CHAPTER 5

TECHNOLOGICAL PERFORMANCE – A COMPARISON OF DOMESTIC AND FOREIGN FIRMS USING DESCRIPTIVE ANALYSIS OF DATA

5.1 GENERAL

The theoretical explanations and empirical evidences given in Chapter 2 deals with how FDI induces or acts as a catalyst to higher economic growth. It is, therefore, expected that foreign firms have high productivity and would perform better in technological competence, considering their technological advances and proprietary knowledge. Under this backdrop it is hypothesised that the technological performance of foreign-owned firms is superior than that of the domestic-owned firms. This chapter test this hypothesis by comparing the performances of domestic and foreign-owned firms in technology capability building and the above hypothesis is tested using a descriptive analysis of the sample data collected.

The performance of domestic and foreign firms\(^1\) for various indicators such as output, output-capital ratio, output-labour ratio, capital-labour ratio, etc. are compared in Section 5.2. The ratios of the mean value of these indicators between domestic and foreign firms have been taken for this

\(^{1}\) The method of classification of domestic and foreign firms is given in Chapter 4, Section 4.5.
purpose. In Section 5.3 the performance of these two categories of firms in all the industries are taken together and compared for a general overview about the performance of these firms after liberalisation (i.e., after 1991). In the succeeding section (Section 5.4), various performance indicators such as output and value added of domestic and foreign firms in different industry groups are compared to get an in-depth knowledge about the industry-specific effect of liberalisation policies on the performance of these firms. Section 5.5 compares the technological performances of domestic and foreign firms in different industry groups using various technology indicators. The industry-wise analysis has been done because in India the policy decisions regarding FDI are generally industry/sector specific. Also, the performance of both categories of firms (domestic and foreign) may vary due to several industry-specific characteristics such as technology intensity of the industry. For instance, machinery and machine tools, transportation, etc are considered highly technology intensive industries, while food processing, textiles, etc are supposed to be less technology intensive (see Kathuria, 2001 for a classification). Moreover, after 1991 liberalisation some sectors, which are globally technology intensive, would have greater chance to invest in R&D, capital goods import, technology licensing, etc. Section 5.6 concludes the chapter.

5.2. CHARACTERISTICS OF DOMESTIC VERSUS FOREIGN-OWNED FIRMS

Table 5.1 gives the ratio of the mean value of output and inputs in domestic firms to the corresponding mean values in foreign firms for the years

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2 Data are taken from absolute values as given in Prowess. No modification is made for this data. The ratios are calculated at firm level for each variable, these ratios are summed up and then divided by the total number of firms to find the averages.
1992, 1996, 2000 and the average for whole period (i.e. 1992 to 2000). The means are calculated over all selected firms for the study. In 1992 the average output of the domestic-owned firms was more than twice that of foreign establishments and their average net capital stock was more than two and a half times that of their foreign counterparts. With respect to employment, domestic-owned firms on an average provided around twice the size of employment to that provided by the foreign-owned firms. They had produced 15 per cent more output per employee in 1992. However, the output per capital and output per intermediate inputs of the domestic-owned firms were lower than that of the foreign-owned firms. Despite high capital base the productivity level of capital (as shown by output/capital ratio) for domestic-owned firms was only 81 per cent of foreign-owned firms in 1992. Since nearly 90 per cent of the domestic firms in the sample used for this study were incorporated before 1985, this implies capital in domestic firms was underutilised.

Table 5.1 Ratio of characteristics of domestic to foreign-owned firms*

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<tr>
<th></th>
<th>1992</th>
<th>1996</th>
<th>2000</th>
<th>Average</th>
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<tbody>
<tr>
<td>Output</td>
<td>2.22</td>
<td>2.01</td>
<td>1.98</td>
<td>2.04</td>
</tr>
<tr>
<td>Net Capital Stock</td>
<td>2.75</td>
<td>3.49</td>
<td>3.47</td>
<td>3.40</td>
</tr>
<tr>
<td>Employment</td>
<td>1.93</td>
<td>1.85</td>
<td>1.63</td>
<td>1.74</td>
</tr>
<tr>
<td>Output/Capital</td>
<td>0.81</td>
<td>0.58</td>
<td>0.57</td>
<td>0.62</td>
</tr>
<tr>
<td>Output/Labour</td>
<td>1.15</td>
<td>1.08</td>
<td>1.22</td>
<td>1.18</td>
</tr>
<tr>
<td>Output/Intermediate Inputs</td>
<td>0.97</td>
<td>0.92</td>
<td>0.84</td>
<td>0.92</td>
</tr>
<tr>
<td>Capital/Labour</td>
<td>1.43</td>
<td>1.88</td>
<td>2.13</td>
<td>1.99</td>
</tr>
<tr>
<td>R&amp;D/Output</td>
<td>1.75</td>
<td>1.40</td>
<td>0.76</td>
<td>0.76</td>
</tr>
<tr>
<td>Technology Imports/Output</td>
<td>0.42</td>
<td>0.32</td>
<td>0.23</td>
<td>0.35</td>
</tr>
</tbody>
</table>

