

## Liberalization and Indian Manufacturing Industry: An Inter Industry Analysis of Technological Change

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### INTRODUCTION

In recent years manufacturing has been playing a dominant role on account of an increase in volume of global trade as a result of globalization and dismantling of trade barriers under the World Trade Organization. Prime Minister's Group constituted for "Evolving measures for ensuring sustained growth of the Indian Manufacturing Sector" noted that manufacturing is not only the backbone of the economy, but is also the muscle behind the national security. Manufacturing sector's growth is crucial to the growth of an economy, as an economy can grow at a higher rate on the basis of its agricultural sector only. This is because the sector tends to have a multiplier effect on other sectors in the economy. The manufacturing sector avails raw materials and services from other sectors in the economy and in turn supplies them with finished products. Hence stimulating demand for everything from raw materials to intermediate goods. Its area of influence includes sector like software, health, and transportation. The world over the manufacturing sector is recognized for creating mass employment for low-skilled workers in the modern sector. With a rapid decline in the capacity of agriculture to offer jobs and the limited scope of the modern services sector to absorb relatively unskilled labor that has been displaced from agriculture, expectations are that the manufacturing sector will create mass employment for this displaced lot. In India the role of the manufacturing sector is recognized to be critical not only for facilitating large-scale employment but also for enabling high GDP growth.

In the initial years of planning, the thrust was to develop the manufacturing base by setting up heavy industry, towards which the organized manufacturing sector was mainly producing basic intermediate goods and machinery. The 1980s saw a clear departure from this strategy with partial liberalization as consumer goods became the dominant industry. The structural reforms since 1990s have made some progress. Despite recent setbacks, it is universally acknowledged that the reforms process in India cannot be reversed and sooner or later these reforms will be implemented. However, the long term competitive ability of Indian firms would depend on production efficiency. Production efficiency, in turn, is dependent on ability to develop, import and adapt new technologies among other factors.

Domestic firms may learn by observing the foreign owned firms. Also greater exposure to imported products may make imitation easier and trade in one sector may enhance productivity in another via input-output relations. Exposure to international competition may drive inefficient firms from the market and reduce the social costs of production by promoting production based on comparative advantage. Access to export markets may induce increased capacity utilization as well as scale economies. So competition generated by trade tends to improve the quality of human capital due to improvement in technical skills and thereby productive efficiency of firms.

An overview of the manufacturing sector shows that it has enjoyed a compounded annual growth rate of 10 per cent for the last five years. The average Index of Industrial Production growth rate has been of the order of 7.8 per

cent over the same time period. Since 1991, the economy is being progressively liberalized and its integration to the global economy is deepening. On one hand, these developments have provided opportunity for growth and expansion of industry; on the other hand, not only is domestic manufacturing facing stiff competition from free imports but also has to re-double its efforts to grow its export capabilities. Globally, as we move towards a free trade regime, products are being sourced from regions or countries enjoying competitive advantages. This could be due to inherent resource endowments such as cheap/easy supply of raw material, large pool of skilled labour, knowledge, innovation or new technologies.

Growth in the manufacturing sector has the potential to elevate much of the Indian population above the poverty line by shifting the part of the workforce out of low-wage agriculture. This would initiate a virtuous circle of higher production, incomes, savings, investment, and a more stable and prosperous India will in turn attract more business and higher growth opportunities.

## REVIEW OF LITERATURE

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.

Further we have reviewed the studies as per our study used the measures for liberalization and technological change in manufacturing industry.

Nagesh Kumar 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 sometimes 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. Petia Topalova 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-competition 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.

The study of Dani Rodrik and Arvind Subramanian 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.

The study done by Balakrishnan, Pushpangadan and Babu 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 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.

The study carried by Saon Ray 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 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 of Mohd Noor, Clarke and Driffield 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 Chandra 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 stand point 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 gloomier. 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. Kavoussi 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 done by Dijkstra aims to what extent trade liberalization affects 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 takes into account the comparisons of labor 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 study done by Jung and Marshall 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 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 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 assesses the rate of trade policy reforms in bringing about productivity improvements for the industrial sector. It leads to the 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 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.

#### **OBJECTIVES OF THE STUDY:**

The present study has the following objectives-

1. To examine the impact of liberalization on technological change in Indian manufacturing sector i.e. to examine whether import liberalization, foreign direct investment and export orientation had improved productivity in the Indian manufacturing sector.
2. To analyze the inter-industry variations in productivity and examine how far these were influenced by outward orientation.

