

# **Strengthening the Export Competitiveness of firms in the Indian Pharmaceutical Industry**

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## **I. Introduction**

The Indian pharmaceutical industry is one of the most vibrant knowledge driven industries in India that has witnessed consistent growth over the past three decades. The industry accounts for 8% of world's production by volume and 1.5% by value. Much of the country's pharmaceutical consumption was met by imports until the early 1970s. Between 1947-57, 99% of the 1704 drugs and pharmaceutical patents in India were held by foreign MNEs which controlled 80% of the market. Patent law protection, hold on technology, financial resources and foreign brand names gave them distinct monopolistic advantages in India (Nayar 1983 ). During the early 1970s, the government put into place a series of policies aimed at breaking away India's dependence on MNEs for the production of bulk drugs and formulations and moving the country towards self-sufficiency in medicines. The introduction of the Patent act 1970 was perhaps the single most significant policy initiative taken by the government that laid the foundation of the modern pharmaceutical industry. This Act did not allow product patents on medicines, agricultural products and atomic energy. For these only process patents could be registered. This act enabled Indian companies to develop skills in reverse engineering and to produce alternate processes for drugs. Exempt from paying for licenses and royalties, Indian companies could now access the newest molecules from all over the world and reformulate them for sale in the domestic market. As a result, after 1970, many new drug firms were set up. These companies developed R&D base, which was later leveraged by them to move up the R&D value chain. By the mid 1980s, India had emerged as a major pharmaceutical producer and the indigenous sector had captured a substantial proportion of the market.

Thus, rapid growth in this industry has largely been the result of the patent regime that had been pursued by the government of India since 1970. The ongoing process of liberalization and WTO's Intellectual property Rights Agreement have made a major impact on this policy framework. Some fear that the post-TRIPs regime will discriminate against local firms in favour of foreign companies that can afford the enormous funding required for research and

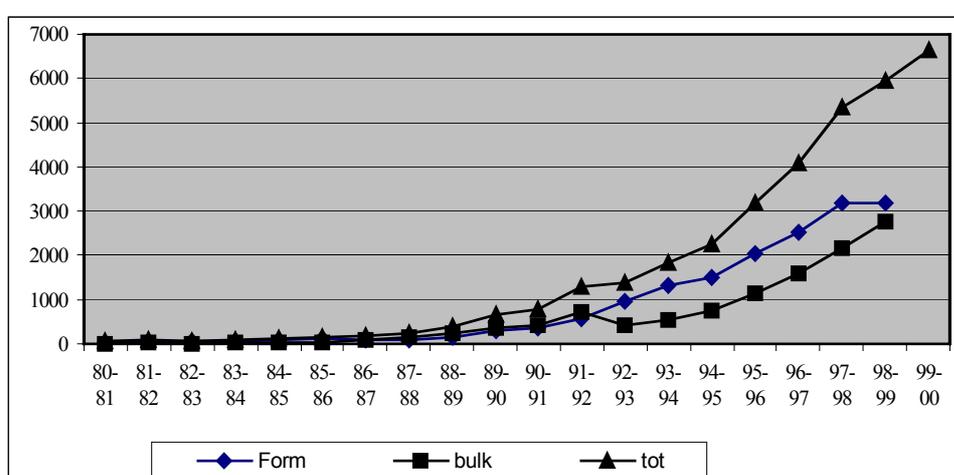
development and will harm the domestic industry while others suggest that this will result in a metamorphosis of the industry. They argue that the industry would make rapid strides in restructuring their business to meet global standards in R&D, manufacturing, product development and marketing as the traditional approaches of bypassing process patents will not be sufficient to get onto the market. This paper however argues that the TRIPs regime poses challenges for the Indian pharmaceutical industry. To meet these challenges, the industry will need to focus on the global marketing initiatives in international markets of generics. This will allow the industry to continue to grow in the post TRIPs regime. The India pharmaceutical industry has already made a firm mark on global markets. Pharmaceuticals' exports grew from Rs. 373.3 millions in 1973-74 to Rs. 119250 millions in the year 2003-2004. It is one of the top 20 top exporters of bulk actives and dosage forms. Indian exports are destined to around 175 countries around the globe including highly regulated markets of US, Europe, Japan and Australia. Furthermore, the regulated developed country markets are now showing a definite shift towards generic drugs amid strident public demand for less expensive medicines. In the next five years a number of patented drugs are going off patent in the USA and Europe. This will open tremendous opportunities for the Indian firms to share additional global market to the tune of US \$60 billion. Thus the most dynamic prospects for growth for pharmaceutical producers is through export market. Focus therefore needs to be on major initiatives on the export front. For this reason, it becomes essential to examine what drives Indian firms' competitiveness in this knowledge based industry and how their performance may further be improved. The present paper is an attempt in this direction. It analyses the determinants of the export performance of firms in this industry. While doing so, the paper uses both the primary survey based data and secondary data. The paper begins with an overview of trends and patterns of pharmaceutical' exports in India in Section II. Section III provides analytical framework for explaining inter-firm variations in the export performance. Section IV analyses the determinants of export competitiveness of the industry using the primary survey data. Section V provides the analysis of the secondary data. Section VI discusses major constraints faced by Indian firms in their exporting activity. Finally, Section VII draws policy implications.

## II. Trends and Patterns of Pharmaceuticals' Exports

### II.1 Aggregate Exports : Trends and Patterns

Till the mid 1980s, production of pharmaceuticals in India was mainly for domestic markets. In the late 1980s, Indian firms started eyeing overseas markets. However, Figure 1 shows that total exports in value terms increased sharply during the 1990s. One may also observe that the exports of both formulations and bulk drugs have increased steadily since 1990-91.

**Figure 1 : Drug exports 1980-81 to 1999-2000**



Source: Based on OPPI (2002)

Table 1 shows that exports constituted only 1% to 5% of total production till the late 1980s. During the 1990s, more than a quarter of production was directed to the export markets. In the late 1990s, the ratio of total production exported increased to 33.3%. In 2001-02 exports accounted for around 38% of total production. Apparently, exports have been increasing at an enormous rate since 1990-91.

**Table 1 : Export-production ratio and import-production ratio (%): 1961-2000**

Years	Export/production (%)	Import/production (%)
1961-69	1.5	8.6
1969-81	4.3	7.5
1981- 86	4.7	8.8
1986-90	10.1	12.5
1990-95	21.2	14.4
1995-00	33.3	19.6

Source: Singh (1986) for 1961-1981; Computed from OPPI (2002) for 1981-2000

In contrast to exports, imports increased slowly. The import-production ratio increased from 8.6% in the early 1960s to 19.6% in the late 1990s. As a result, the industry emerged as a net foreign exchange earner.

The above analysis is based on the aggregate data provided by the ‘Organisation of Pharmaceutical Producers of India’ (OPPI). We considered it important to use a more disaggregated database to examine the trends and patterns of the export activity of Indian enterprises in this industry over the period of the 1990s. We made use of the on-line Prowess Data Base (2003 version) of the Centre for Monitoring Indian Economy (CMIE), for this purpose. Prowess covers financial data of over 300 pharmaceutical companies incorporated in India. These companies are in both the small scale and the organised sector. The financial data covered by the Data Base includes most of the information that incorporated companies are required to disclose in their annual reports, viz. profit and loss account and a balance sheet along with information contained in the schedules and annex. We used this database to extract export –related information for all the pharmaceutical companies for the period 1990-91 to 2002-2003. That yielded a total of 2290 observations with a varying number of companies in different years. We calculated the export –sales ratio of sample firms in each year of the 1990s. Table 2 presents information on the average export-sales ratio of the sample firms in selected years. It shows that there has been a continuous increase in the export intensity of firms in this industry since 1990 and that exports constituted around one-third of sample firms’ sales-turnover in 2003. This supports our conclusions drawn on the basis of the OPPI database.

**Table 2 Export-Sales Ratio of pharmaceutical firms in selected years : 1990-2003**

Year	Average export-sales ratio	No. of Firms
1990	7.94	51
1995	14.11	194
2000	19.65	220
2001	20.66	220
2002	24.27	173
2003	32.41	45

Source : PROWESS, CMIE

Evidence also suggests that the export products are now moving towards the direction of developed countries as against India's earlier bias towards Asian and East European region. Table 3 shows that in 1989-90, 44.5% exporters were directed to USSR. Germany, USA, UK

followed it. By the year 2002, US emerged as the most favoured nation while the share of Russia declined substantially. It also suggests that there has been tremendous diversification of the export markets during the 1990s. While only 8 markets constituted over 72% of total exports in 1989-90, these markets accounted for only one-fifth of the total exports in 2002-2003.

**Table 3 : Destination of India's pharmaceuticals' exports in 1989-90 and 2002-03**

Year	Share in total 1989-90	Share in total 2002-2003
USSR	44.2	4.0*
FRG	13.2	1.8
USA	3.9	10.8
UK	2.9	2.1
Hong Kong	2.7	0.6
Singapore	2.0	0.6
Poland	1.9	0.3
Japan	1.7	0.2
China	-	3.3
Others	27.5	80.3

Sources : EXIM (1991), DGICS database. \* includes Russia only

To capture the dynamics of the firms' export performance, we examined export-sales ratio of 91 firms that were common in our samples in all the years after 1995. The distribution of export intensity for these firms is provided in Table 4. It shows two things. One, the share of exporting firms increased in the sample.