Source: Computed from sample data
Note: Average is for the whole period, i.e. 1992 to 2000.
* Number of domestic firms 874 and foreign firms 255.

These three years have been selected based on initial year (1992), middle year (1996) and terminal year (2000) of liberalisation period for which data is available.
Most of the indicators show that the differences in average size between domestic and foreign firms have declined over time. By the year 2000 the size of domestic firms has come down in terms of output, though it is still nearly twice higher than that of the foreign firms. This suggests that output of domestic firms has declined or the market share of foreign firms has increased during the liberalisation period from 1992 to 2000. The relative capital productivity (given by output/capital ratio) has declined to 57 per cent in 2000. It should be noted that the average capital stock for domestic firms has increased but their output has come down, suspecting increased unutilised or underutilised capacity among these firms after the liberalisation. The ratio of productivity of intermediate inputs between domestic to foreign-owned firms has also fallen over time. The average size of labour force has come down slightly for the domestic firms (from 93 per cent higher in 1992 to 63 per cent higher in 2000) indicating that the employment rate by foreign firms is higher than the domestic firms. However, the output per employee for domestic-owned firms has become 22 per cent higher than that of the foreign-owned firms by the year 2000 indicating that the average labour productivity of the domestic firms has increased slightly. The level of capital used per labour has turned 113 per cent higher in 2000 from just 43 per cent more in 1992 indicating a shift towards capital intensive production. This shift in capital intensive production is perhaps one of the reasons for increased labour productivity.

In the case of technology inputs, the R&D and technology imports per unit of output in domestic-owned firms was very high compared to foreign firms in the beginning of liberalisation. In 1992, the R&D intensity of domestic-owned firms was 75 per cent higher than that of foreign-owned firms. However,
the differences in R&D intensity has come down considerably over time and by the year 2000, the R&D intensity for domestic-owned firms was only 76 per cent that of foreign-owned firms. This shows that after the liberalisation of Indian economy in 1991, either the R&D spending of foreign firms has increased substantially or the R&D spending of domestic firms has decreased. The former can be expected if the foreign affiliates are doing R&D for their parent firms. The technology imports per unit of output in domestic-owned firms was always lower than that in foreign-owned firms throughout the study period (1992-2000). In 1992, the technology import intensity of domestic-owned firms was 42 per cent that of foreign-owned firms. The differences in technology intensity has widened over time (32 per cent in the year 1996 and 23 per cent in the year 2000). The decline is expected as the liberalisation reduced restrictions on technology imports from foreign firms. Therefore, foreign ownership seems to have led to more reliance on foreign technology, hence more technology imports per unit of output.

5.3 PERFORMANCE COMPARISON OF DOMESTIC AND FOREIGN-OWNED FIRMS

The relative performance of domestic and foreign-owned firms in the beginning and end of the sample period, i.e. 1992 and 2000, for five different indicators is given in Table 5.2. The indicators used are: export-intensity (export per unit of output), extent of vertical integration (gross value added per unit of output), capital goods import intensity (capital goods import per unit of output), R&D intensity (R&D spending per unit of output), and technology licensing intensity (technology import per unit of output). The table also gives the compound growth rates of these indicators for the period between 1992 to 2000.
### Table 5.2 Performance Comparison of Domestic and Foreign-owned Firms

