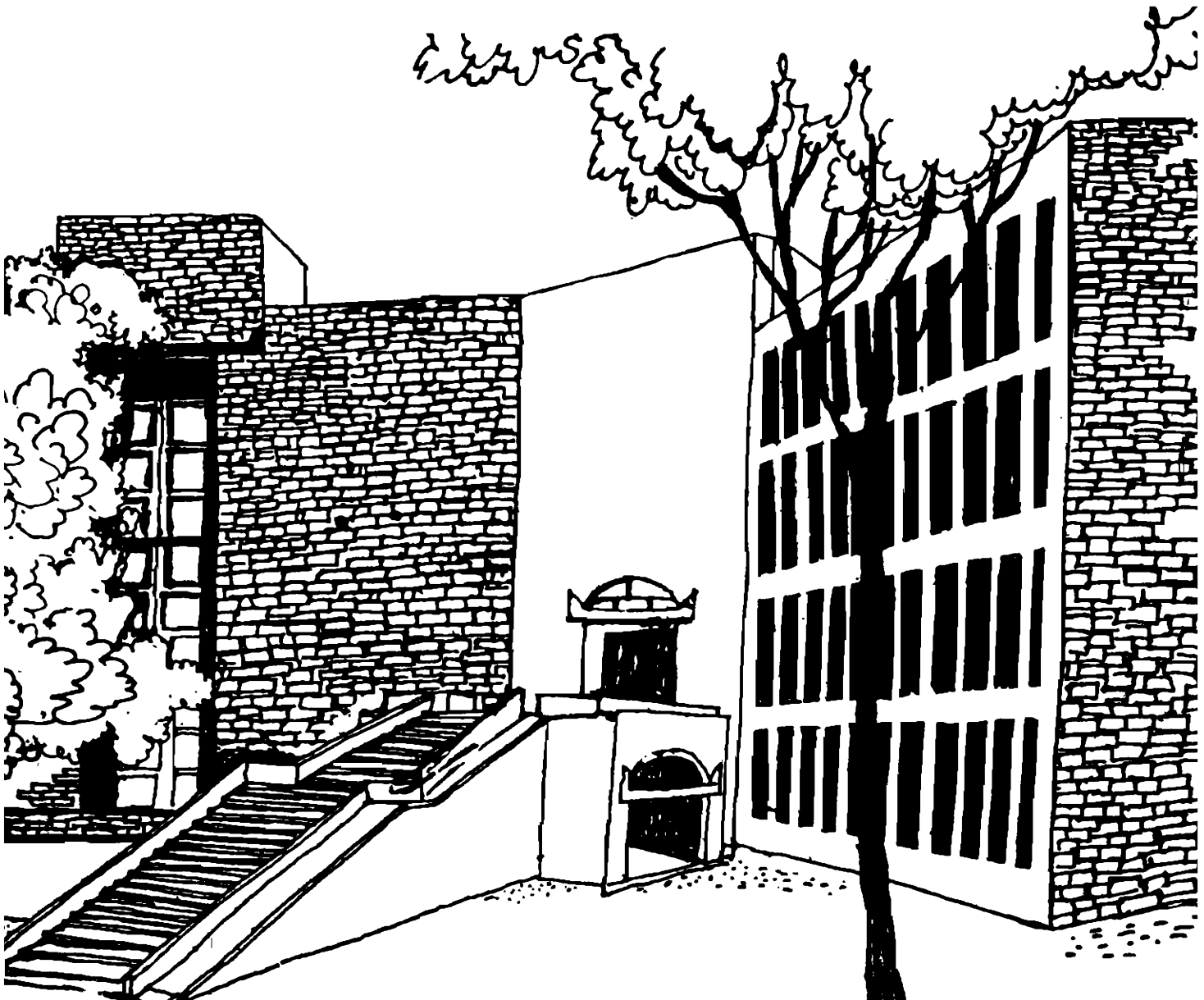




Working Paper




**INDIA'S EXPORTS SINCE THE REFORMS:
THREE ANALYTIC INDUSTRY STUDIES**

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India's Exports Since the Reforms: Three Analytic Industry Studies