**Table 4: Distribution of 91 firms by export-sales ratio : 1996-98 and 2001-03**

Export intensity	1996-8 (%)	2001-2003 (%)
0	22	19
0-5	35	25
5-10	10	13
10-15	5	7
15-25	8	12
25-50	12	15
>50	8	9
Total	100	100

Source : PROWESS database

Two, the proportion of firms in higher export-sales ratio category increased over the period between 1996-98 and 2001-03. The analysis suggests that the rapid increase in export may be attributed to (1) an increasing number of firms taking to exports and (2) a continuous increase in the proportion of overseas sales of the exporting firms .

## ***II.2 Export Performance : Inter-firm variations***

Though the export intensity of the industry increased substantially in the 1990s , there were wide inter-firm variations in the export performance. Table 5 provides the distribution of firms by average export-sales ratio for four years between 1999 and 2002. It was found to be of skewed U-shape. Of the 253 firms for which the information was available, 73 (29%) firms did not export while 74 top exporting firms (29%) exported more than 15% of their sales turnover during this period. The remaining 106 firms (42%) had export-intensity which

**Table 5 : Distribution of firms by export intensity : 1999-2002**

export to sales ratio	1999-2002	Share of total
0	73	0.29
0 - 0.025	41	0.16
0.025- .05	21	0.08
0.05 - .075	16	0.06
0.075- 0.10	13	0.05
0.10- 0.125	9	0.04
0.125 - 0.15	6	0.02
0.15 - 0.25	26	0.10
0.25 - 0.50	31	0.12
0.5<	17	0.07
total	253	1

Source : PROWESS database

was varying between greater-than- zero and 15%.

To gain deeper insights on inter-firm variations in the export performance, we analysed the export performance of all the sample firms during the period 1990-2003. Of the 309 firms for which we had data, 173 firms were found to be exporting, the remaining 136 firms were non-exporting. Firms that never exported or exported in one or two years were considered non-exporting firms. Several firms in this category had missing observations. However in the absence of information these firms were categorised as non exporting firms.

We estimated export trend growth rate of each exporting firm for the period 1990-2003, using the following semi logarithmic function.

$$\text{Log EXP}_t = \log a + \log b T$$

Where  $\text{EXP}_t$  = value of exports in year t, T= time variable

Our analysis revealed that as many as 90 (over 52%) firms had registered a significant trend export growth rate over this period. Of these firms, 75 registered a trend growth rate of over 20%. These included, Arti drugs, Ajanta Pharma, Ranbaxy, Dr. Reddy's Labs, Lupin, Cadila, Amratanjan, Orchid and Morepen. Of the remaining 83 firms, 40 firms had a negative trend growth rate while 43 firms had positive trend growth rate. The growth rate however was not statistically significantly different from zero in both the cases. One may therefore conclude that though the export performance of the industry has been impressive, there are substantial inter-firm variations. In what follows, we analyse why some firms perform better than the others.

### **III. What factors help in enhancing the export performance of the industry : Our hypotheses**

Exporting entails costs and risks above those incurred in supplying the domestic market. For example, exporting involves additional transport, distribution and marketing costs international market research and advertising and, depending on the country, additional financial and legal risks. While some of these additional costs vary with the volume exported (eg production and transport costs), others are 'fixed' costs. Some fixed costs can be recovered if the firm does not succeed internationally (eg by selling fixed assets). However, others are 'sunk costs' in the sense that, once incurred, they cannot be recovered if exporting turns out to be unsuccessful (eg the time and money spent on international market research and advertising). The theoretical literature argues that many of these costs are likely to be significant (eg Baldwin 1989, Baldwin and Krugman 1989, Dixit 1989, Krugman 1989). To export successfully, therefore, firms need to possess a competitive advantage to overcome the advantages typically enjoyed by rival firms located in the country into which they export (eg greater familiarity with local laws and customs and lower transport costs, greater familiarity

with local tastes). Sometimes the source of competitive advantage can arise within the firm and is the result of firm's own efforts and vision. At other times, the source of this advantage can arise outside the firm. These could be due to government incentives. These incentives may help in reducing the costs of exporting or offer higher profit margins. The share of exports in total firm's sales (export intensity) therefore depends on two sets of factors : firm specific advantages and government incentives. Algebraically,

$$EXP_i = f(\text{Firm specific advantages, government incentives})$$

Where  $EXP_i$  is the export intensity of firm  $i$ .

### ***III.1 Firm Specific Advantages***

The competitive advantages of firms, which collectively may be referred to as 'firm-specific factors', are likely to have a pervasive influence on their export performance. The literature on firm-specific determinants of export performance and behaviour is extremely rich (see, for instance, Chetty and Hamilton, 1993, for a thorough review of the literature on the subject) and covers a wide spectrum of issues, such as the relative importance of firms' demographics (Bonaccorsi, 1992; Wagner, 1995), or the relative impact of the beliefs, attitudes and perceptions of the firm's top management (Bijmolt and Zwart, 1994). We will in this paper, focus on technology and cost related factors.

#### Technological capabilities

Pharmaceutical industry is one of the most research intensive industries. As the quintessential science-based industry, pharmaceuticals depend heavily on high level manpower and substantial R&D for new products and growth. The data collected from the National Science foundation shows that the US pharmaceutical industry spends a greater percentage of sales in research than other American industries including the electronics, communications and aerospace sectors (NSF 2003). Industrial R&D funds as a percent of net sales of R&D performing companies averaged 11% over the period between 1997-2000. Computer and electronics with 8% followed it. According to the PhRMA (2003) annual report, member companies spent roughly 17% of domestic sales on R&D in 2001. Apparently, there is an intense R&D based competition in this industry. Furthermore, there have been mega mergers and acquisitions in the pharmaceutical sector (see for instance Scherer 2000). These are largely motivated by the desire of the companies to pool their R&D portfolios and to position

themselves across a wide spectrum of end market products. These mergers and acquisitions have further intensified innovation based competition.

As competition is increasingly technology based, it is expected that technological capabilities would play an important role in determining a firm's propensity to export in this industry. Firm-specific technological capabilities are determined not only by their own R&D efforts but also by the acquisition of technologies from external sources ( Jain 1998). In what follows we analyse the importance of the two channels of acquiring technological capabilities for Indian pharmaceutical firms.

Imports of disembodied technologies (MTS) : Investment in R&D has shown a dramatic growth in developed countries, in the past 25 years<sup>1</sup> . It may be attributed partly to greater opportunities for innovation because of advances in scientific knowledge<sup>2</sup> and partly to the fact that pharmaceutical R&D process has become longer, riskier and complex because of more complex scientific tools and an upsurge of new approaches to treat complex diseases. It is documented that only 1 out of 5000 screened compound is approved as a new medicine. The average cost to develop a new drug has therefore grown from \$138 million in 1975 to \$802 million in 2000 (phRma 2003). Thus, the research processes in this industry are increasingly becoming time consuming, complicated, risky and costly driving up R&D expenditures in this industry worldwide. Developing countries' firms do not have resources to carry out innovative R&D. Major thrust of R&D in these countries is therefore in improvement in process efficiencies and product quality. Firms get access to newer technologies through imports. Therefore acquisition of newer technologies from external sources (MTS) is expected to be a key factor in the competitiveness of firms.

R&D (RDS) : R&D generates not only innovations but also allows firms to better assimilate external technological knowledge. Indian firms are not innovators but they need to perform R&D to absorb foreign technologies. The need to perform R&D for assimilating foreign

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<sup>1</sup> The ratio of R&D to total sales that was 9.3% in 1970 increased continuously and in 2001, these companies spent roughly 17% of domestic sales on R&D (PhRMA 2003).

<sup>2</sup> With massive expenditure incurred on basic research, scientific knowledge has shown tremendous advancement in this industry. Among the 24 US industry groups on which detailed statistics are published, pharmaceuticals devoted the highest fraction (16.6%) of its total R&D to basic research, for all other firms the comparable figure was 5.3% (NSF, 1996, p.44). Evidence suggests that the new products are becoming available in a short period of 5-7 years making existing products obsolete

technologies in this sector is clear from the fact that the pharmaceutical industry in India also is the most research intensive industry having the highest R&D-sales ratio. Over the period 1992-93 to 1999-00, R&D – sales ratio was greater than 1% for only 4 industries- electronics, automobile, drugs and personal care products and the drugs industry with the ratio 1.55% emerged as the top R&D spender (Kumar and Aggarwal, 2001 based on CMIE data).

Evidence also suggests that the number of R&D performing firms in this industry has been increasing steadily. The PROWESS database provided by the CMIE suggests that in 1990, 4 out of 45 firms were R&D performing firms and that they constituted 6.6% of the total number of firms. In 2001, 77 out of 171 (41%) firms were performing R&D. Besides seventy seven firms have in-house R&D departments approved by the Department of Scientific and industrial research. Many firms including lesser known firms such as IPCA , Sunil Pharma Merck, Themis, Ambalal and Arti have multiple R&D Centres.

R&D activity focuses on developing new products development, upgrading manufacturing processes, developing dosage and formulation form of new and existing drugs and improved packaging. These efforts lead to product diversification, better yield, quality improvement, improved productivity, better capacity utilisation and cost containment. Furthermore, many firms are now performing R&D with the focus on export markets. In the technology Notes for the year 2003 (PROWESS 2003), several firms including Korpan, Divi, Dolphin, RPG, Vorin reported that they are focusing on the development of the products that have substantial export potential. Thus a strong R&D bias is expected to augment the international business.