<table>
<thead>
<tr>
<th>Indicator (%)</th>
<th>Domestic Firms</th>
<th></th>
<th>Foreign Firms</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Export/Output</td>
<td>6.71</td>
<td>11.74</td>
<td>7.40</td>
<td>8.96</td>
</tr>
<tr>
<td>Gross Value Added/Output</td>
<td>25.87</td>
<td>20.49</td>
<td>-2.33</td>
<td>27.94</td>
</tr>
<tr>
<td>R&amp;D/Output</td>
<td>0.02</td>
<td>0.08</td>
<td>11.71</td>
<td>0.01</td>
</tr>
<tr>
<td>Technology Import/Output</td>
<td>0.24</td>
<td>0.11</td>
<td>-7.71</td>
<td>0.57</td>
</tr>
<tr>
<td>Capital Goods Import/Output</td>
<td>2.09</td>
<td>1.15</td>
<td>-4.62</td>
<td>1.45</td>
</tr>
</tbody>
</table>

Source: Computed from sample data

Note: Ratios are calculated from the absolute values
* Number of domestic firms 874 and foreign firms 255.
** Growth rates are for the whole study period, i.e., 1992 to 2000.

The table shows that foreign-owned firms have a higher export intensity (in row 1) than that of the domestic-owned firms. For both groups of firms the export-intensity has increased considerably. While the export intensity of foreign firms has grown at a rate of 4.54 per cent after liberalisation, the indicator has increased considerably at a rate of 7.40 per cent for domestic firms. This shows that though the liberalisation policies were helpful for both the domestic and foreign firms to improve their export performance, the domestic firms gained more with the opening up of trade borders.
The extent of vertical integration (row 2) has fallen in both domestic and foreign firms. However, the fall in domestic firms is much higher (2.33 per cent) than that of foreign firms, where the fall is just 0.21 per cent. These results indicate that the easy availability of intermediate inputs after liberalisation may have induced the domestic-owned firms to buy rather than produce,\(^4\) while the foreign-owned firms largely depend on own intermediate inputs for production than subcontracting to other firms. This may be due to high technical content in the production of goods, which the foreign-owned firms fear, that may easily be diffused or spread out.\(^5\) With regard to the technology indicators, the table shows that the R&D intensity of both domestic and foreign firms is very meager, though it has increased considerably overtime. The R&D intensity of foreign-owned firms increased at a phenomenal rate of 23.48 per cent compared to a reasonable rate of growth of 11.71 per cent in domestic-owned firms during the period between 1992 to 2000 (row 4). One reason for the increasing R&D in foreign firms could be that their (embodied) technological import has increased. To absorb these technologies to the local (Indian) conditions, they need to invest in R&D. On the other hand, with changed global scenario, domestic firms have to spend on R&D to be in business.

The disembodied technology import intensity (row 4) has fallen in both domestic-owned and foreign-owned firms at the rate of 7.71 per cent and 2.52 per cent respectively. However, in the case of capital goods import

\(^4\) This is consistent with the findings of Kathuria (2002)

\(^5\) An old anecdotal evidence clearly substantiate this. The subcontracting by Hindustan Machine Tools (HMT) led to the breakage of joint venture between HMT and Oerlikon, Switzerland in early 1950s under the pretext that it would diffuse the technical know-how of Oerlikon to Indian firms. However, it is quite possible that foreign firms, which have high content of proprietary knowledge may still prefer vertical integration rather than subcontracting.
intensity (the embodied technology imports), it has been falling in domestic firms (at an annual rate of 4.62 per cent), while it has been slightly growing (at an annual rate of 1.73 per cent) in foreign firms, reflecting their increasing dependence on technology embodied in capital goods.

From Table 5.2, a structural change can be observed in the dependence on different technological sources within domestic-owned as well as foreign-owned firms. In both group of firms, the dependence on disembodied technological imports have come down. The capital goods import intensity (embodied technology imports) has a positive growth rate for foreign firms. Foreign firms mostly use foreign technology and depend on imported machineries and equipments since such machines and equipments compatible to their technologies may not be available locally. Another reason for this positive growth rate of capital goods import intensity for foreign firms can be due to the relaxation of import restrictions during the liberalisation period.