**RESEARCH METHODOLOGY**

In the literature, there are different methods such as Stochastic Frontier Analysis (SFA) and Data Envelopment Analysis (DEA) that could be used to measure the Malmquist Productivity Index (MPI). However, the widely used method is data envelopment analysis like linear programming method. In order to check the growth robustness of Indian manufacturing sector Total Factor Productivity Growth has been analyzed. DEA method to calculate the Malmquist Productivity Index in Indian manufacturing industry has been used. The Malmquist Productivity Index (MPI) has been used to analyze Total Factor Productivity growth. The use of MPI has been preferred over traditional non-frontier techniques given the property of MPI that it decomposes the Total Factor Productivity change into two mutually exclusive and non-additive components namely, Efficiency Change (indicator of catching-up) and Technological Change (indicator of shift in production function). However, the non-frontier techniques assume that all firms are different and thus, Total Factor Productivity is the outcome of frontier shift or technological change only.

Total Factor Productivity Growth has been calculated for measuring the performance of Indian Manufacturing industries. To calculate the Malmquist Productivity Index (MPI) in Indian manufacturing industry, DEA method has been used. The use of MPI has been preferred over traditional non-frontier techniques given the property of MPI that it decomposes the Total Factor Productivity change into two mutually exclusive and non-additive components namely, Efficiency Change (indicator of catching-up) and Technological Change (indicator of shift in production function).

In order to see the performance of Indian manufacturing industry sub groups we have calculated the Compound Annual Growth Rate of labour (total person engaged) and Gross value added at constant prices. The overall study period i.e, 1980-81 to 2009-10 is divided into three sub periods. The Compound Annual Growth Rate has been used as an indicator to compare the pre and post liberalization performance of manufacturing industry subgroups.

**Findings on performance and determinants of Total Factor Productivity change in Indian Manufacturing Industry Subgroups:**

- The compound annual growth rate (CAGR) of Gross Value Added and labour were used as an indicator of industrial performance in overall study period. In **Food product** industry CAGR of Gross Value Added and labour was 7 percent and 11 percent respectively. If we compare the CAGR of both labour and Gross Value Added in pre and post reform period, we observed decrease in CAGR of labour and Gross Value Added in post reform period. We observed decrease in CAGR of Labour and Gross Value Added in period III<sup>rd</sup>, but CAGR of Labour was negative in this period.
- In **Cotton Textiles** industry the CAGR of Gross Value Added and labour was 5.2 percent and 14.6 percent respectively in overall study period. If we compare pre and post reform period, we observed increment in CAGR of labour, on the other hand CAGR of Gross Value Added registered negative growth in period II<sup>nd</sup>, but both indicators registered positive growth in period III<sup>rd</sup>.
- In **Wood & wood product** industry we found CAGR of 1.8 percent and 10.1 percent of Gross Value Added and labour respectively. After the comparison of pre and post reform performance we observed decrement in CAGR of Gross Value Added in post reform period. On the other hand CAGR of labour in post reform period registered improvement, this improvement in CAGR was greater in period II<sup>nd</sup> in comparison to period III<sup>rd</sup>.
- In **Paper and allied** industry CAGR of Gross Value Added and labour registered 2.9 percent and 12.3 percent respectively in overall study period. In the comparison of pre and post reform period, we observed increment in CAGR of both Gross Value Added and labour in period II<sup>nd</sup>, in III<sup>rd</sup> period CAGR of both labour and Gross Value Added registered decrement, but CAGR of Gross Value Added registered negative growth.