Marketing capabilities

Advertising expenditures (ADS) : Pharmaceutical Companies' *Promotional Practices* is another important factor affecting this industry. When a pharmaceutical company develops a new drug it gives the drug two names. The first one is its generic name, which represents the chemical structure or chemical form of the drug. The generic name of the drug never changes. The second name given to the drug is its brand name. The use of brand name confers a considerable scope of product differentiation between a brand name and its generics. Brand-generic differentiation encourages firms to spend heavily on brand promotion. Generic companies also spend some funds on marketing but such expenses for originator (branded) products are much higher than for generic products (Cpb 2001).

Product differentiation is not always between a brand and its generics, it is between different brands of the same product also. At any time there may be different brands of the same product in the market. Companies may vary an existing molecule through molecular restructuring and introduce their own brands of the similar product. For instance, Glaxo's anti-ulcerant ranitidine is conceptually the same molecule as SmithKline Beecham's cemitidine. Both of them have the same reaction in the human body to prevent ulceric tendencies. However these are two different brands and therefore attract promotional campaign by the firms. The industry is thus characterized by product differentiation at two different levels : brand-brand differentiation and brand-generic differentiation.

Promotional activities directed at doctors chemists and retailers aim at creating differentiation in their minds by emphasising small differences between competing products and by providing information about side effects. Direct-to-consumer advertising is aimed at influencing the choice of end users. Heavily influenced by advertising, patients become brand conscious and increase brand requests.<sup>3</sup> Advertising reduces the demand elasticity of a brand and has direct bearing on the profit margin. According to data cited by *Government Accounting Office (the USA)* in 2001 companies spent \$19.1 billion on all promotional activities. On average, 10.6% of total US sales went for advertising. Brand image and marketing expenses therefore are expected to play an important role in determining firm performance.

In India prescription drugs cannot be advertised in the general media. The list of such drugs is quite large and includes all antibiotics and specific painkillers etc. The avenues for advertising are therefore restricted. Companies advertise through trade journals and medical megazines. They also sponsor conferences in India and abroad often at the company costs to establish brand name. At these conferences pamphlets, free samples and other materials are distributed. Average advertisement-sales ratio for 203 companies covered by CMIE in 2001-02 was around 5% which was substantially higher than the R&D intensity. Firms such as Dr. Reddy's, Ranbaxy, Ajanta, cadila, amrutanjan, abbott, Torrent were spending over 8% of their sales turnover on promotional activities. These costs are thus substantial and firms incurring such expenses may be expected to compete in global markets for additional profits.

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<sup>3</sup> A 1998 survey found that 53% of physicians reported an increase in brand name requests up from 30% from mid 1997 before the relation of FDA guidelines for T.V. advertising). Another study found that patient requests were honoured 73% of the time (NIHCM, 1999).

## Size

Size (SIZE) : High level of concentration is yet another characteristic of this industry. High cost of the R&D, patent protection and advertising expenditures prove to be effective entry barriers for new firms. Owing to these entry deterrents, the industry worldwide is characterized by a high degree of concentration. The leading firms thus enjoy substantial market power in this industry. We therefore expect large sized firms to have an edge in the export markets over smaller domestic firms. The arguments put forth above suggest that the size barriers in this industry could be formidable barriers to entry for potential new firms and for the survival of independent local firms. Though the industry is fairly competitive, concentration at the top appears to have increased over time. Larger size makes it possible for firms to extend their R&D and the geographical scope of their markets. Thus we expect size to have a positive effect on the export performance of firms.

Another reason why large firms are expected to have higher export intensity is that many of these firms are becoming outward oriented. Outward investment has been made easier by the government's decision to liberalise overseas acquisition regulations<sup>4</sup>. The existing literature (See Kumar and Pradhan 2003) suggests a significantly positive relationship between outward investment and home country exports. Since much of outward investment is undertaken by large firms in this industry, we expect large firms to have significantly higher export intensity.

## Ownership

Transnationality (FF) : Top 10 pharmaceutical companies in the world contribute 50% of global sales while top 20 firms contributed over two-thirds of total sales in 2001. These large companies are of transnational character and are concentrated in the US and European markets. Apparently, this Industry enjoys a high degree of transnationality. In 2001, ten leading TNCs enjoyed 47% worldwide market share. Market share for the top twenty firms was 66%. One may therefore expect export intensity of foreign firms to be higher than that of domestic firms.

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<sup>4</sup> Approvals will not be needed for foreign investment upto US \$ 50 million. In addition, the government has extended the facility for allowing pharmaceutical and biotechnology companies to acquire firms upto US \$100 million through equity swaps/ADRs/GDRs. Companies can exceed the 100 million limit if their export earning allowed them to do so. The companies can spend as much as 10 times of their export earning to acquire overseas firms through stock swaps.

Cost of production

Variable costs (VCOST) : Cost management may be also be an important factor affecting the competitiveness of firms. In their Management Discussion and Analysis Reports, many firms indicated that strict measures to control cost of production have made it possible for them to compete in the world markets. Indigenisation of imported raw material, better negotiations, cutting down the consumption of power and steam, reducing wastage, better working capital management and reducing transport costs through improved marketing and logistic team work have given them cost advantages and increasing yield per batch. Firms with lower costs per unit are likely to be more competitive in the overseas markets. We thus expect the variable cost of production to be negatively related with the propensity to export.

### ***III.2 Government policy incentives***

Left to themselves some firms develop competence and competitiveness due to their global vision. But for the majority, time required to do so would be very long. These firms need export-friendly policies and an enabling trading environment, all of which aim to enhance competitiveness. Governments can therefore play a crucial role in putting into place an export-friendly 'enabling environment'. The enabling factors in this sector would include comprehensive technology support for all enterprises, access to industrial finance at competitive interest rates, tax relaxation and an efficient and cost-competitive infrastructure, a well developed information structure, outward-oriented trade and industrial rules, and a proactive foreign investment strategy. Like many governments elsewhere, government of India (GOI) too has been giving several export incentives to Indian exporters to promote exports from the country. Such schemes provided both direct and indirect subsidies and included Cash Compensatory Support, Replenishment import licence, tax exemption of export income, subsidised export credit and export credit insurance, bonded warehouses, support for export marketing and so on. Since the effect of all these factors cannot be quantified, we shall try to analyse the effect of some of these government measures on the export performance of firms.

Fiscal incentives

Indirect fiscal incentives on imports of raw materials (IMPR) and capital goods (IMCAP): Export incentives are given by GOI through several institutions/agencies and under various Acts. Export incentives are primarily given by the Ministry of Commerce through its

Directorate General of Foreign Trade (DGFT), and by the Ministry of Finance. Major incentives given by DGFT include Export Promotion Capital Goods (EPCG) Scheme and Duty Exemption/Duty Remission Schemes. The EPCG scheme, first introduced on April 1, 1990 and amended from time to time, allows for the import of capital goods at concessional customs duty. Duty Exemption/Duty Remission Schemes aim at providing imported raw materials at the lower price. While duty exemption scheme exempts import of inputs required for export production from duty, the duty remission scheme enables post export replenishment/ remission of duty on inputs used in the export product (Duty Entitlement passbook Scheme). The Ministry of Finance operates the duty drawback scheme. Under the scheme, excise duty and customs duty paid on inputs is refunded to the exporter of finished products. Thus the objective of this scheme is also to make the imported raw material cheaply available to firms. Aside from this, incentives in the form of Special Import Licence (SIL) were given to exporters for import of goods that are otherwise restricted, by paying normal customs duties. SIL is dead with the removal of all QRs by April 1, 2001.

One expects that the firms importing raw materials and capital goods tend to export more to avail such incentives . These firms may also have advantage over the others as they are able to produce high quality products at lower costs. There may thus be a positive relationship between intensity of raw material imports and capital goods imports on the one hand and propensity to export on the other.

Income tax exemptions (PCM) : The Ministry of Finance tax exempts export profits i.e. profits from exports are exempted from income tax. Profits that a firm in Export Processing Zone makes is exempted from income tax. Similarly, Export Oriented Units are exempted from paying income tax on its profits. Any firm in Domestic Tariff Area (DTA) exporting goods can claim exemption from income tax on the profits it makes from exports . One may expect that the firms with higher profit margins are tempted to export more to avail these exemptions. Thus, we expect a positive relationship between PCM and export intensity.

#### Liberalisation

Liberation measures in the Pharmaceutical industry (LIBDUM) : As described above, major policy initiatives in the direction of liberalization in the pharmaceutical industry were announced in 1994 through the ‘Drug policy 1994’. Besides, several custom duty and excise duty exemptions were given to the industry and foreign investment norms were liberalised.

All these measures are likely to have positive influence of the propensity to export in the post 1994 period. We therefore hypothesise that the average propensity to export increased substantially in the post 1994 period.

#### Technology support

It is described above that the government has made concerted efforts to encourage R&D activities in this industry. Though the effect of all the measures may not be captured quantitatively, we may analyse the role of the institutional support for R&D promotion given by the government to Indian firms.

Institutional Support (DOMROY): The government has set up various institutions promotion indigenous R&D efforts. In 1978 institutes like BCG institute Madras, Heffkins Institute Mumbai and CRI Kasauli were activated to promote R&D in the drug sector. As described above, the Department of Science and Technology (DST), Government of India has also initiated programmes on drug development for promoting R&D in drugs and pharmaceuticals sector. We expect that the technical fees paid to such institutions is an indicator of the collaboration between a firm and the government research institutions, and hypothesise a positive relationship between such fee and royalty and the propensity to export.