5.4 INDUSTRY-WISE PERFORMANCE AND CHARACTERISTICS COMPARISON OF DOMESTIC-OWNED AND FOREIGN-OWNED ESTABLISHMENTS

Table 5.3 shows the proportion of output accounted for selected firms in different 2-digit industries by ownership type for the years 1992 and 2000. There is a decline in the share of output by foreign-owned firms in industries like chemical and food processing. For the non-metallic mineral industry, the output share of foreign-owned firms remained more or less the same over the study period.
Table 5.3 Proportion of Output in Selected Establishments by Industry and Ownership, 1992 and 2000

<table>
<thead>
<tr>
<th>Industry</th>
<th>Domestic-owned Firms</th>
<th>Foreign-owned Firms</th>
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<tbody>
<tr>
<td>Chemical</td>
<td>75.39</td>
<td>90.01</td>
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<tr>
<td>Food Processing</td>
<td>75.56</td>
<td>56.54</td>
</tr>
<tr>
<td>Machinery and Machine Tools</td>
<td>75.35</td>
<td>87.91</td>
</tr>
<tr>
<td>Metal and Metal Products</td>
<td>85.38</td>
<td>93.08</td>
</tr>
<tr>
<td>Non-metallic Minerals</td>
<td>83.33</td>
<td>92.31</td>
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<tr>
<td>Textiles</td>
<td>91.58</td>
<td>85.89</td>
</tr>
<tr>
<td>Transportation</td>
<td>72.62</td>
<td>86.54</td>
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</table>

Source: Computed from sample data

*Percentage of firms by ownership out of total firms in each industry.

The proportion of output accounted for by foreign-owned firms in industries such as machinery, metal and metal products, textiles and transportation has increased by the year 2000. The increase has been very significant in textile (from 14.11 per cent in 1992 to 20.42 per cent in 2000) and transportation (13.46 per cent in 1992 to 19.06 per cent in 2000) industries. Around 8 per cent of the total textile firms are foreign firms, which account for one-fifth of the total output in this industry while the rest 80 percent of the output is by domestic firms that constitute 92 per cent of the total firms in this industry. In fact, this is one of the sectors where unit output of the foreign firms
is much higher than that of domestic firms. The food processing industry is the only other industry where foreign firms are having a higher per unit output. In all other industries, this is lower for foreign firms compared to domestic firms. This shows that in food processing and textile industries foreign firms have larger average market share compared to domestic. There is a large presence of foreign (multinational) firms in food processing industry. Three of the top ten companies in this group are multinationals – Nestle, Britannia and Smitkline Beecham Consumer Healthcare. Further, the multinational, Hindustan Lever has a dominant position in several food products items. The important presence of MNEs in food processing industry is clearly shown by the proportion of output (given in Table 5.3) and proportion of value added (given in Table 5.4) for foreign firms.

Table 5.4 Proportion of Value Added in Selected Establishments by Industry and Ownership, 1992 and 2000

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<tbody>
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<td>Chemical</td>
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<td>Food Processing</td>
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<td>Machinery and Machine Tools</td>
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<td>Metal and Metal Products</td>
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<td>Non-metallic Minerals</td>
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<td></td>
<td></td>
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<tr>
<td>Textiles</td>
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<tr>
<td>Transportation</td>
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</table>

Source: Computed from sample
*Percentage of firms by ownership out of total firms in each industry.
Looking at the volume of output shares between domestic and foreign owned firms, it is evident that except in the food processing industry, the output shares of foreign-owned firms in all other industries were well below 20 per cent in 1992. The figures for year 2000 show some significant improvement in textile and transportation industries.

Table 5.4 looks into the proportion of value added contributed by the selected firms by ownership in different industries for the years 1992 and 2000. As in the case of output shares, the contribution of value added by foreign-owned firms in food processing industry has been 41.03 per cent in 1992 and has increased slightly to 43.82 per cent in the year 2000. The shares of value added by foreign-owned firms in the chemical and non-metallic industries have remained fairly constant in both years. In all other industries the foreign firms' shares have increased. The increase in the transportation (from around 14 per cent in 1992 to 21 per cent in 2000), machinery (from around 12 per cent to 18 per cent), metal and metal products (from around 7 per cent to 12 per cent) and textiles (from around 14 per cent to 18 per cent) industries are significant. A noticeable finding is that in food processing industry, where the foreign-owned firms have almost 40 per cent shares in output and value added, the output share of the foreign firms has slightly come down during the period between 1992 and 2000, while the value added has slightly gone up.

5.5 COMPARISON OF VARIOUS TECHNOLOGICAL CHARACTERISTICS OF DOMESTIC AND FOREIGN FIRMS.

The technological performance of domestic-owned and foreign-owned firms are compared in various industry groups using following
technological indicators as R&D intensity, export intensity, capital goods import intensity, and technology import intensity.

