

The study carried by Sanjay Chakravorty\textsuperscript{47} examined, where do new industrial investments locate, and what factors drive the industrial location decision? Do these investments follow the model of 'divergence followed by convergence' suggested by the cumulative causation, agglomeration economies, and transport-costs approaches? These

questions are examined with district-level data from India for the pre-and post reform period using: *first*, tables and maps of concentration and clustering, aggregated for all industry and disaggregated into five sectors (Heavy Industries, chemicals and petroleum, Textiles, Agribusiness, and Utilities), and *Second*, logistic OLS/Heckman Selection regression models for these six elements. The doter provides evidence of both interregional divergence and intra-regional convergence, and suggests that 'concentrated decentralization' is the appropriate framework for understanding industrial location in post reform India

Okamoto and Sjoholm\(^{48}\) examined productivity growth in the Indonesian manufacturing sector. They use a longitudinal data set to calculate the effects on aggregate manufacturing productivity growth from improvements within establishments, from reallocation of market shares, and from the turnover of plants. Productivity growth was mainly explained by reallocation of market shares and from turnover of plants. Moreover, the foreign contribution to productivity growth is unclear and depends on the choice of productivity measure. They conclude that the foreign contribution was about the same size as the foreign share of manufacturing output. They also found difference in the causes of productivity growth between foreign and domestic plants.

The study carried by Goldar and Kumari\(^{49}\) raised the issue that how far the import liberalization contributed to the better productivity performance of Indian Industry in the post-reform period (1981-82 to 1997-98). Econometric Analysis indicates that the lowering of effective protection to industries favourably affect productivity growth. The


\(^{49}\) Goldar Bishwanath, Anita Kumari (2004), 'Import Liberalization and Productivity Growth In Indian Manufacturing Industries in the 1990s.' *The Developing Economies*, XLI-4, December, pp. 436-460
result suggests that gestation lags in investment projects and slower agricultural growth in the 1990s had an adverse effect on productivity growth. The analysis reveals that underutilization of industrial capacity was an important cause of the productivity slowdown, with corrections for capacity utilization, the estimated productivity growth in the 1990s is found to be about the same as in the 1980s.

The study carried by Pradhan and Barik\(^50\) re-examined the growth path followed by total factor productivity growth for a long time period ranging from 1963-64 to 1992-93. In addition to the aggregate manufacturing sector, it extends the analysis to some of the most polluting industries India identified by the Central Pollution Control Board, New Delhi with a view to assess the 'turn around' proposition. For this purpose eight industries have been selected. They estimate TFP with the help of divisia tornquist approximation from a Translog Production Function. The empirical results were—

1. Value added function does not exist for any of industries.

2. The growth path followed by TFPG can be appreciated better when the period (1963-92) is divided into three sub periods.

According to these findings he led to the conclusion that TFPG was experiencing a deceleration during the 1980s.

By using panel data on Indian Firms from 1974-75 to 1981-82, Basant and Fikkert\(^51\) provide estimates of the impact on output of Indian firms R&D expenditures, their technology purchases, and international and domestic R&D spillovers. The private returns to technology purchases are estimated to be high and statistically significant,


\(^{51}\) Basant Rakesh and Brian Fikkert (1996), "The effects of R&D, Foreign Technology Purchase, and Domestic and International Spillovers on Productivity in Indian Firms", *EPW*. 48
while the private returns to firms own R&D expenditures are somewhat lower and are often significant. It shows both international and domestic R&D spillovers. The estimates permit estimation of total factor productivity growth in the period preceding India's industrial liberalization policies.

The study of Chang Yang Lee\textsuperscript{52} aims to shed some new insights on the long debated extensively and intensively explored relationship between market concentration and industry R&D intensity. The study develops from a Classic Dorfman-Steiner (1954) Model of firm R&D, a model of industry R&D, where consumer preference over quality and price, R&D technology, and the joint distribution of firm specific technological competence and market share jointly determine the level of industry R&D intensity. The joint distribution term, which reflects both the underlying distribution of firms-specific technological competence and the strength of its links with market share, suggests that the concentration, R&D relationship differs depending on the strength of the link or simply the appropriability of R&D in terms of market share, a positive relationship is predicted for low-appropriability industries, where market concentration supplements low R&D appropriability, while a negative or an inverted U-shaped relationship for high appropriability industries.