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Abstract:

Our analysis of markets, competitors and suppliers in three key Indian export industries—diamonds, garments, and software—sheds light on the effects of India's recent economic reforms on export competitiveness. It also calls attention to the imperative to upgrade in international competition. And finally, it affords some insight into the process of such upgrading in the context of a relatively poor country. Our somewhat unexpected inferences about demand conditions and related and supporting industries suggest the following testable hypothesis: internationally competitive industries from poor countries will tend to have a standalone character, at least initially. That is, they will be relatively detached from both domestic demand and domestic related and supporting industries.

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Introduction

One of the more obvious changes since the inception of India's economic reforms is the opening of the Indian economy to world trade. India's trade exposure (measured as exports plus imports as a percentage of GDP) increased from 15% in 1989-90 to 23% in 1995-96.² Exports grew slightly more quickly than imports between 1990-91 and 1995-96: at annual rates of 11% in dollar terms and 27% in rupee terms, versus 9% and 23%, respectively, for imports. India's share of world exports increased from 0.5% to 0.8% over that period. The net trade balance remained stuck in the red—to the tune of -\$4.5 billion at the end of this period, versus -\$5.5 billion at the beginning—but it decreased as a percentage of GDP, from 3.2% to 1.7%. Garments, textiles and jewelry continued to account for about one-half of total exports; petroleum, chemicals and capital goods accounted for a slightly larger share of the imports (see Table 1).

These basic patterns are not particularly surprising. Virtually every model of international trade known to economic theory predicts that trade exposure will increase as trade restrictions diminish. The maintenance (or restoration) of a rough balance between imports and exports fits in as well with an emphasis on national economies settling down quickly into general equilibrium with each other. And the pattern of specialization, in the case of major export and import sectors at least, would seem to be consistent with the pattern of comparative advantage/disadvantage implied by India's resource endowments, seen in an international context.

² By way of comparison, the average worldwide level of openness had reached 23% in the early 1970s and exceeded 35% by 1995.

But trade-theoretic (economic) equanimity should not be allowed to obscure policy concerns. Like their counterparts elsewhere, Indian policymakers tend to be concerned about international “opening up” leading to an excess of imports over exports rather than the other way around. These concerns about export growth are evident in recent talk about reestablishing “export thrust” industries, and they are fueled by the fact that for the first three or four years of the current reform process, the impact of (sequenced) tariff cuts in most industries was more than offset by the large (and relatively sudden) devaluation of the Indian rupee toward the beginning of this period—a pattern that might be expected to lead to trade surpluses rather than deficits before the end of this period. And the importance of export growth is amplified by the recognition that India will have to phase out tax exemptions and other subsidies for exports and further loosen restraints on imports, particularly of consumer goods.

To probe the issue of export growth in greater depth, we opt to look at the performance and prospects of a limited number of Indian industries with significant exports in a way that encompasses demand characteristics, horizontal and vertical linkages with other industries, patterns of competition, and the effects of a broader vector of policy choices than trade policy alone.³ In order to do so, we draw on interviews with executives and policy-makers as well as official statistics. Note that our approach is complementary to the more standard one of analyzing (changes in) the trade-positions of all

³ For that reason, we do not structure our discussion in terms of a specific list of changes in trade policy such as devaluation, reductions in tariff and non-tariff barriers to trade, liberalization of the conditions governing foreign investment, et cetera.

sectors/industries in order to test the theory of comparative advantage or the impact of (reduced) policy distortions.⁴

Our sample of export industries—diamonds, garments and software—reflects earlier work on those industries, conducted by Ghemawat with Michael Porter and Srinivasa Rangan under the auspices of the Confederation of Indian Industry, on internationally competitive Indian industries in the early 1990s, before reforms had had much time to work their way through the system.⁵ The present study takes the earlier diagnoses of these industries as its point of departure and focuses on their evolution since the inception of the reform process.