5.5.1 Chemical Industry

Figures 5.1 shows the trends in various technology intensity variables for domestic and foreign owned firms in chemical industry from 1992 to 2000. A comparison of R&D intensity for these two categories of firms is given in Figure 5.1a. In 1992 (the initial year of liberalisation in India), the R&D intensity in both domestic-owned and foreign-owned firms were more or less the same and very low in quantum. This variable in both categories of firms had an increasing trend until 1997-98 period, then started falling. However, the R&D intensity was considerably fluctuating for the domestic firms, indicating that R&D intensity for domestic firms is more volatile. Figure 5.1b shows that export intensity was higher in domestic firms compared to foreign firms. This can be attributed to the fact that one of the reasons for foreign firms to invest is the existence of huge domestic market. On the other hand, entry of foreign firms implies reduced market share for domestic firms, as then they have to look outward for sales. For both categories of firms the export intensity was almost steadily increasing but only marginally. In the liberalised regime the opportunities for outside sales increased, besides the shift in policy orientation from import substitution to export promotion.

As indicated in Figure 5.1c, the capital goods import intensity has increased drastically for the domestic firms soon after liberalisation compared to their foreign counterparts. However, after 1996 it has started declining but with greater fluctuations. For the foreign firms the capital goods import
Figure 5.1 Comparison of Technology Indicators for Domestic and Foreign Firms in Chemical Industry

Note: The title of the figures represents the Y-axis also for all the figures from Figure 5.1 to 5.7.
intensity was almost constant during the analysis period with a very marginal increase till 1998. This indicator was in fact very low for the foreign firms compared to the domestic firms in the first year of the study period, i.e., 1991-92. Technology import intensity in figure 5.1d shows that foreign firms are performing better than domestic firms with respect to this indicator. The trends in both categories of firms are more or less the same since 1993 with an increase until 1994-95, then declining till 1997 again rise back until 1999 and then started coming down.

The general slow down in the chemical industry during the second half of 1990s clearly affected the R&D intensity of both group of firms and the capital goods import intensity of domestic firms. It should be noted that most of the foreign multinational firms in chemical industry are mainly producing fast moving consumer goods (FMCGs), which include companies like Hindustan Lever, Proctor and Gamble, Colgate-Palmolive and Novartis. A Centre for Monitoring Indian Economy (CMIE) report (2001) shows that this particular section of chemical industry has performed almost consistently in production. This is clearly shown by consistent and stable trends in most of the indicators (except for R&D intensity) of foreign firms in chemical industry.

5.5.2 Food Processing Industry

The technological performance in food processing industry shows that R&D intensity given in Figure 5.2a is very low and almost constant for both domestic and foreign firms, except for a sudden high in 1993 for domestic firms. Food processing is an industry where usually less R&D spending takes place. Out of the 34 domestic food processing firms in the sample, only 8 firms
have reported any R&D spending during the study period. While most of these industries spend less than one per cent of their output for R&D, in 1993 Tata Tea (the largest domestic firm in the sample in terms of output) has spent almost 1.2 per cent of its output on R&D. This is very much reflected in the Figure 5.2a.

Unlike in chemical industry, the export performance of foreign firms in this industry (given by Figure 5.2b) is far better than their domestic counterparts. This is because this sector comprises of a number of large foreign multinationals (see Table 5.3 for example, where the output share of foreign firms are almost 43 per cent in 1992 and 37 per cent in 2000 while foreign firms constitute only 24.4 per cent of total food processing firms). However, the gap between the export intensity of these firms had been slowly reducing over time. This is expected since the domestic firms get better knowledge about foreign markets due to their interaction with export-oriented foreign firms. Another argument is that prevailing high export intensity limits further scope of enhancing exports for foreign firms but not for domestic firms. The capital goods import intensity, as given in Figure 5.2c, is highly fluctuating for foreign firms with high values in a year and very low in the succeeding year. It has to be noted that firms usually do not import capital goods every year. Some firms may do bulk purchase in certain years and may not go for capital goods imports for next 4 to 5 years due to foreign exchange requirements. That would be a reason for these high fluctuations in capital goods import intensity for foreign firms. However, for domestic firms, as illustrated in Figure 5.2c, this intensity is very low except in the initial years of liberalisation, where firms would have gone for more imported capital to prepare for the expected foreign competition due to liberalisation.
Figure 5.2a: R&D Intensity