- In **Leather and related** industry we observed 5 percent and 7 percent CAGR of Gross Value Added and labour in overall study period. In comparison to pre and post reform period, we found decrease in CAGR of both labour and Gross Value Added in period II<sup>nd</sup>, but in period III<sup>rd</sup> CAGR of labour registered 14 percent growth, on the other hand CAGR of Gross Value Added registered 3.1 percent growth.
- **Rubber & Related Products Industry** registered 0.9 and 9.3 percent CAGR of Gross Value Added and labour in overall study period. In comparison of pre and post reform performance we found deceleration in CAGR of Gross Value Added in period II<sup>nd</sup> and III<sup>rd</sup>. CAGR of labour registered increment in both II<sup>nd</sup> and III<sup>rd</sup> period
- **Chemical and chemical products** industry registered 6.4 percent and 18.5 percent CAGR of Gross Value Added and labour in overall study period. After the comparison of pre and post reform period, we found increment in CAGR of both Gross Value Added and labour in period II<sup>nd</sup>, but in period III<sup>rd</sup> negative CAGR of both labour and Gross Value Added has been observed.
- In **Non-metallic mineral** products we observed CAGR of 5.3 percent and 14.1 percent in Gross Value Added and labour respectively. If we compare the pre and post reform period, we observed negative CAGR of Gross Value Added in period II<sup>nd</sup>, but in period III<sup>rd</sup> 9.9 percent CAGR of Gross Value Added has been observed. In case of labour 26.8 percent and 6.8 percent CAGR has been observed in period II<sup>nd</sup> and III<sup>rd</sup> respectively.
- **Basic metal and related** industry registered 5.1 percent and 14.6 percent CAGR of Gross Value Added and labour has been observed in overall study period. In the comparison of pre and post reform period negative CAGR of Gross Value Added has been observed in period II<sup>nd</sup>. In period III<sup>rd</sup> 21.6 percent CAGR of Gross Value Added has been observed. In case of labour we observed higher CAGR of 31.3 percent and 8.8 percent in period II<sup>nd</sup> and III<sup>rd</sup> respectively.
- In **Machinery and machine tool** industry we found negative CAGR of Gross Value Added in overall study period, but CAGR of labour registered 10.9 percent growth in the same period. In comparison to pre and post reform period, we found decrement in CAGR of Gross Value Added in post reform period. On the other hand CAGR of labour registered 25.6 percent and 10 percent growth in post reform period.
- In the **Transport equipment** industry we observed negative CAGR of Gross Value Added in overall study period, but in case of labour 7 percent CAGR has been observed. In comparison to pre and post reform period, we observed negative CAGR of Gross Value Added in period II<sup>nd</sup>, but in period III<sup>rd</sup> 6.1 percent CAGR has been observed. If we see the CAGR of labour it registered 19.7 percent growth in period II<sup>nd</sup> and 4.1 percent growth in period III<sup>rd</sup>, it was an improvement over period I<sup>st</sup>. In period I<sup>st</sup> CAGR of labour registered negative growth.
- We found 2.5 percent CAGR of Gross Value Added in **Other manufacturing** industry, on the other hand CAGR of labour registered negative growth in the study period. If we compare the pre and post reform period negative CAGR of Gross Value Added has been observed in period II<sup>nd</sup>, but in period III<sup>rd</sup> 1.2 percent CAGR of Gross Value Added has been observed. In case of labour only III<sup>rd</sup> period registered 8.8 percent CAGR in comparison to other periods in which it was negative.
- In period-I all manufacturing industries experienced positive Total Factor Productivity change. The industries having highest Total Factor Productivity change were wood, wood product and non-metallic industry; they registered 12.7 per cent and 10.7 per cent Total Factor Productivity growth respectively. The lowest Total Factor Productivity growth of 4.2 per cent has been experienced by machinery, machine tools industries due to a regress in Efficiency change. The positive Total Factor Productivity change in majority of the industries was explained in terms of remarkable increase in Technical change as compared to Efficiency change which was negative for all except in case of non-metallic industry.
- In period-II we found positive Total Factor Productivity change for all industries except for food product industry which registered a regress in Total Factor Productivity change. Non metallic industry with 9.3 per

cent Total Factor Productivity growth was the highest performer in this period. The positive Total Factor Productivity change in most of the industries in this phase was explained by the majority contribution of Technical change as compared to Efficiency change which was negative for all industries except in case of cotton textiles and rubber industries.

- In period-III Total Factor Productivity change registered positive growth in all manufacturing industry subgroups except in cotton textile industry which experienced a regress in Total Factor Productivity change. Other manufacturing and machinery and machine tools industry registered highest Total Factor Productivity growth of 19.6 per cent and 10.6 per cent respectively. The positive Total Factor Productivity change in majority of industries was explained in terms of Technical change as compared to Efficiency change. Contribution of Efficiency change in Total Factor Productivity change was low as compared to Technical change.

In sum, in comparison of productivity growth during three sub periods it was revealed that Total Factor Productivity growth in Indian manufacturing sector has fallen from 6.7 percent per annum during pre reform period to 4.7 percent per annum during the first phase of post-reform period, Total Factor Productivity growth registered 7.6 per cent increase per annum only in the second phase of post reform period which was marginally better than the pre-reform growth of Total Factor Productivity growth. Hence at aggregated levels impact of economic reforms was not in a desired direction as envisaged by the policy planners of India.

In the manufacturing industry subgroup out of 12 Manufacturing Industries six industries were showing positive Total factor productivity change and another six industries were showing a regress in Total Factor Productivity change throughout the study period i.e,1980-81 to 2009-10.The lowest performers were food product and cotton textile industry, this low performance can be explained in terms of Technical change, since this was negative throughout the period, Efficiency change was positive but this positive change was waved off by negative change in Technical change and it resulted into negative Total Factor Productivity change. The highest performers were other manufacturing and transport equipment industry, these industries registered 14 per cent and 12.8 per cent average Total Factor Productivity change respectively. If we compare the manufacturing industries having positive Total Factor Productivity change and those who were having negative Total Factor Productivity change, we found in low performers with negative Total Factor Productivity change the reason was a regress in Technical change because Efficiency change was positive in most of the industries. Manufacturing industries having positive Total Factor Productivity change showed both Efficiency change and Technical change was positive, but the higher proportion of Total Factor Productivity change was explained by Technical change as compared to Efficiency change.

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