From the perspective of the present study, our sample is favored by more than just sunk costs. First, two of the industries (diamonds and garments) are final consumption goods, and the third (software) is an upstream input. This parallels a pattern often observed in developing countries: their exporting industries tend to cluster in final consumption goods and, to a lesser extent, in upstream inputs. Industrial and supporting functions, in contrast, tend to represent an “excluded” middle.⁶

Second, all three industries are salient in and of themselves, although not always for the same reasons. Cut and polished diamonds and garments each account for roughly 15% of India’s exports. And the software industry commands attention disproportionate to its relatively small share of Indian exports (only 2.5%) because it is growing particularly rapidly, it relies on skilled rather than unskilled labor as its principal source of competitive

⁴ For recent applications of this latter approach to the Indian environment, see Mehta [1997] and Morris [1997].

⁵ See Ghemawat, Rangan and Porter [1995].

⁶ This is based on the project with Michael Porter and Srinivasa Rangan cited above. Porter took the lead on this segment of the analysis.

advantage, and it supplies an intangible product or service rather than a traditional manufactured product.

Some of these differences might be restated in another way. Diamonds and garments can be cast as the post-Independence stars in the growth of India's exports: they increased their collective share of India's exports from 1% or so in the early 1950s to about 30% recently, helping offset the sub-par performance of more traditional export items such as tea and jute manufactures. But, as we will see in the respective industry studies, there are questions about whether diamonds and garments can sustain their leading roles in export growth. Software, in contrast, is often cast as a new and rising star—a proposition we examine in that industry study.

Third, and this point is related to the second one, the three industries that we study also vary in terms of India's share of world exports. India has already achieved the world's largest share of exports of cut-and-polished diamonds (70% by weight and 30% by value). India's share of garment exports, at about 3%, is more modest, but significantly exceeds its average share of total world exports. India's share of world exports of software is, in contrast, still somewhat lower than its average share of total world exports.

Fourth, trade balances represent another interesting dimension of variation. India's trade surplus from diamond cutting and polishing is about a quarter of total exports of cut-and-polished diamonds because rough diamonds are essentially all imported and domestic value addition is relatively small. India's trade surplus from garments, in contrast, approximates export levels, implying much more domestic value addition despite a similar level of total exports. Value addition is proportionately high in software exports as well,

but India's trade surplus in that sector is reduced by significant (often enabling) imports of computer software and hardware.

The three sections that follow analyze the Indian diamond, garment and software industries in that order, starting with what is in some sense the simplest case and concluding with the most complicated one. Each industry study is organized in terms of a simple value system that works back from the *markets*, foreign and domestic, that are served, to the *competitors* that serve them, to the *suppliers* who provide key resources to those competitors. We use this template to analyze each industry's recent performance and future prospects, to try to isolate the effects of the reform process, and to discuss the reforms that still need to be made. Given space constraints, the individual industry studies have to be described very briefly, the narrative style is correspondingly more interpretative than descriptive.⁷ The concluding section tries to synthesize the findings from the three industry studies.

Diamond Cutting and Polishing

Cut-and-polished diamonds account for more of India's exports than any other single product category. Unlike many of the other industries in which India has achieved a leading share of world exports (e.g., mica, whole cashews), diamond polishing involves high-precision processing of primary inputs: Indian processors take small stones (mostly weighing less than 0.06 carats or 12 milligrams) and apply "brilliant" (58-facet) cuts to them. The success of this industry in India has been relatively recent (it really dates back

⁷ Fuller descriptions and documentation of the post-reform experiences of each of the three industries can be found in the working paper version of this paper, Ghemawat and Patibandla [1997]. Also see Ghemawat, Rangan and Porter [1995].

only 35 years). The Indian diamond polishing industry employs around 600,000 workers around the year and another 300,000 between agricultural seasons. These numbers are substantial, even in a country as populous as India. In addition, many of these jobs are reported to have been created in small communities, particularly in western India, that were previously entirely dependent on agriculture. Indian competitiveness in this industry derives from the innate labor-intensity of the process of cutting and polishing near-gems, which can only be automated to a limited extent.