Figure 5.2b: Export Intensity

Figure 5.2c: Capital Goods Import Intensity

Figure 5.2d: Technology Import Intensity

Figure 5.2  Comparison of Technology Indicators for Domestic and Foreign Firms in Food Processing Industry
However, this trend has come down slowly and has steadied at a lower level. Figure 5.2d indicates that for the foreign firms the technology imports intensity has increased exponentially until 1997 and thereafter showing a slight declining trend. In the case of food processing industry, where the technology is already mature, the reliance on technology imports is much expected for foreign firms. For the domestic firms, this technology indicator, which was higher than that of the foreign firms in 1992 declined to a bottom low in 1994, then with a slight increase in 1995 and steadied thereafter.

5.5.3 Machine and Machine Tools Industry

The R&D intensity for both domestic and foreign firms in machine and machine tools industry, as given in Figure 5.2a, had almost the same trend – increasing considerably during the liberalisation period. The domestic firms performed better than foreign firms in R&D intensity at least until 1997. The machine and machine tools industry is a sunrise industry with lot of technological design changes taking place. Therefore, an increase in R&D is expected. The export intensity is higher for foreign-owned firms compared to domestic-owned firms in this industry (Figure 5.3b). This technology indicator was increasing almost at the same rate for both categories of firms.

The trend in capital goods import intensity (as shown in Figure 5.3c) was same for both domestic and foreign firms, with domestic firms behaving as leaders in setting trends. Figure 5.3c shows that soon after liberalisation the capital goods imports intensity has fallen in both categories of firms but the fall was rapid in domestic firms. After the initial fall, this indicator has increased suddenly for domestic firms, which was followed by foreign firms with the
Figure 5.3 Comparison of Technology Indicators for Domestic and Foreign Firms in Machine and Machine Tool Industry
same one year lag. The technology import intensity of foreign firms, as indicated in Figure 5.3d, was considerably higher than that of domestic firms throughout the analysis period. In both domestic and foreign firms this technological indicator is slightly falling with the rate of fall higher in foreign firms. One should expect a fall in technology import intensity of foreign firms after liberalisation, because firms can now bring in their own capital and technology and start business as a fully-owned subsidiary or establish a joint venture rather than licensing their technology to an unknown buyer. Taking this together with the increasing trend in R&D intensity, it could be suspected that R&D and technology licensing have a substitute relationship within this industry. It should also be noted that most industry groups under machine and machine tools industry suffered a slow down in the second half of the 1990s, especially since 1996-97. This general slow down has clearly affected the capital goods import intensity and R&D intensity of both groups of firms in this industry.

5.5.4 Metal and Metal Products Industry

Soon after liberalisation, the R&D intensity of both domestic and foreign firms has gone up considerably. After this initial rise the R&D intensity has fallen sharply with very little R&D spending by foreign firms in 1995. However, this has bounced back and increased considerably till 1998, falling thereafter. The R&D intensity for the domestic firms in this industry is also fluctuating but these fluctuations are not as stark as for the foreign firms. As in the case of other industries, in metal and metal products industry also, the fluctuations in R&D intensity is expected to be due to the low level of R&D spending by the firms (mostly below one per cent of their sales that are usually
Figure 5.4 Comparison of Technology Indicators for Domestic and Foreign Firms in Metal and Metal Products Industry
not reported). It is mandatory for firms to report R&D spending only when it is more than one per cent of their sales. The export intensity of both domestic and foreign firms are almost same and increasing with the foreign firms having slightly upper hand as shown in Figure 5.4b. There are large fluctuations in the export intensity of foreign firms, while it is steadily increasing for the domestic firms over the period.

Except in the initial three years, the capital goods imports intensity has almost the same trend for both domestic and foreign firms with foreign firms registering a better performance than that of the domestic firms in this industry (Figure 5.4c). Both categories of firms started with almost the same amount of technology import intensity (Figure 5.4d). However, the liberalisation had induced foreign firms to increase their technology import intensity in metal and metal products industry, and this has remained high (compared to domestic firms) throughout the analysis period. The domestic firms showed a slightly decreasing trend in their technology import intensity.