The study carried by Tyler\textsuperscript{53} analysed the empirical relationship between economic growth and export expansion in developing countries as observed through an inter-country cross-section analyses. Employing data from 55 middle income developing countries for the period 1960-1977, bivariate tests revealed significant positive associations between growth and various other economic variables including the growth


of manufacturing output, investment, total exports, and manufacturing exports. A production function model was also specified and estimated with the cross-sectional data. The results indicated that export performance was important, along with capital formation, in explaining the inter-country variance in GDP growth rates during the 1960-77 period.

The study done by M. Parameswaran\textsuperscript{54} examined two important components of the total factor productivity growth, namely technical change and technical efficiency change of firms belonging to the capital goods producing industries. Empirical analysis of these two components was motivated by the policy changes that capital goods producing industries were subjected to during the 1990s as well as by the existing evidences on the total factor productivity growth in Indian manufacturing industry. Technical change and technical efficiency change were estimated in a single step, using a Stochastic Frontier production function. The result of the study showed that all the industries studied experienced a significant improvement in the rate of technological progress during the post-reform period. However, the evidence on technical efficiency showed that not only the level of technical efficiency was lower during the post reform period, but also the rate of decline in the technical efficiency was higher in all industries except in one. Thus the paper provides further insight into the productivity performance of these industries during the post reform period.

The study carried by Chappelle and Plane\textsuperscript{55} analysed the productive performance in four manufacturing sectors of the Ivorian economy: textiles and garments, metal

products, food processing, wood and furniture. To appraise the productive performance, econometric production frontier models were used, illustrating the maximum output attainable from a given quantity of inputs. The frontier and firm efficiency scores are derived from stochastic production functions estimated on cross-sectional data. The stochastic specification of the models allows for the decomposition of the error term into two components, one the normal random effect and the other to account for technical inefficiency. It was explained by various exogenous variables describing the economic and institutional environment. Firm size proves to be a statistically significant determinant of the productive performance. Across the four sectors, the positive impact of being large compensates the negative effect of a formal institutional status in an environment where government regulations still prevail.

The study carried by Anita Kumari\textsuperscript{56} analyzed the effect of economic liberalization on pattern of sources of growth of output of Indian manufacturing industry from a demand side perspective. The analysis has been based on Chenery’s factor decomposition approach based on input-output framework. It decomposes output growth into its four sources: domestic demand expansion, export expansion, import substitution and intermediate demand expansion due to change in input-output coefficient. The basic data used for this study has been the input-output tables for 1983-84, 1989-90 and 1997-98. The analysis has been done separately for the pre-liberalization period, 1983-84 to 1989-90, and the post-liberalization period 1989-90 to 1997-98, to examine the changing pattern in the sources of growth of output as a result of policy liberalization and structural reforms during the 1990’s. It shows that output growth in manufacturing industry has

\textsuperscript{56} Kumari, Anita (2001), “Liberalization and Sources of Industrial growth in India: An Analysis on Input Output Approach”, \textit{Institute of Economic Growth}. 51
been mainly driven by domestic demand expansion followed by contribution of export expansion during both pre-liberalization as well as post-liberalization period, but after liberalization the contribution of both domestic demand expansion and export expansion has increased. Contribution of both import substitution and intermediate demand expansion to output growth, which has been positive before liberalization, has become negative.

The paper presented by Durisamy\textsuperscript{57} analysed the efficiency and productivity performance of the unorganized manufacturing sector in 13 major Indian States over the period 1978-79 to 2000-01 using a large scale National Sample Survey data for the five periods, 1978-79, 1984-85, 1989-90, 1994-95 and 2000-01. The study also compares the performance of the sector across the Indian states in the reforms period (1989-90 to 2000-01) with that in the pre-reforms period (1978-79 to 1989-90). Levels and changes in labour productivity are examined and the Data Envelopment Analysis (DEA) is applied to calculate Malmquixt Productivity Indexes. Their analysis shows that all states except Rajasthan have registered a positive growth in labour productivity across the Indian states. The Malmquist total factor productivity measure shows that, on an average, the annual rate of total factor productivity growth have been higher in the reforms period than in the pre-reform years. It was also evident that in most of the states the rate of total productivity growth had improved after the reforms. It also draws attention to the fact that the work of technological progress was the main constraint for achievement of high levels of total factor productivity during the reference period in the Indian unorganized manufacturing sector.