Markets

The post-reform export performance of the Indian diamond cutting and polishing industry seems, at first glance, to have continued to be strong (see Table 2). In 1995-96, the Indian industry processed 102.8 million carats of rough diamonds, and Indian exports of cut and polished diamonds amounted to almost \$4.7 billion (Lakhi, 1997). The dollar volume of India's diamond exports grew at a compound annual growth rate of 12% between 1990-91 and 1995-96, which meant diamond exports maintained their share of India's total exports. In addition, there was noticeable improvement over this period in the ratio of domestic value addition to export revenues: the ratio increased from 23% in 1990-91 to 25% by 1992-93 and 30% by 1995-96, probably because of a small increase in the average carats, and therefore the value per carat, of the stones cut and polished in India.

But behind the official statistics, leading diamond merchants seem more subdued. Their concerns stem primarily from market saturation. India has a virtual monopoly in the world market for small cut and polished diamonds, but revenues from near-gems are not

expected to continue to grow at historical rates (partly because of supplier discord; see below). In addition to the danger of market saturation, analysts suggest that much of the diamond industry's profitability through the late 1980s was based on its ability to "game" Indian foreign exchange regulations (Piramal, 1996). Thus, exports were supposed to have been under-invoiced in the past in pursuit of the black market premium on foreign exchange (if the difference was repatriated) or to enable capital flight (if it was not). By holding on to diamonds rather than immediately re-exporting them, Indian merchants could, in effect, speculate against the rupee, which depreciated steadily until 1991-92 before stabilizing in real terms (see Table 3). India's economic reforms have reduced the payoffs to such activities.

Many industry observers argue that the Indian diamond industry has two possible avenues for expansion: cutting and polishing larger stones or integrating forward into the production of diamond-studded gold jewelry. Both of these options are encumbered with obstacles. In the former case, expanding into cutting and polishing larger gems would require the international diamond cartel, De Beers, and its common marketing agency, the Central Selling Organization (CSO), to agree to supply Indian firms with larger gems. This seems unlikely for a variety of reasons that are discussed in the section on suppliers.

The second possibility for Indian diamond firms is to integrate forward into the production of higher value-added diamond-studded gold jewelry, both for export and for the domestic market. Several impediments can be cited in this regard. The domestic market continues to be restricted because of regulations and price-sensitivity: diamond jewelry tends to be expensive even at the low end. The market that exists is mostly served

by artisanal custom-designs, rather than mass-produced or branded jewelry. And export markets tend to require different, less ornate designs than the domestic market, typically in lower-carat gold. Still, there *are* some signs of progress: the share of gold jewelry in India's total exports increased from 6.7% in 1990-91 to 10.5% in 1995-96,⁸ and domestically, the number of jewelry outlets in major cities is reported to have increased substantially. Liberalized access to gold (also discussed in the section on suppliers) seems to be an important part of the reason.

Competitors

The Indian diamond industry has historically been highly fragmented: while precise data are lacking, there are tens of thousands of diamond polishing establishments as well as several thousand exporters. Many of the exporters, particularly the smaller ones, subcontract production to cottage establishments that operate in the unorganized sector and thereby escape the nets of taxation and labor legislation. This subcontracting structure is traditional to the industry: the families of Jains (a small religious minority) from the town of Palanpur in western India, who have been involved in diamond trading for centuries and who dominate India's diamond trade today, have tended to focus on trading and to outsource manufacturing.

The structure of competition in the Indian diamond industry has undergone several changes since the early 1990s. A new community, the Marwaris, has entered the industry, although this change seems linked to developments internationally on the supplier side (discussed in the next section) rather than to the reform process *per se*. At the same time,

⁸ The product mix of exports at present is 86% cut and polished diamonds, 10.5% gold jewelry, and 3% colored gem stones.

market saturation has helped induce some exit/consolidation: many small cutting and polishing establishments are reported to have been acquired, for their artisans, by the largest competitors. As a result, the top four firms' share of exports increased from 7% in 1992-93 to 10% in 1995-96. Some of the larger firms have also modernized operations by improving working conditions and investing in modern machinery. Even more modern operations, however, have been set up overseas by at least one large Indian firm. Industry participants blame the limited level of modernization in India on the government's failure to reform labor laws and other policies enshrined in the Factory Act.