5.5.5 Non-metallic Minerals Industry

As in the case of metal and metal products industry, the R&D intensity for foreign firms in non-metallic industry has been fluctuating heavily, as illustrated in Figure 5.5a. However, compared to foreign firms, the trend in the R&D intensity for the domestic firms in this industry had been almost consistent, except for a sudden rise in 1996. But, towards the end of the analysis period (1999, 2000), it has started declining for these firms. Figure 5.5b shows that the gap in export intensity between domestic and foreign firms during 1992 was reduced by the next year (1993). A sudden rise or fall in most of the
Figure 5.5 Comparison of Technology Indicators for Domestic and Foreign Firms in Non-metallic Minerals Industry
technology indicators can be explained by having a close look at the sample
data. Out of a total 8 sample firms in the foreign category in non-metallic
minerals industry, only 3 firms have reported any investment in R&D
throughout the study period. In 1994, the R&D intensity of foreign firms has
increased considerably. This is because one of the firms, Alta Laval (India) Ltd
(the biggest company in terms of output in the sample for this category), had
invested in R&D almost 2.3 per cent of its sales. Again in 1998 there is an
increase, because the same firm invested almost 1.4 per cent of its sales in
R&D. In all other cases, the firms invested only less than one per cent of their
sales in R&D.

The export intensity for both domestic and foreign firms remained
more or less constant except for a sharp fall in 1996 for foreign firms. This is
the only year in which the export performance of foreign firms fell below that
of domestic firms. It should be noted that the non-metallic minerals industry
includes the gems and jewelry sector, which is predominantly an export
oriented industry and accounts for 20 per cent of India’s total exports. In the
year 1996, Classic Diamonds (India) Ltd., a firm that was exporting almost 99
per cent of its output in all other years, did not report any export. This is found
to be the reason for this sharp decline in export intensity of foreign firms in this
year.

The capital goods import intensity was very high for the domestic
firms in the initial year (1992) of liberalisation in this industry, which has
sharply come down in the next year itself (1993) and then slowly increased
until 1996, after which it has fallen continuously till 1999. For the foreign firms
this technological indicator slowly increased in the initial years and then
suddenly rose to a peak in 1996 but fell with the same speed. By the end of the analysis period (1999, 2000), for foreign firms also this technology indicator is showing a recovery. In most of the years, the capital goods imports intensity of foreign firms is less than the domestic firms. It should be noted that, out of the eight foreign firms in the non-metallic minerals industry, only two firms had spent for capital goods imports during the initial year 1992. However, in 1996, five firms had imported capital goods with two firms (India Gypsum Ltd and Alfa Laval (India) Ltd) having capital goods imports of around 43 per cent and 16 per cent of their sales. In all other years and in the case of all other firms, the capital goods imports were very meager (1 to 5 per cent of their sales).

While the technology import intensity for the domestic firms remained low and more or less constant throughout the period, this indicator has increased considerably for the foreign firms after a slight decline in the initial two years. Initially, only two foreign firms out of the total eight in the sample for this industry were engaged in technology imports, but in the year 2000, six out of the eight foreign firms were engaged in technology imports through licensing. Foreign firms seem to have taken advantage of the liberalised policies to bring in their advanced and sophisticated technologies from abroad and have facilitated in technological capability building in this industry.

5.5.6 Textile Industry

The Figure 5.6a reveals that the R&D intensity of foreign firms in the textile industry had a sharp increase in the year 1997, otherwise which showed a flat performance (no considerable increasing or decreasing trend). The sharp
Figure 5.6a: R&D Intensity

- Domestic
- Foreign

Figure 5.6b: Export Intensity

- Domestic
- Foreign

Figure 5.6c: Capital Goods Import Intensity

- Domestic
- Foreign

Figure 5.6d: Technology Import Intensity

- Domestic
- Foreign

Figure 5.6  Comparison of Technology Indicators for Domestic and Foreign Firms in Textile Industry
increase in the year 1997 was because one of the firms, Indo Rama Synthetics (India) Ltd, had invested considerably (around 28 per cent of their sales) on R&D during that year. Figure 5.6b presents the export intensity of domestic and foreign firms in textile industry. This indicator had an increasing trend for both categories of firms, with foreign firms always performing better than domestic firms in export performance.