We thus expect the following factors to influence the export performance of firms.

$$\text{EXP} = f(\text{RDS}, \text{MTS}, \text{ADS}, \text{FF}, \text{SIZE}, \text{VCOST}, \text{IMPR}, \text{IMCAP}, \text{PCM}, \text{LIBDUM}, \text{DOMROY})$$

In order to examine the relevance of these factors, we first conducted a primary survey. Primary survey technique was considered important because the survey provides a perspective on the industry from the producer's point of view. In what follows, we shall discuss findings from our primary data analysis.

## **IV Determinants of Export Competitiveness : Primary Survey Based Analysis**

### ***IV.1 Primary Survey : The Database***

A total of 450 questionnaires were sent to analyse how producers evaluate the effectiveness of various factors affecting their export competitiveness. Prospective respondents included

the members of OPPI and Indian Domestic Manufacturers Association (IDMA). In Chennai and Delhi questionnaires were filled in by personal interviews. Only a total of 31 responses could be gathered. Of these 31 firms, 5 firms were not exporting. However their responses provided useful insight on the factors that constrained their export performance. Of the 26 firms that were exporting, 10 were in the organised sector while 16 were in the small scale sector. Thirteen firms were producing formulations, 5 produced bulk drugs while 7 firms produced both formulations and bulk drugs. One firm was producing films and foils for the pharmaceutical sector. Respondents included CEO/managing directors, partners and senior managers of export divisions. We examined their responses to draw inferences regarding the factors determining the competitiveness of firms.

The main objective of this part of the research was to assess the effectiveness of specified factors in :

- (1) firms' decision to start exporting, and
- (2) promoting their export competitiveness.

In what follows, we analyse the responses of the producers to the two questions asked, separately.

#### ***IV.2 Primary Survey : The Analysis***

##### **Decision to start exporting**

We asked respondents to evaluate the relevance of 6 possible factors that motivated them to export. These factors included technological capabilities related factors and government policy incentive related factors. While specifying the government incentive related factors, we included 'price controls' as one of the factors beside other factors discussed above. This was because, price regulation in this industry is a widely prevalent phenomenon. Government regulate prices either directly or indirectly by regulating monopolies affecting economic conditions in the industry<sup>5</sup>. These controls reduce profitability and increase the incentive to market the products globally. Thus price controls are expected to affect the decision to export positively.

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<sup>5</sup> In the US, there is very little direct price intervention. However, price competition has recently been influenced by the rapid expansion of health care maintenance organisations (HMOs). Virtually all HMOs use limited lists, or so-called formularies, and by 1995, such organisations accounted for 75% of US drug purchases. In the EU and Japan, on the other hand, where the government is the main purchaser, there is substantial price intervention of one form or another..

The respondents were asked to mark a four-point scale with values ranging from strongly important (3) to not important (0). Table 6 presents a summary of replies to this question. While summarising the findings, the scale was condensed to 3 levels : the most important, important and not important. A majority of firms revealed that their own R&D efforts and fiscal incentives ,both direct and indirect played a major role in their decision to start export. It is important to note that technology collaborations with the foreign firms were rated rather low. This needs further examination. Price controls were also not assigned an important role in their decision to export. This is in contradiction with the apparent view that price controls motivated firms to export. As a matter of fact, price controls were introduced in the 1960s while exports started on a significant scale in the late 1980s. Finally, the response to the ‘liberalisation’ factor was also low. It may be attributed to the fact that many firms started exporting prior to 1991. We expect this to appear significant factor in driving competitiveness.

Firm size-wise patterns suggest that small firms attached rather high importance to government incentives while large firms rated the importance of both R&D capabilities and government incentives highly. Even large firms view government incentives as being more vital than R&D efforts in their decision to start exporting. Technology collaborations seem to have an important impact on the decision to export in the organised sector. This is not so for the small scale sector firms. This is in tune with their response to the relevance of R&D efforts. Small domestic market size also motivated organised sector firms to look outwards; it is not important for the small scale sector firms. This result is self explanatory. A majority of large firms feel that liberalisation of trade policies has positively affected their business. Small firms seem to be divided on this issue.

**Table 6 : Evaluation by firms of reasons for starting exports**

	Most important	Important	not important	Average response	Cv
	% of total firms				%
A. Your R&D capabilities					
(av)	23.1	46.1	30.8	1.58	69.8
(OS)	30.0	50.0	20.0	1.9	52.3
(SS)	18.8	43.7	37.5	1.3	91.1
B. Equity collaborations with for. companies (AVE)					
(OS)	3.8	19.2	76.9	0.35	215.2
(SS)	10.0	30.0	60.0	0.6	161.1
	0	12.0	88.0	.19	290.1

C. Technology collaborations with for. Companies (AVE)	3.8	38.4	57.7	0.69	134.0
(OS)	0	60.0	40.0	2.2	46.9
(SS)	6.2	25.0	68.8	0.5	178.9
D. Small domestic markets in your product (ALL)	11.5	30.8	57.7	0.81	135.7
(OS)	10.0	50.0	40.0	1.0	105.4
(SS)	12.5	18.7	68.8	0.69	165.6
E. Tax Incentives					
ALL	40.0	38.4	21.5	2.08	52.6
(OS)	42.0	33.0	25.0	2.1	52.4
(SS)	31.3	37.5	31.3	1.43	87.9
F. Price controls in domestic markets ALL	7.7	42.2	50.0	0.92	110.1
(OS)	10	50	40.0	0.9	110.5
(SS)	6.3	43.7	50.0	.93	113.4
F. Concessional imports for exports ALL	34.6	42.3	23.1	1.73	68.4
(OS)	30.0	60.0	10.0	1.9	52.3
(SS)	37.5	31.3	31.25	1.62	80.6
H. Trade and FDI Liberalisation policies of the 1990s . ALL	15.4	38.4	46.2	1.04	110.5
(OS)	10.0	60.0	30.0	1.00	105.1
(SS)	18.3	31.3	50.0	1.06	116.3

Note : ALL : All firms; OS organised sector; SS: small scale sector

Source : Primary data

Our interviews also revealed that vision to be global player and additional profits had been other major forces that attracted Indian firms to foreign markets. The model adopted by Indian firms was first to cater to unregulated markets, then to enter quasi regulated markets and finally to have access to regulated markets. Apparently, firms having R&D capabilities and vision to grow decide to export. Government incentives are crucial motivating factors for them to do so. Relevance of technology-related factors seem to be rather low for small sector firms.

#### *Factor affecting the export performance*

To further extend our perception of the export determinants, we asked respondents to evaluate the relevance of 6 groups of factors for their export competitiveness. Table 7 summarises the evidence derived from this question.

The first group of factors was related to the cost of production. The two factors evaluated in this group were the labour costs and other production costs. We asked whether lower costs contributed to their competitiveness in the world market. Our analysis of the responses suggests that cost advantage is an important factor for firms' competitiveness in India. However, this is not the most important factor. While a majority of firms perceives it an important factor, only one-fourth of the firms felt that it was the most important factor. The average response was almost the same for both labour and non labour costs. Interestingly, organised sector firms assign a greater importance to labour costs while for the small firms production costs other than labour appear to be more important. It could be because small firms are more labour intensive and they can effectively bring down their costs by managing non labour costs.

The second group of questions related to the relevance of the technological capabilities of firms in their export performance. More specifically, we asked the respondents to evaluate the importance of their process R&D, introduction of new products and technology purchases from abroad, in their export performance. Two important patterns emerged. One, firms provided a substantially stronger evaluation of the importance of their own R&D efforts than technology purchase. In fact, over 60% respondents did not consider technology purchase an important factor. Two, firms assigned a higher rating to the modification in process technology than to the introduction of new products, reflecting the importance of the pursuit of improvement in processes in the industry's technological trajectory. Size-wise average response patterns suggest that the organised sector firms assign a higher ranking to technological capabilities as compared to the small sector firms. Furthermore, though acquisition of foreign technology was considered important by large firms for starting exports, it was not considered important for driving their export performance. This result we shall explore later.

The third group of factors related to export performance was the brand image and marketing channels. The average responses of 2.04 and 1.65 respectively, suggest that these firm specific characteristics are important factors in driving export performance of firms. Only 15% respondents considered them to be unimportant. Interestingly, firms rated the importance of brand image relatively highly. Around 42% respondents considered it to be the most important factor. On the contrary, only 23% respondents assigned the highest rank to marketing channels. Our sector-wise analysis suggests that small firms have a rather low

evaluation of these factors as reasons for driving their exports. This could be because these firms are not capable of spending huge sums to create brand image and marketing channels and many of them are exporting due to contract manufacturing and /or lower costs.

Firm size was not considered important by a majority of firms. Our analysis by size however indicates that the low evaluation of this factor was mainly due to the inclusion of small firms in the analysis. Organised sector firms emerged as highly responsive to this firm specific characteristic.

Our analysis of the responses provides a strong support to the relevance of government incentives in driving export performance of firms in India. Though these incentives are considered relevant by both organised and small sector firms, the former are relatively more responsive to the relevance of their influence.