Another dimension of competition along which change is starting to be experienced concerns geographical location. The Indian diamond cutting and polishing industry was historically concentrated in rural western India, particularly around the city of Surat in Gujarat. Recently, operations have been started up in other parts of India, particularly the south. This dispersion is possible because it does not seem to take too long or be too costly to train labor outside the traditional centers. The extra training costs are offset by various advantages. First, wage rates can be reduced relative to the levels they have reached in western India. Second, locating in areas where there are few other diamond polishing operations reduces both the diversion of diamonds to the black market and the loss of trained workers to operations that skimp on in-house training programs. Note that the implication is not that diamond operations can be set up anywhere: the need for a suitably deep pool of workers, diligent local work habits and good transport arrangements constrain locational choices. Instead, the implication is that there are costs

as well as benefits to agglomeration and that in a developing economy where the key inputs are not very specialized, the former may outweigh the latter.

Suppliers

Probably the most important link in the value system for this industry is the supply of rough diamonds by the international cartel, De Beers. Rough diamonds dominate the cost structure of polished diamonds.⁹ The structure of the diamond trading system is such that most of the scarcity rents are appropriated upstream by the suppliers of rough diamonds, particularly De Beers and its distribution arm, the CSO.

Firms that cut and polish stones supplied by the CSO have no choice in what they buy; their purchases are allocated by De Beers. De Beers/the CSO and most other producers make virtually all their money off larger stones. But the supply of smaller stones has nearly quintupled since the early 1980s, primarily due to the expansion of Zaire's output and the opening of the largest diamond mine in the world at Argyle, Australia. These smaller stones could be called a nuisance from the CSO's perspective, but it has so far been willing to move them anyway, to preserve marketing exclusivity and to prevent these near-gems from undermining the overall pricing structure in the diamond market. However, the CSO's commitment to moving near-gems is precarious: it recently took the unusual step of "rebalancing" its price book by reducing the prices it pays to suppliers of these small stones and increasing prices to suppliers of large stones.

As a result of modernization, some larger Indian firms are in a position to cut and polish larger rough diamonds. But De Beers/the CSO, apparently concerned about

⁹ The cost structure of producing cut and polished diamonds includes: 75% raw material, 12% labor, 4% interest, and 9% other (mostly the cost of holding inventories).

concentration of too much of the downstream industry in any one location, limits Indian firms' access to large stones, forcing them to rely on secondary markets in Hong Kong, Israel, Antwerp, the U.S., and Switzerland. There was some freeing of the supply of rough diamonds for a period in the mid-1990s, from two sources. First, Russia failed to renegotiate its contract with De Beers and for some time independently supplied larger roughs to India. Second, the Argyle mine broke from the CSO. Argyle's diamonds account for only 6% of CSO's input in terms of value, but 40% in terms of volume. Ironically, the immediate impact of Argyle's break from the CSO was to cause a crisis in the Indian industry by driving down the prices of near-gems.

Recently, however, both these developments seem to have been reversed, with Russia and Argyle rejoining the CSO fold. Thus it appears that the supply of rough diamonds, and hence Indian firms' ability to expand into larger diamonds, will remain under the control of De Beers, which shows no sign of altering its current policy of allowing Indian firms to cut and polish only small near-gems. Given that De Beers has successfully controlled the diamond market for more than a century, there is more than the usual level of presumption that it will continue to be able to do so. And if De Beers/the CSO did collapse, the prices on near-gems would be likely to collapse as well.