The study carried by Narayanan\textsuperscript{58} analysed the behavior of Indian automobile firms operating under regulated and liberal economic policy regimes. Results from the step-wise discriminate analyses presented, reveal that the conduct and performance of firms in this sector differ significantly between the regulated (1985-86 to 1990-91) and liberal (1991-92 to 1995-96) economic policy regimes with respect to foreign equity participation in house R & D efforts, technological imports, capital intensity, advertisement, exports growth and profits.

The study carried by Nagesh Kumar\textsuperscript{59}, in order to maximize the revenue productivity of their intangible assets, affiliates of MNEs are more likely to pursue non-price rivalry than their host country counterparts. The choice of rivalry is expected to get reflected on different aspects of conduct and performance of the firm. Comparing the behaviour of two groups of firms in 49 Indian industries, it was found that MNE affiliates operate at relatively larger scales, enjoy higher profit margins, are more vertically integrated and fund flush firms with more skilled personnel. For advertising and R & D inputs they benefit also from the global expenditures of their associates.

The study of Hossain and Karunaratne\textsuperscript{60} investigated the effects of trade liberalization on the technical efficiency of the Bangladesh Manufacturing sector by estimating a combined stochastic frontier-inefficiency model using panel data for the period 1978-94 for 25 three-digit level industries. The results show that the overall


technical efficiency of the manufacturing sector as well as the technical efficiencies of
the majority of the individual industries has increased over time. The findings also clearly
suggest that trade liberalization, proxies by export orientation and capital deepening, has
significant impact on the reduction of the overall technical inefficiency. The evidence
also indicates that both export promoting and import substituting industries have
experienced rises in technical efficiencies over time. Finally, the joint test based on the
likelihood ratio test rejects the Cobb-Douglas production technology as description of the
database given the specification of the translog production technology.

The study of Chang and Robin\textsuperscript{61} investigated the relationship between innovation
practices and performance in the firms of Taiwan. Using a panel of 4000 firms, they
examine the effects of importing technology (versus doing R&D) on Total Factor
Productivity (TFP) growth. The relationship between these two innovation strategies is
also explored. It is found that R & D strongly contributes to the growth of TFP, whereas
the importation of technology has no significant effect. However, the interaction is only
weakly significant, which makes it difficult to qualify the type of relationship
(complementarity or substitutability) that exists between the two innovation strategies.

The study carried by Saon Ray\textsuperscript{62} looked at how the reform process has helped the
country improve its competitiveness by investigating the effect of such reforms on the
efficiency of Indian manufacturing firms. The efficiency of a cross section of firms
belonging to 27 industry groups of the capitaline database has been estimated using the

\textsuperscript{61} Chang, Chia-Lin and Stephane Robin (2008), ‘Innovation Strategy and Total Factor Productivity
Growth: Micro Evidence from Taiwanese Manufacturing Firms.’ Downloaded From Internet.
changoires.ucl.ac.be

\textsuperscript{62} Ray Saon (1999), ‘Economic Reforms and Efficiency of Firms: The Indian Manufacturing Sector during
the Nineties’, Paper Presented at, Institute of Economic Growth, University of Delhi.
Data envelopment analysis (DEA) approach. Next, regressions have been run for each year in the period 1991 to 2001, in order to estimate the impact of various policy reforms on efficiency and outline their trends over the years. The results highlight the positive impact of import liberalization on the efficiency of firms through import of capital goods and import of technology. Another policy that has been found to be successful is the easing of foreign ownership norms of firms as a part of a more market friendly industrial policy.