**Table 7 : Evaluation by firms of factors that drive their export competitiveness**

		Most important	Import ant	Not important	Average response	C.V.
		% of total firms				%
☐ Low labour cost	ALL	26.9	53.8	19.2	1.62	149.1
	OS	30.0	60.0	10.0	1.9	52.3
	SS	25.0	50.0	25.0	1.43	80.2
☐ Low costs other than labour	ALL	23.1	61.5	15.4	1.62	161.0
	OS	20.0	60.0	20.0	1.4	76.7
	SS	25.0	62.5	12.5	1.75	57.1
☐ Regularly introducing new product	ALL	26.9	53.8	19.2	1.73	160.3
	OS	30.0	50.0	20.0	1.80	63.1
	SS	25.0	56.3	18.8	1.68	63.9
☐ Continuous R&D to improve processes	ALL	50.0	34.6	15.4	2.00	171.5
	OS	70.0	20.0	10.0	2.50	38.9
	SS	37.5	43.8	18.8	1.68	70.8
☐ Purchase of new tech.on continuous basis	ALL	19.2	19.2	61.5	0.88	71.1
	OS	20.0	20.0	60.0	0.9	142.9
	SS	18.8	18.8	62.5	.87	143.8
☐ Established image	ALL	42.3	42.3	15.4	2.04	189.3
	OS	60.0	30.0	10.0	2.20	51.6
	SS	31.2	50.0	18.7	1.93	54.8
☐ Marketing channels	ALL	23.1	61.5	15.4	1.65	162.5
	OS	30.0	50.0	20.0	1.60	73.3
	SS	18.7	68.7	12.5	1.68	56.1
☐ Large Firm size	ALL	19.2	19.2	61.5	0.88	71.1
	OS	30.0	30.0	40.0	1.3	102.8
	SS	12.5	12.5	75.0	.62	183.6

□ Government incentives	ALL	38.5	46.2	15.4	1.77	154.8
	OS	40.0	50.0	10.0	1.90	57.9
	SS	37.5	43.7	18.7	1.68	70.8

Note : ALL : All firms; OS organised sector; SS: small scale sector

Source : Primary data

Finally, the impact of liberalisation appears to be favourable on the export performance of firms. Of the 26 exporting firms, 14 firms revealed that liberalisation influenced their exporting activity positively (Table 8). Some firms such as Cadila, Sresan, Troikka, Vasu Pharma, Ciron drugs and Sun pharmaceuticals informed that their exports zoomed up while others suggested they were able to diversify destinations. A few firms started exporting activity in the 1990s. Seven firms did not find any change in their export performance. Only one firm reported to have suffered adversely. The remaining 4 firms did not find this question applicable to them because they came into operations in the 1990s.

**Table 8 : Evaluation by the effect of liberalisation on the export performance**

<b>Impact</b>	<b>% of total firms</b>
Affected favourably	54.0
Did not find any change	27.0
adversely	4.0
Not applicable	15.0
Total	100.0

Source: primary data

#### Local firms and Foreign Firms

We interviewed 3 foreign firms. While two were exporting one was a non-exporting firm. The non-exporting firms revealed that the parent company had decided not to export from India. The company has not established manufacturing facility of its own. It hires such facilities for producing formulations using the parents' technology for the domestic markets and competes in domestic markets on the basis of cost advantage.

The exporting firms cited equity collaboration with foreign firms as the major reason for their decision to export. Both of them informed that exports to foreign parent and their foreign operations are among the most important factors driving their competitiveness. Fiscal incentives, established image and lower costs were other actors influencing their competitiveness. They did not assign a very important role to their R&D effort (Table 9).

**Table 9: Evaluation by firms of factors that drive their export competitiveness : analysis of foreign and domestic firms**

Factors	Average Response	
	Foreign firms	Domestic firms
<input type="checkbox"/> Low labour cost	1.5	1.6
<input type="checkbox"/> Low costs other than labour	1.5	1.6
<input type="checkbox"/> Regularly introducing new product	0.5	<b>1.8</b>
<input type="checkbox"/> Continuous R&D to improve processes	1.5	<b>2.1</b>
<input type="checkbox"/> Purchase of new technologies on continuous basis	1.0	0.87
<input type="checkbox"/> Established image	<b>2.5</b>	<b>2.0</b>
<input type="checkbox"/> Marketing channels	<b>3.0</b>	<b>1.7</b>
<input type="checkbox"/> Large Firm size	<b>2.5</b>	0.75
<input type="checkbox"/> Government incentives (including tax incentives)	<b>2.5</b>	<b>1.7</b>
<input type="checkbox"/> Foreign Operations	<b>2.5</b>	0.54
<input type="checkbox"/> Exports to foreign parents ( for foreign firms)	<b>3.0</b>	-
<input type="checkbox"/> Affiliation with foreign firm	<b>3.0</b>	-

Source : Primary survey

In sum, the primary data analysis provides a valuable insight on the factors determining export competitiveness of firms in this industry. It not only provides support to our export model but also indicates that there may be differences in the export determinants of small and large firms , and MNE affiliates and local enterprises. In the following section we shall formally test the model using the secondary data and explore how the significance of different factors vary across different groups of firms. The model is,

$$EXPIN = f(RDS, MTS, ADS, FF, SIZE, VCOST, IMPR, IMCAP, PCM, LIBDUM, DOMROY)$$

+   +   +   +   +   -   +   +   +   +   +

where EXPIN represents the export intensity of a firm.

## V. Determinants of Export Competitiveness : Secondary Data Based Analysis

### V.1 Methodology and Data

The secondary data were sourced from the PROWESS data base (2003 release) provided by the Centre for Monitoring Indian Economy. We have already described this database above. It provided data on 308 firms with varying number of annual observations. We had a total of 2290 observations. We dropped firms with missing observations and were left with 2156 observations. Distinction was made between large medium and small firms. For this we

examined the size distribution of our sample firms. At the upper end 25% of the total observations were above the sales turn over of Rs. 100 millions and at the lower end 25% observations were below the sales of Rs. 45 million. These were identified as two threshold limits. Firms above 100 million of turnover were identified as large firms ; firms below the sales turnover of 45 million were small firms and the remaining firms were middle sized firms. Distinction was also made between domestic and foreign firms. Firms with 10% or more equity holding were identified as foreign firms.

Since some firms did not export at all, tobit model estimates were obtained. In view of the panel structure of the data, we could estimate random effect models taking account of year-specific variations<sup>6</sup>. However, since we already had a liberalisation dummy as one of the variables, the results returned by STATA could not be interpreted. Random effect models were also estimated after dropping the liberalisation dummy and the results were found to be remarkably similar. However, these are not presented here to avoid multiplicity of results. We decided to present only tobit model estimates here.

With respect to some of the explanatory factors described above there could be problems of two-way causality. For instance, technology imports by firms are likely to influence their export performance but the intensity of technology imports may itself depend on whether they are exporting or not. Similarly, investment in R&D activities could be high because of outward orientation or vice versa. Finally, the causality between the intensity of exports and cash flow may very well be stated in both directions. To address this problem of causality we have used lagged variables in the analysis. Barring size and variable cost all other variables are lagged. Most lagged variables are created by taking averages of previous three years' values. The objective was to capture the cumulative effects of previous efforts also. For profit margins, we used only a one year lagged variable. The variable definitions are as follows:

$EXP_{it}$ : Exports of goods by  $i$ th firm as a proportion of its sales in  $t$  th year.

$MTS_{it-1}$  : Total royalties and technical fee paid abroad by  $i$ th firm over the past three years ,  $t-1, t-2$  and  $t-3$  as a proportion of its total sales during the same period.

$RDS_{it-1}$ : Total R&D expenditure of  $i$ th firm in  $t-1, t-2$  and  $t-3$  years as a proportion of its total sales during these years

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<sup>6</sup> Fixed effect tobit models are not yet available.

ADS : Total advertisement and marketing expenditures by *i*th firm in *t-1, t-2 and t-3* years as a proportion of its total sales during the same period

*SIZE<sub>it</sub>*: Net sales of *i*th firm in *t* th year (transformed into logarithms).

FF : A dummy variable taking value one for companies with 25 per cent or more foreign ownership by a controlling shareholder.

VCOST : Total variable costs as a proportion of its sales in year *t*.

*IMCAP<sub>it-1</sub>*: Total Imports of capital goods by *i*th firm in *t-1 t-2 and t-3* year as a proportion of its total sales during these years.

IMPR : Total imports of raw materials by *i*th firm in *t-1 t-2 and t-3* year as a proportion of its total sales during this period.

*PCM<sub>it-1</sub>*: Profit margins before tax of *i*th firm as a proportion of its total sales in *t-1*th year.

DOMROYS : Total royalties and technical fee paid domestically by *i*th firm in *t-1, t-2 and t-3* years as a proportion of its total sales during these years.

LIBDUM : A dummy variable taking value one for years<1996

## V.2 Empirical results

The results are presented in Table 10. LR chi-square statistics is significant at 1% level indicating that the various determinants of export performance taken together contribute significantly to the explanation of export competitiveness of the pharmaceutical firms.