Both capital goods import intensity and technology import intensity for the foreign firms shows same increasing trend with capital goods imports reaching the peak in 1996 and technology imports registering a high in 1995 (Figure 5.6c and 5.6d). After that these indicators were dipping. For both indicators, the performance of domestic firms was very low and almost constant. In the textile industry, of the eight foreign firms in the sample, all had spent for capital goods imports during the year 1996 with SIV Industries Ltd spending a considerable amount causing the graph to reach a peak in this year. In the case of technology import intensity, while only one out of the eight firms licensed any technology in 1992, five firms had spend for technology licensing in 1995. Out of these five firms two firms (Indo Rama Synthetics (India) Ltd and Indian Card Clothing Ltd) had spent 37 per cent and 33 per cent of their sales, respectively, for technology imports. However, the number of firms that spend on technology imports had come down and only two foreign firms out of the eight sampled firms had any technology imports during the year 2000.

5.5.7 Transportation Industry

In the transportation industry, the R&D intensity for the domestic and foreign firms were almost similar in trend and magnitude, except in the year
1998 where the R&D intensity of foreign firms had a sharp rise as illustrated in Figure 5.7a. This is because the R&D intensity was very high for Daewoo Motors India Ltd (around 5 per cent of their sales) during 1998. The high R&D intensity for this firm was due to a sharp fall in output (around 73 per cent) at the same time the R&D expenditure had increased around 99 per cent. The export intensity for both these categories of firms also had almost moved together with increasing trend. This is because, the Indian transport industry, at present, has almost all the global players. In fact, most of them are using their Indian plants for export purpose. Moreover, many foreign automobile firms are outsourcing their components from Indian auto-ancillary manufacturers. This is one of the main reasons for the steady increase in export intensity of both categories of firms in this industry. Except for a slight decline during 1994-1996 (especially for foreign firms), this increasing trend was almost steady and consistent with foreign firms always having an upper hand in exports.

The capital goods import intensity as illustrated in Figure 5.7c had been increasing for both domestic and foreign firms until 1996. In 1997, there was a steep increase in this indicator for foreign firms. This is because, Daewoo Motors India Ltd made huge capital imports in this year (around 234 per cent of their sales\(^6\) in that year). The increased capital goods imports followed by a large spending on R&D by this firm explains the revival plans of Daewoo Motors in India during the period 1997-98.\(^7\) However, after 1996-97 period the capital goods import intensity was declining in both the categories of firms, but

\(^6\) While the value of output for this firm in 1997 was Rs 811.13 crores, it has imported capital goods worth Rs 1898.09 crores.

\(^7\) It should be noted that the huge capital goods imports in 1997 by this firm was followed by a large investment in R&D during 1998 to adapt the imported capital goods to local conditions.
Figure 5.7 Comparison of Technology Indicators for Domestic and Foreign Firms in Transportation Industry
foreign firms performing better than domestic firms. The technology import intensity had improved considerably after 1992 (the initial year of liberalisation) in foreign firms and this was significantly higher than the technology import intensity of domestic firms that had a slight declining trend throughout the analysis period.

5.6 CONCLUSION

An attempt has been made in the present chapter to compare the technological performance of domestic and foreign-owned firms in Indian manufacturing industry after the 1991 liberalisation, for the period 1992 to 2000. The technological performance (leading to capability building) has been captured using four technological indicators, viz., R&D intensity, export intensity, capital goods import intensity and technology import intensity. An analysis comprising all the sample firms taken together for different years shows that there has been substantial growth in the R&D intensity and export intensity for both domestic and foreign owned manufacturing firms in India. However, technology import intensity has declined in both categories of firms indicating the reduced dependence on technology imports through licensing after liberalisation. This also indicates that technology imports and FDI are substitute in nature. The capital goods import intensity for domestic firms also registered a negative growth while there was a small positive growth for foreign firms.

A close look at various technological indicators for domestic and foreign owned firms in various industry groups shows that manufacturing firms in India are not very R&D intensive, and firms do not invest large amount every
year in R&D or capital goods imports. It is also found that firms took time to alter their behaviour after liberalisation. The technology indicators were also affected by various external factors like overall deceleration in industrial growth and reduced investment due to a number of reasons like political uncertainty in India during 1996-98, East Asian currency crisis in 1997, etc. The results also pointed that increased foreign investment has not helped Indian industries in attaining robust export growth. The performances of different technological indicators for domestic and foreign firms showed that the technological capability building by these firms are more industry-specific.