The study carried by Nagesh Kumar\textsuperscript{63} analyzed the determinants of location of overseas R&D activity of U.S. and Japanese Multinational Enterprises (MNEs) in a three-dimensional setting. Large domestic market, the abundance of low cost R&D manpower, and the scale of national technological effort favour the location of overseas R&D in a country. Tests covering sectoral composition support the proposition that a significant proportion of MNEs R&D activity follows that of leaders in their own fields. Lack of adequate patent protection or restrictive trade regime does not affect the attractiveness of a country otherwise well suited for R&D activity. Internationalization of R&D activity of Japanese MNEs is confined to relatively low technology intensive industries compared to U.S. MNEs.

The study carried by Balakrishnan, Pushpangadan and Babu\textsuperscript{64} investigated the existence of productivity since the introduction of trade reforms in the Indian economy. Data for a panel of 2300 firms spread over five industry groups at the two digit level of

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the NIC 1987 yielding over 11009 observations was assembled from the data base on electronic medium (PROWESS) of the Centre for Monitoring the Indian Economy (CMIE). The study found no evidence of acceleration in productivity growth since the onset of reforms in 1991-92.

**Liberalisation and Real Effective Exchange Rate**

The price of nontradable goods in India has been growing much more rapidly than the price of tradable goods. This development is significant because the ratio of nontradable to tradable goods prices is a critical relative price—it is a measure of the real exchange rate. An increase in the relative price of nontradable goods therefore, corresponds to a real exchange rate appreciation. After all, Balassa-Samuelson\(^{65}\) argued that real exchange rates typically appreciate as countries develop—and India has been developing rapidly.

According to the study carried by Kohli and Mohapatra\(^{66}\), they examined the evolution of non-tradable and tradable prices in Indian economy over 1980-2002 and find widening differentials i.e, the real exchange rate has been appreciating. Assessing the role of both demand and supply factors, they find that demand pressures arising from higher income growth accounted for much of the relative price increase during the post-reform period. Falling import prices also contributed significantly, along with an increase in government spending.

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For emerging and developing countries, Chinn\textsuperscript{67} estimated a productivity-based model of relative prices and real exchange rates for nine East Asian economies and finds conflicting results. The hypothesis of productivity-driven real exchange rate appreciation is supported for Japan, Malaysia, and Philippines but not for fast growing countries like China and Thailand in the time-series samples; the panel estimates support the productivity effect with government spending and terms of trade emerging as insignificant factors. Ito, Isard, and Symansky\textsuperscript{68} find that rapid growth is associated with real exchange rate appreciation only for some APEC and ASEAN economies, viz. Japan, Korea, Taiwan, and to some extent, Hong Kong and Singapore, while countries like Indonesia, Malaysia and Thailand did not experience any real appreciation. They point out three factors that might explain the lack of exchange rate appreciation—high productivity growth in service sectors, divergences in domestic-foreign tradable prices and economic reforms that promote export and growth through nominal depreciation.

Choudhri and Khan (2004)\textsuperscript{69}, focused solely upon developing countries. In a panel sample of 16 countries, they found the traded-nontraded sector productivity growth differential to be a significant determinant of the relative price of nontraded goods, which, in turn, exerts a significant influence upon the real exchange rate.

Study carried by Xiangming Li\textsuperscript{70} used an event study based on carefully documented trade liberalization in 45 countries. The result showed that real exchange rate


\texttt{70 Xiangming Li (2003), “Trade Liberalisatio and Real Exchange Rate Movement”, IMF, WP/03/124.}
depreciates after countries open their economies to trade. In countries with multiple liberalization episodes, however, real exchange rates appreciate during early episodes, suggesting that partial or non credible trade liberalization are associated with real appreciation.

The study of Dani Rodrik and Arvind Subramanian\textsuperscript{71} explored the causes of India’s productivity surge around 1980, more than a decade before serious economic reforms were initiated. Trade liberalization, expansionary demand, a favorable external environment, and improved agricultural performance did not play a role. They find evidence that the trigger may have been an attitudinal shift by the government in the early 1980s that unlike the reforms of the 1990s, was pro business rather than pro market in character, favoring the interests of existing businesses rather than new entrants or consumers. A relatively small shift elicited a large productivity response, because India was far away from its income-possibility frontier. Registered manufacturing, which had been built up in previous decades, played an important role in determining which states took advantage of the changed environment.