**Table 10: Tobit model estimation of export intensity of firms categorized by size and ownership**

	All firm	Firms categorised by size				Firms categorised by ownership	
	All firm	Large firms	Medium firm	Medium firm	Small firm	Foreign firms	Domestic firm
RDS	0.18055 <b>(2.97)<sup>a</sup></b>	0.505 <b>(4.20)<sup>a</sup></b>	0.053 <b>(0.653)</b>		0.103 <b>(0.136)</b>	0.513 <b>(2.62)<sup>a</sup></b>	0.179 <b>(2.67)<sup>a</sup></b>
MTS	-0.0509 <b>(-0.929)</b>	-0.111 <b>(-1.917)<sup>c</sup></b>	3.072 <b>(1.557)</b>		-17.747 <b>(-0.909)</b>	0.025 <b>(0.039)</b>	-0.052 <b>(-0.872)</b>
RDS*MTS				121.089 <b>(3.53)<sup>a</sup></b>			
ADS	-0.0309 <b>(-0.789)</b>	-0.022 <b>(-0.19)</b>	-0.279 <b>(-2.93)<sup>a</sup></b>	-0.279 <b>(-2.99)<sup>a</sup></b>	0.069 <b>(0.787)</b>	0.039 <b>(1.919)<sup>b</sup></b>	-0.105 <b>(-1.846)<sup>c</sup></b>
VCOST	0.000316 <b>(0.062)</b>	-0.034 <b>(-0.987)</b>	0.001 <b>(0.21)</b>	0.001 <b>(0.204)</b>	-0.151 <b>(-1.816)<sup>c</sup></b>	-0.182 <b>(-3.02)<sup>a</sup></b>	0.001 <b>(0.134)</b>
FF	-0.09673 <b>(-5.39)<sup>a</sup></b>						
SIZE	0.036005 <b>(8.50)<sup>a</sup></b>	0.012 <b>(1.178)</b>	0.034 <b>(3.80)<sup>a</sup></b>	0.032 <b>(3.69)<sup>a</sup></b>	0.033 <b>(2.62)<sup>a</sup></b>	0.023 <b>(4.27)<sup>a</sup></b>	0.039 <b>(8.05)<sup>a</sup></b>
IMPR	0.784856	0.933	1.006	0.985	0.658	0.411	0.805

	<b>(15.04)<sup>a</sup></b>	<b>(8.69)<sup>a</sup></b>	<b>(9.11)<sup>a</sup></b>	<b>(9.06)<sup>a</sup></b>	<b>(7.62)<sup>a</sup></b>	<b>(4.40)<sup>a</sup></b>	<b>(13.69)<sup>a</sup></b>
IMCAP	0.409859	0.288	0.767	0.743	0.077	-0.042	0.413
	<b>(4.84)<sup>a</sup></b>	<b>(3.02)<sup>a</sup></b>	<b>(2.94)<sup>a</sup></b>	<b>(2.89)<sup>a</sup></b>	<b>(0.291)</b>	<b>(-0.225)</b>	<b>(4.37)<sup>a</sup></b>
PCM	-0.03196	0.132	-0.067	-0.068	-0.093	-0.134	-0.033
	<b>(-2.04)<sup>b</sup></b>	<b>(3.71)<sup>a</sup></b>	<b>(-3.11)<sup>a</sup></b>	<b>(-3.19)<sup>a</sup></b>	<b>(-1.111)</b>	<b>(-1.46)</b>	<b>(-1.90)<sup>b</sup></b>
DOMROY	-1.50718	-1.083	-3.993	-2.889	-0.211	-1.642	-0.926
	<b>(-2.95)<sup>a</sup></b>	<b>(-1.87)<sup>c</sup></b>	<b>(-2.07)<sup>b</sup></b>	<b>(-1.983)<sup>b</sup></b>	<b>(-0.404)</b>	<b>(-2.614)<sup>a</sup></b>	<b>(-1.892)<sup>c</sup></b>
LIBDUM	0.027691	0.033	0.035	0.033	0.059	-0.011	0.051
	<b>(1.646)</b>	<b>(0.481)</b>	<b>(0.861)</b>	<b>(0.815)</b>	<b>(1.592)</b>	<b>(-0.912)</b>	<b>(2.042)<sup>b</sup></b>
cons	-0.11501	0.013	-0.124	-0.114	-0.004	0.072	-0.148
	<b>(-4.516)<sup>a</sup></b>	<b>(0.142)</b>	<b>(-2.249)<sup>b</sup></b>	<b>(-2.11)<sup>b</sup></b>	<b>(-0.042)</b>	<b>(1.107)</b>	<b>(-4.637)<sup>b</sup></b>
nob	1187	240	497	497	260	190	997
log likelihood	1.828083	55.7851	-84.309	-79.628	-14.319	220.529	-83.703
LR chi2 ( )	440.37	141.96	158.76	168.12	72.31	68.16	367.59

<sup>a</sup> significant at 1 % ; <sup>b</sup> significant at 5%; <sup>c</sup> significant at 10%, parentheses show t-statistics

#### Firm specific advantages

As expected, R&D efforts appear to confer distinct advantage to Indian firms in foreign markets. These efforts help bring out an improvement in process, product development, packaging and operational efficiencies and are major strength of companies in international markets. Estimations by firm size however indicate that R&D intensity was a significant export determinant only for large firms. For small and medium sized firms RDS emerged insignificant. Small firms do not have required resources to carry out substantial R&D in this industry. In our primary survey also R&D efforts were rated rather low by small sector firms. Their R&D intensity is much lower than that of large firms. Pradhan (2003) found the relationship between firms size and R&D intensity to be inverted U-shaped but the turning point was at the firm size level above which there were only 2-3 firms. He concluded that small size was responsible for keeping R&D performance of the industry at low level. Large firms on the other hand have acquired substantial R&D capabilities. Though most of the research efforts are confined to the process development and quality control and drug delivery system in India, large firms are now increasingly focusing on the basic research. R&D activities of some of them are discussed as under.

- Ranbaxy Laboratories has undertaken drug discovery and development in four therapeutic areas: metabolic disorders (diabetes, dyslipidemia, obesity and associated disorders); cancer; inflammation and anti-infectives. The new initiatives now aim at new molecule research. Ranbaxy spent about Rs.56 crore on R&D (3.6 per cent of turnover) in 1999 and plans to spend six per cent of its turnover on R&D by 2004.

The company has received government permission to begin phase 2 clinical trials for its Benign Prostatic Hyperplasia (BPH) molecule and phase 1 clinical trials for its asthma molecule. It is also doing collaborative research with Cipla and Bayer. US, EU Japan accounted for 85% of its global sales in the year 2002-2003.

- Dr Reddy's Laboratories has identified drug discovery as one of its long-term strategy. The research focus has been in the therapeutic areas of metabolic disorders, cancer, inflammation and bacterial infection, apart from process research. The company's total expense on R&D as a ratio of sales in 2002-2003 was 9.92%. During 1999-2000, its first anti-diabetic compound, DRF-2593, licensed to Novo Nordisk, entered phase 2 clinical trials and the second lead compound, DRF-2725 entered Phase 1 clinical trials. The company filed for 28 product patents and 13 process patents in India, US and PCT countries. In 2001, the company outlicensed DRF 4158 to Novartis US for \$55 million. In the same year it acquired exclusive EMR for its Fllouxetine 40 mg. Capsules. The company is exporting to 60 countries.
- Wockhardt Ltd's R&D spend for the period December 1998 to December, 1999 was Rs.450 million (around eight per cent of total turnover) and it expects its annual R&D expenditure in the coming years to be sustained in this region. The NDDS segment constitutes a major thrust area in R&D for the company. The company is exporting to 61 countries.
- Nicholas Piramal India Ltd's R&D budget in 1998-99 was Rs.246 million (5.7 per cent of turnover) which came down to Rs.92 million in 1999-2000 (two per cent of turnover). The company spent four per cent of its sales turnover to R&D expenditure in 2002-03. Two of its NCEs are: the anti-cancer IM-962 and a joint research initiative with a US company and Aablaquin. Its export markets include US, EU., Japan, South East Asia, Middle East and Latin America.

Several other firms including Alembic, Cadila, Korpan, JB Chemicals, Panacea are also involved in the research on New Chemical Entities. A number of companies such as Torrent, JB Chemicals, Shasun, Orchid, Morepen, Cadila, are filing patents in developed markets of US and EC. These R&D efforts appear to have been critical to their success in international markets.

Contrary to the expectation, RDS emerged as a significant determinant of export performance of foreign firms also. Interestingly R&D intensity of foreign firms is not significantly different from that of domestic firms in this industry (Pradhan 2003). These firms acquire basic technology and technical know how for introduction of new products and processes from their parent companies. These are adapted to local conditions through R&D and exported to other developing countries. It is found that most MNCs located in India focus mainly on the markets of other developing countries due to parent companies' restrictions (EXIM 1991).

For the overall sample, international technology transfer payments did not turn out to be significant. One may expect that the firms that are continuously updating their technologies have competitive advantages. That does not appear to be the case here. To explain the result it is important to understand the technological characteristics of the industry. In this industry, firms either move forward along one single technological path making successively better products or they adopt various technologies. Firms that choose the former option can also break into the world markets by producing better products and better processes if technology is not protected by patent. The patent Act 1970 in India allowed Indian firms to reverse engineer the technologies which made it possible for firms to improve processes or develop new forms of dosage and formulations. Firms thus diversified the product baskets, contained costs and improved operational efficiency. Therefore it is not important for firms to continuously import new technologies to compete in the world markets. We examined the 'Technology Note' of 86 Firms for the year 2003. Of these 9 firms were MNCs and they reported that they could access technological innovations of their parent companies without making payments. Of the remaining 77 domestic firms, only 23 firms (30%) bought technology at least once in the last 5 years. Around 70% of firms did not import technology during the last 5 years. Dey's chemicals reported that it imported technology in 1968, thereafter its operations have been based on its own R&D.

Our results by firm-size suggest that technology imports are not significant for very large firms. Since these firms have acquired substantial R&D capabilities they are not dependent on imported technologies for exporting. The behaviour of medium firms is however different. Though MTS was insignificant for them also an interactive term between RDS and MTS emerged significant with positive sign. Apparently, their strategy to excel in the world markets has been to continuously update technologies and absorb them using their R&D.