Manoj Pant and Sangeeta Mondal\textsuperscript{72} found, as developing countries increasingly open their economies to foreign direct investment (FDI) one of their principal objective has been to achieve technology transfer from foreign firms to host country firms. Their study for India shows that this technology transfer is more likely to be achieved by the presence of foreign firms rather than by simple purchase of foreign technology. It is also seen that


\textsuperscript{72} Pant, Manoj and Sangeeta Mondal (2010),” FDI, Technology Transfer and Spillover —A Case Study of India”, \textit{Centre for International Trade and Development}, School of International Studies Jawaharlal Nehru University, Discussion Paper.
technology transfer is dependent on the absorptive capacity of firms and the competitive nature of the industry. Finally, this study finds that institutional factors like the degree of competition positively impact the effects of traditional factors like absorptive capacity in determining technology transfer.

Vinish Kathuria, Rajesh Raj S N, Kunal Sen\textsuperscript{73} analysed the productivity performance of both the organised and unorganised segments of the Indian manufacturing sector using unit level data. Both partial and total factor productivity measures were employed. Their analysis reveals that labour productivity has increased for the organised sector over time, whereas both labour productivity and capital intensity growth have slowed down in the unorganised sector during the period between 2000-01 and 2004-05. The improvement in TFP growth in organised manufacturing in the post-2000 period as compared to the second half of the 1990s across most states in India is heartening as also the fact that output growth was mostly productivity-driven in the post-reform period. However, the declining TFP and the increasing capital intensity of the unorganised sector are causes of worry and raise several important questions. Both partial and total factor productivity measures were employed. Their analysis reveals that labour productivity has increased for the organised sector over time, whereas both labour productivity and capital intensity growth have slowed down in the unorganised sector during the period between 2000-01 and 2004-05. The improvement in TFP growth in organised manufacturing in the post-2000 period as compared to the second half of the 1990s across most states in India is heartening as also the fact that output growth was mostly productivity-driven in the post-reform period.

Smruti Ranjan Behera, Pami Dua, Bishwanath Goldar\textsuperscript{74} analyzed the spillover effect of Foreign Direct Investment (FDI) across Indian manufacturing industries. Foreign presence by way of FDI brings new channels of technology spillover to the domestic industrial firms in the form of enhanced efficiency and diffusion of knowledge in the long-run. By carrying out Pedroni cointegration tests, the analysis tries to provide a long-run relationship between endogenous variables and explanatory variables, pertaining to technology spillovers across Indian manufacturing industries. They found technology spillovers are relatively higher in industries like food products, textiles, chemicals, drugs and pharmaceuticals and non-metallic mineral products.

Mathew Joseph, Karan Singh, Ranjan Kumar Dash, Jyotirmoy Bhattacharya, Ritika Tewari\textsuperscript{75} developed tools to examine selected major issues in the Indian economy. The study computes the potential growth rate of the economy and the agricultural sector, extends the analysis of the fiscal stimulus and its effects, and estimates the short and long run elasticities of India’s trade. This brings out the need for structural reforms in raising the potential growth rate of economy and that of agriculture to achieve a non-inflationary, high growth trajectory for the country. The fiscal stimulus effects indicate the importance of fiscal consolidation efforts to sustain high growth. The trade elasticities buttress the case for maintaining an appropriate real effective exchange rate.

Rajiv Kumar, Abhijit Sen Gupta\textsuperscript{76} reviewed the current state of the Manufacturing sector and focuses on determinants of its competitiveness. The paper finds that Indian

manufacturing sector exhibits a great deal of regional variation and a marked dualism between the organized and the unorganized segments in terms of both productivity and wage levels. The level of labour absorption in the organized manufacturing sector has been weak as reflected in the declining labour intensity in this sector. This does not augur well for achieving inclusive growth. They also find that although there have been significant changes in the composition of exports in the last 20 years; India is still a very small player at the global level, especially in knowledge intensive and advanced technology products. Finally, the paper explores India’s potential for transforming itself into a hub of mass manufacturing. According to them the main constraints in doing so have been the low level of R&D, relative lack of skilled personnel and relatively low FDI levels.

Ravindra H. Dholakia, Astha Agarwalla, Amir Bashir Bazaz, Prasoon Agarwal paper was based on the 8 Input – Output (I-O) tables for the Indian economy available over a period of 36 years from 1968-69 to 2003-04. The technical progress (TP) in the context of the I-O tables is based on the concept of a production function defining the relationship between gross output and material inputs as well as value added at the disaggregated sectoral level. The paper attempts to answer the following questions: (i) Was the TP substantial and continuous throughout the period?; (ii) Was the rate of TP during the inward looking and outward looking growth strategy phases of the economy the same?; and (iii) Was the rate of TP at the disaggregated sectoral level almost constant over time? In order to measure the rate of TP, the available eight national I-O tables in India are first made compatible for the number, scope and definitions of sectors as well as

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for prices by converting them at constant 1993-94 prices. Chenery-Watanabe coefficient is used for measuring the rate of TP for different sectors across the 8 IO tables.

The study of Fulvinder Pal Singh\textsuperscript{78} analyzed the TFP growth trends in Indian manufacturing sector at both aggregated and disaggregated inter-state levels. Using the Malmquist productivity index for panel dataset of 16 major industrial state over a period of 29 years spanning over 1979-80 to 2007-08, the study observed manufacturing sector of India is growing with 9.1 percent per annum growth of Total Factor Productivity (TFP) during the entire study period. Out of Sixteen Industrial states there are five states namely Uttar Pradesh, Madhya Pradesh, Gujarat, Orissa and Rajasthan where double digit TFP growth has been noticed. The manufacturing sector of Uttar Pradesh is growing with highest TFP growth at the rate of 12.8 percent per annum followed by Madhya Pradesh with TFP growth of 11.8 percent per annum. The analysis of the sources of the TFP growth in Indian manufacturing sector reveals that both technical progress and technical change are equally contributing TFP growth in sector under evaluation. It has also been observed that at all India level efficiency change is greater than technical progress.

Petia Topalova\textsuperscript{79} in his study used a panel of firm-level data, their study examined the effects of India’s trade reforms in the early 1990s on firm productivity in the manufacturing sector, focusing on the interaction between this policy shock and industry, firm and environment characteristics. The rapid and comprehensive tariff reductions–part of an IMF-supported adjustment program with India in 1991–allow them


to establish a causal link between inter-industry and inter-temporal variations in output tariffs, input tariffs, and effective rates of protection and consistently estimated firm productivity. Specifically, reductions in trade protectionism led to higher levels of firm productivity, with this effect strongest in industries that were import-competitive and were not subject to excessive domestic regulation. A significant productivity boost was generated by the lower tariffs on intermediate inputs as well. Interestingly, state-level characteristics, such as labor regulations, investment climate, and financial development, do not appear to influence the effect of trade liberalization on firm productivity. Finally there is strong suggestive evidence of complementarities between trade liberalization and industrial policies that encourage domestic competition.

Nagesh Kumar\(^{80}\) analyzed the trends, patterns and determinants of outward Investments by Indian enterprises that have increased notably since the onset of reforms. He found the sharp rise in outward investments since 1991 has been accompanied by a shift in geographical and sectoral focus of Indian investments. He develops an analytical framework for explaining the probability of an Indian enterprise investing abroad in an exclusive large dataset of Indian enterprises. The findings suggest that Indian enterprises draw their ownership advantages from their accumulated production experience, cost effectiveness of their production processes and other adaptations to imported technologies made with their technological effort, and some times with their ability to differentiate product. Firm size exerts a positive but a non-linear effect. Enterprises that are already in export markets are more likely to be outward investors. Finally, policy liberalization of 1990s turns out to have pushed Indian enterprises abroad.

\(^{80}\text{Kumar, Nagesh (2006), “Emerging Multinationals: Trends, Patterns and Determinants of Outward Investment by Indian Enterprises”, Research and Information System for Developing Countries, Research Paper.}\)