These firms perform substantial R&D but their efforts do not appear to be substantially large to give them an edge in the export markets on the basis of R&D alone. Small Firms do not seem to depend on their technological capabilities for exporting.

Tobit estimates by ownership suggest that this variable is not significant for foreign firms also. The reason is that these firms acquire new technological development from their parent firms without making payments. This is reported by most MNCs in their 'Technical Notes for the year 2002-03'.

ADS did not emerge significant/emerged significant with a wrong sign. This is contrary to our expectations. A debate surrounds the desirability of the high levels of promotional spending in the pharmaceutical industry. While the proponents suggest that high promotional spending is informative as they signal high quality, opponents argue that the high levels of such spending are wasteful. Our primary survey results suggest that our producers also view brand image and marketing as of high relevance. As discussed above they are also incurring heavy expenditures under these headings. But higher promotional expenditures may not be performance enhancing. Advertising needs to be effective and targeted. Interestingly, ADS emerged significant with a positive sign for foreign firms. These firms have already established brand names and marketing channels. Any incremental advertising appears to be resulting in value addition. Our results by firm size suggest that ADS is insignificant for large and small firms. It is significant with a negative sign for medium-sized firms. It could also be that their advertising is directed more towards domestic markets. This may help them in the export markets in the longer term.

Our results should not be taken to suggest that marketing does not affect export competitiveness of firms. In fact, marketing expenditures are used successfully in building brand image and entering the export markets. Major efforts are made by the firms to receive approval for their manufacturing products which enables them to explore new growth opportunities in these markets. For promoting exports, companies are establishing branch offices in several countries (for instance, Cadila, Elder Pharma). Companies are also promoting international business through agents in countries where branch offices are not set up. Some firms are forging marketing JVs. RPG for instance entered into product-specific joint ventures with the leading players in European markets. Our results merely indicate that

large advertising expenditures incurred by domestic firms may not be justified by the export performance of firms and that small scale firms do not compete on the basis of brand name.

VCOST did not emerge significant for all the firms pooled together. Though it is negative it missed significance. A more disaggregated analysis however shows that cost containment is a major determinant of the export competitiveness of small firms. This is in line with our findings from the primary survey. Small firms compete primarily on the basis of lower costs and high quality. India has an enormous cost advantage in the production of pharmaceuticals. Manufacturing costs for bulk drugs are one third of those in developed countries (Chaudhuri 1997). Operating costs are half, labour is one-tenth and some important equipment is one-fifth the level of the developed world ( as reported in Chaudhuri 1997). Many small scale firms take advantage of the cost factor. They get involved in contract manufacturing which is based on the technology supplied by the customer firms. Their strength lies in producing quality products at low costs. Getting a breakthrough in contract manufacturing helps in increasing global acceptance in terms of quality. Interestingly VCONST emerged significant for the foreign firms also. Apparently these firms are also exporting mainly on the basis of lower cost of production in this country.

FF is significant at 1% with negative sign. Clearly export intensity of foreign firms is significantly smaller than that of domestic firms. This is in contradiction with our expectations. It could however be attributed to the Patents Act 1970. This Act (effective April, 1972) greatly weakened intellectual property protection in India, particularly for pharmaceutical innovations. Although all inventors were affected by the weakened patent regime, it is clear that foreigners, in particular, no longer found taking out a patent in India worthwhile. The lack of patent protection meant that while foreign firms had to pay royalties for new drugs their Indian counterparts could use imitations. This might have affected the R&D and export performance of foreign firms in India.

There is a tremendous literature on the impact of size on the export performance of firms. Given the characteristics of the pharmaceutical industry we expected it to be positive. Our results are quite in line with our hypothesis. SIZE emerged significant in almost all the equations that we estimated. Even in the small firm group it was positive. The only exception is the group of large firms. For this group of firms SIZE is insignificant. This group includes

firms with sales turnover of Rs 100 million or more. One does not expect much variation in the size and export intensity in this group.

We attempted to test whether there are non linearity in this relationship but we did not find any. Massive investments R&D and brand promotion may explain the importance of scale economies in this industry.

#### Government Incentives

Indirect tax incentives provided by the government appear to have had significant impact on the competitiveness of firms. Both IMCAP and IMPR turned significant with positive sign. Apparently, the government incentives allowed cheap imports of raw materials and capital goods which encouraged the firms importing raw materials and capital goods to penetrate into foreign markets to avail such benefits. The use of imported raw materials and capital goods also help them in improving their quality and processes.

Interestingly, IMPR has emerged significant across all groups of firms while IMCAP is insignificant for small and foreign firms. IMCAP also implies transfer of embodied technology. For small firms technological advantages are not important. This may explain the non significance of IMCAP for them. For foreign firms imports of machinery could be a part of their investment and hence it is not relevant.

PCM comes up with a coefficient that is negative.. This result is contrary to our expectation. We hypothesised the relationship between the two to be positive. One may argue that this variable could be significant for large firms only because they are generally earning large profits and exemption from income tax could be an attractive incentive for them. Our results support this argument. This variable is significant with positive sign for large firms. For medium sized firms it is significant with negative sign. It could be that medium sized firms with lower profits might be attempting to break into profitable export markets.

Liberalisation seems to have favourably affected the export performance of domestic firms. Foreign firms do not appear to be influenced by these changes in trade and investment policies. There is a simple explanation for this. Though there has been substantial liberalization, the Patent Act has not yet been amended to provide full patent protection. There is an unusual importance of patents in this industry (Norgue 1990). Developing new

drugs is costly and risky. Producers invest huge sums in new discoveries with a focus on high profit margins. Patent protection is a significant component of their profit expectation.(Scherer 2000). In the absence of patent protection MNCs do not introduce new products in India. MNCs therefore continue to focus on domestic markets and /or export to developing countries from India as their base

DOMROYS comes up with negative sign in all the equations. It could be that firms have strategic tie ups with domestic research institutes to produce new products that are directed to domestic markets. Sometimes the objective is to substitute the imported raw material. One of the producers in a personal interview revealed that they involved a CSIR lab to develop technology for producing bulk drug for an anti cancer tablet in India. The aim was to produce the tablet at lower prices for domestic markets. The project however failed and they lost substantial money in the process. Thus these tie ups may not be for improving export competitiveness and may not always result into success.

## **VI. Constraints on firms' export performance**

To further extend our perception of the constraints in firms' export competitiveness we asked the firms to evaluate the relevance of six factors that might have affected their exports adversely. Table 11 summarises the evidence derived from this question. It suggests that high transaction cost remained the most important factor constraining their export performance. Transaction costs were stated to be high not only due to poor logistics, government bureaucracy and outdated banking laws but also due to strict registration procedures for exporters in importing countries. For exporting, firms have to acquire WHO GMP (Good Manufacturing Practices) certificate which is valid for 3 years now and is product specific. It involves time and cost. One of the firms stated

*'Normally for export now a days we have to obtain WHO GMP which is valid only for 3 years & it is product specific. Earlier we had WHO GMP certificate issued in 1990 without expiry so we were able to export to countries like Singapore & Malaysia till date. Now schedule M has come so we are all busy in compliance to make state of Art at factory. Many new products are required by our foreign counter parts but as we have to obtain Certificate of Pharmaceutical Products it becomes difficult to call & obtain WHO GMP CERTIFICATE PRODUCTS . If we call at this moment for inspection of our products we will not get WHO GMP certificate.'*

Besides, many firms observed that regulatory restrictions imposed by importing countries are a major constraint in their exporting. They have to acquire a license from the importing countries' authorities, which is granted upon assurance that the manufacturers comply with production and safety standards. Exporters have to submit a number of documents including drug samples. These are tested in the importing countries and upon clearance the exporters are allowed to export. These rules vary from country to country increasing the cost of exporting substantially. Moreover, rules on documentation are not clear. Complete information on documentation is not available. Sometimes there are language problems. In some countries (for instance, the EU), the registration procedure is highly complicated and includes physical inspection. It is observed that firms are unable to get registration even after 3-4 years. Sometimes, importing countries before granting registration to foreign firms seek advice from international experts. These experts may give negative recommendations in order to promote their own countries' firms. Cipla, an Indian firm, which offered an anti-AID drug at a very low price, was not granted license to export the drug to South Africa. Price quoted by the Indian firm was used to compel MNCs to reduce price.<sup>7</sup> The regulatory requirements thus increase transaction costs substantially and appear to be a major export constraint for the majority of firms in this industry.

**Table 11: Constraints on export performance**

Constraining factor	Most important % of firms	Important	Not important	Average response	C.V. %
<input type="checkbox"/> High Transaction cost	56.0	32.0	12.0	2.1	53.29702
<input type="checkbox"/> Inadequate infrastructure	32.0	36.0	32.0	1.7	74.34521
<input type="checkbox"/> Lack of information	12.0	60.0	28.0	1.2	83.33333
<input type="checkbox"/> Large domestic markets	16.0	32.0	52.0	0.9	128.3974
<input type="checkbox"/> Antidumping measures	4.0	36.0	60.0	0.7	138.9946
<input type="checkbox"/> Restrictions placed by technology suppliers /foreign suppliers	8.0	36.0	56.0	0.8	127.1081

Source : Primary survey

Aside from transaction costs, high production costs also affect the export performance of firms. According to industry experts<sup>8</sup>, poor infrastructure, high cost of power, high interest costs and rigid labour laws are some of the factors that affect the production costs in the industry.

<sup>7</sup> Our thanks to Mr. Wakankar for making these points in the RIS-DSIR seminar, 13 August, 2004.

<sup>8</sup> Both, Mr. Raizada and Mr. Wakankar emphasized this point in the RIS-DSIR seminar, 13 August, 2004

Inadequate marketing infrastructure and lack of information are other important constraints for the firms. To further investigate the role of these factors we asked the non exporter firms to evaluate specified factors that are motivating them to be inward oriented. They also cited the lack of information and absence of marketing infrastructure as a relevant factor for their not looking outwards. A firm stated that it is located in such an isolated place where it has poor accessibility to information on export opportunities.

Some firms also suggested that the problem of duplicate companies and spurious drugs is also a serious constraint for Indian exports. There are instances where duplicate firms in connivance with the local traders and authorities manage to export spurious drugs. This affects the reputation of Indian firms abroad. In the year 2002, 52 Indian companies were blacklisted in various foreign countries. These included 4-5 organised sector companies which never exported to the countries where they were blacklisted<sup>9</sup>.

Thus high transaction costs both, internal and external, high production cost, absence of information and marketing infrastructure and widespread prevalence of duplicate firms are some of the major export constraints.

## **VII. Policy Implications**

India's drug exports have increased dramatically during the 1990s. Since 1990 India has been enjoying positive trade balance. This paper attempted to identify the factors that determine the export competitiveness of firms in the Indian pharmaceutical industry. Our findings suggest that the competitiveness of firms depends not only on firm specific advantages but also on government fiscal incentives. Among the firm specific factors, own R&D efforts emerged as one of the prime factors influencing export competitiveness. Furthermore, it was found that R&D efforts involved in the modification in process technology were more relevant than the introduction of new products, reflecting the importance of the pursuit of improvement in processes in the industry's technological trajectory. Technology imports was not found to have played a significant export-enhancing role. Furthermore, it was observed that the export behaviour differed across different size-groups. While large firms were

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<sup>9</sup> Mr. Wakankar made this point and was supported by Mr. Raizada in the RIS-DSIR seminar, 13 Aug. 2004.

competing on the basis of their own R&D efforts, medium firms followed a different strategy. Due to lack in the depth of their R&D they imported newer technologies and absorbed them using their R&D efforts to acquire competitiveness. Small firms were competing on the basis of lower costs. Brand promotion and marketing expenditures were not found to be related with the export performance of firms but that could be because these expenditures might not capture the effects of these factors. Primary survey based analysis indicates that marketing and established brand names are highly relevant in the export performance of firms. However such efforts need to be more effective and targeted. The study also shows that firm size is an important firm specific advantage. Large sized firms are more export oriented. Finally, the paper suggests that the technology support given by the government institutions is not affecting the competitiveness of firms favorably. Our primary survey indicates that complex multiple regulatory rules, poor logistics, outdated banking laws, strict regulatory rules followed by importing countries, high production costs and lack of marketing infrastructure and information are the major constraints in the export constraints of Indian firms.

The paper argues that the government should focus on ruthless export promotion in the TRIPs driven environment. If multinationals aggressively market patented drugs in India, Indian companies can enjoy strong sales in the opposite direction by exporting generics. For this, research and development is an important area that needs attention. R&D spending among most Indian drug firms still averages less than 2% of total turnover, compared to 17% in the US. Many believe that strengthened patent protection is expected to encourage foreign firms to locate their R&D in India due to sizeable pool of low cost and technically skilled labour. This will set in motion a range of other dynamics such as licensing, co-marketing and joint ventures, generating multiplier effects that benefit local drug manufacturers. Lanjouw (1998) however argued that costs are not the prime concern and there is no reason to expect that the introduction of patent protection would encourage MNCs to locate their R&D here. It is therefore, important to announce new policy initiatives, particularly relating to the research and development and pricing regime. Whilst India may currently lack the resources for conceptual research, it can generate some research and development through molecular restructuring, which involves varying an existing molecule. With increasing patent protection, Indian firms can earn royalties on sales in new molecular varieties. Moreover, the profits derived from patent protection may in turn be invested in research and development by local Indian firms, thereby stimulating indigenous innovation and competitiveness. Heavy R&D investment is thus the key factor in improving the competitiveness of firms. Industry

experts suggest that the firms investing in R&D below some threshold level should be penalized<sup>10</sup>. This could be an indirect inducement for the R&D performers. Evidence indicates that technology transfers through public institutions have not effectively influenced the export performance of firms. It is therefore important to strengthen them and make them effective. In our survey, 37.5% of the firms suggested that strengthening the technology support from DSIR could be one of the most important policy measure affecting their competitiveness. On the other hand, 33% suggested that it was not important. This divided opinion implies highly varied experiences of firms (Table 12). This needs to be looked into.

**Table 12 : Evaluation of government policy measures for export promotion**

Policy Measure	% of firms		Average response
	Important	Not important	
<input type="checkbox"/> Trade facilitation	83.3	16.7	1.63
<input type="checkbox"/> Coordination with Indian embassies in information dissemination	91.7	8.3	1.88
<input type="checkbox"/> More liberal fiscal incentives	87.5	12.5	2.08
<input type="checkbox"/> R&D support from the Department of Science and Technology	66.7	33.3	1.63

Another important area that needs attention is marketing and Indian brand promotions in foreign markets. Companies are spending heavy amounts under these headings but these are not proved to be export enhancing. Government can play a proactive role here by providing direct assistance to the industry in marketing. It may help in establishing export networks that allow firms to target foreign markets. Such programmes are quite successful in British Columbia, New Zealand, and Australia. Indian embassies across the world may collect information on issues such as guidelines for licensing of pharmaceutical companies; registration procedures for medicines; local production level; demographic data; and healthcare systems, health indicators and prevalent disease patterns. This information should be made readily accessible through internet. Many firms (92% firms) believed that Indian embassies abroad could play a very important role in information dissemination. Besides, the government may hold a series of educational programmes for domestic exporters with special emphasis on the quality of product and organise trade shows abroad that may provide platform to firms to exhibit their products. Financial assistance may also be offered to firms for participating in international trade shows and foreign travels. Firms seek support

<sup>10</sup> Mr. Vimal Raizada made this point in the RIS-DSIR seminar, 13<sup>th</sup> August, 2004.

mechanism for concessional airfare for export promotion trips (including Trade fair participation) and concessional rate of interest . Though the government has schemes of concessional airfare, many firms are not quite aware of them. One of the respondents who tried to utilize the Marketing Development Assistance scheme in the case of two exhibitions cum conferences that he attended in last financial year, shared his experience with us. He stated that in both the cases he been using the help of a reclaim consultancy firm. He is yet to receive the grant amount (even after 6 months of submission) and he has now been informed that it may take some 3-4 months further after completion of all the paper work and the decision of the MDA authorities.

Costs are found to be a major factor driving export competitiveness of small firms. However, high costs of basic facilities such as power, poor infrastructure and high transaction costs offset these advantages. Regulatory requirements, international rules, complex trade procedures, outdated banking laws and government bureaucracy also result in high exporting costs. Control measure from DGFT/ customs/ central excises need to be minimized to the extent that they should be only helping the exporters rather than harassing them. Over 83% firms that were interviewed felt that these regulations should be further relaxed and trade facilitation should be initiated. Some of the measures suggested by firms to achieve this are as follows.

- Simplify export procedures
- E-connectivity to avoid delay, paper work and discretion
- State- of –the –art cargo-handling facilities at ports
- Number of nodal agencies monitoring exports should be reduced
- Better infrastructure facilities at lower costs
- Concessional finance
- More freedom should be given to exporters who are earning foreign exchange to the country.
- The government may extend technical and financial assistance in the registration procedures, which involve considerable resources and time.

The country also needs to develop world class standards. This in turn requires stringent quality standards in the domestic markets. For this, in –house regulatory expertise needs to be developed. Until the last two years, there was no registration requirement for a drug in

India. Firms could import/ manufacture the product on the basis of the approval from the Drug Controller. In case the drug was already approved in foreign markets, approval could be given on the basis of Phase III test (Confirmatory Clinical test). The Controller could dispense with this requirement also if it was in the public interest. However, two years ago, registration requirements have been introduced in India. This may help in achieving in high quality standards. Patent system should also be strengthened. There are instances where companies have acquired the US patent but they are waiting for the Indian patent. This could be due to lack of patent culture in the country. Industry sources<sup>11</sup> also suggest that modern medicine system in alternative medicines needs to be introduced. China has developed a huge export market by introducing modern systems in the alternative medicines. India also has a vast potential here, which needs to be tapped.

Finally, our analysis calls for strengthening and extending the financial incentive packages offered by the government. Following are some suggestions made by the firms we interviewed.

- Revision of DEPB rates
- Simplifying procedures for DEPB
- Extend validity for DEPB by 6 months
- Add more products in custom duty concessions
- Greater tax benefits
- Incentives on R&D

One must however note that while these incentives are WTO compatible, these are countervailable. Moreover, with decline in tariff rates, some of the existing incentives may become redundant. It is therefore important for the government to play a more proactive role by supporting R&D efforts and marketing efforts, facilitating cost reduction by providing basic facilities at lower costs, streamlining trade procedures and providing technical and financial assistance in registration processes. With a more focused approach, the industry will be able to compete fiercely in the world markets.

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<sup>11</sup> Mr. Vimal Raizada made this point in his presentation at the RIS-DSIR seminar.

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