Given the one-sidedness of their dependence on De Beers, some of the leading Indian diamond competitors seem to be looking at an avenue for expansion other than larger roughs: branching out into diamond-studded gold jewelry. Recent Indian policy changes that have improved access to gold at lower prices have had a major influence on this strategic thrust. Particularly significant was the repeal (in 1990) of the Gold Control

Act, which regulated the movement of gold, prohibited the accumulation of more than 400 grams of gold per artisan at any time and required licensing to deal with gold and manufacture gold jewelry. More recently, the Indian government allowed three state-run agencies and eight banks to import and sell gold freely to jewelry exporters and local dealers. However, customs duties of 20% to 75% still prevail on the import of raw materials other than gold that are used in the manufacture of gold jewelry, including non-gold alloys, injection waxes, wax patterns, and investment powders.

Garments

Garments have vied for some time now with cut-and-polished diamonds for the designation of India's largest export industry. But because the domestic content of garment exports is close to 100%, garments' net contribution to India's trade balance is much larger. While employment is difficult to estimate with any degree of precision because most garment manufacture in India takes place in the unorganized sector (like diamond cutting and polishing), most estimates exceed one million.¹⁰ The garment industry also generates significant employment via backward linkages (particularly with the powerloom sector) that make it the leading contributor to export-related job-creation. Furthermore, the experiences of other countries whose general level of development ranges from India's to the very advanced (e.g., the United States and England) suggest that the garment industry, along with its suppliers of fibers and textiles, is likely to play a pivotal role in the early stages of industrial development.

¹⁰ See Khanna, 1992 for a survey of pre-reform estimates of employment by the Indian garment industry.

Markets

Indian garment exports grew at an average rate of 27% in rupee terms and 7% in dollar terms between 1989-90 and 1995-96, roughly keeping pace with the growth of world trade in garments (see Table 4). Most of India's garment exports are cotton-based, but exports of synthetics have recently grown even more rapidly (off a much smaller base, admittedly), from 6% of total exports in 1988-89 to 10% in 1994-95. And, unlike the apparent stalemate in diamonds, India's limited share of world trade in garments leaves room for substantial export growth.

Whether Indian garment exporters will actually achieve such growth remains an open question. There seem to be at least two broad sets of concerns. First, most of India's garments are exported under the Multi-Fiber Arrangement (MFA), which restricts garment imports by quotas in certain markets (basically the United States, Canada and West Europe). According to India's Apparel Export Promotion Council (AEPC), 73% of India's garment exports in 1993-94 were to countries that restricted imports under the MFA. Furthermore, 71% of the exports to those countries consisted of restricted items, in most of which Indian quotas were fully utilized. Given the competitive problems of the Indian garment industry that are discussed below, the agreement reached during the Uruguay round of multilateral trade negotiations to phase out the quota system by 2005 may be more of a threat than an opportunity.

Second, Indian garment exports have tended to be directed at a narrow, low-end niche of the international market. They are mostly cotton-based (whereas most international trade involves synthetics or blends), are concentrated in the simple product

categories of women's outerwear and men's underwear and shirts, and are priced at the bottom of those categories, with an average unit value that has stagnated under \$5 and may even have dropped recently. Reasons for the low unit value realizations include poor quality, limited design and marketing capabilities that relegate Indian garment exporters to the role of contract manufacturers, excessive dependence on seasonal, fashion-oriented demand, and production and infrastructural bottlenecks that stretch out delivery lags. These weaknesses are explored further in the section on competitors.

Turning from foreign markets to the domestic one, India historically lacked significant domestic demand for readymade garments: most Indians bought fabric and relied on inexpensive tailors to make it into garments. That has started to change in the 1990s, with the emergence of middle-class demand, broadly defined. In a few product categories, such as men's shirts, there seem to have been complementarities between domestic and foreign demand. But the role of domestic demand in spurring international competitiveness continues to be limited by a number of factors. In terms of fiber base, there has been a steady shift in domestic demand over the past two decades, away from cotton fabrics and toward non-cotton (and blended) fabrics due to their durability and wash-and-wear characteristics. This trend does not match the export categories in which the Indian garment industry is most successful overseas, which tend to be cotton-based. And there continue to be important fashion differences between domestic demand and foreign demand. More than half of India's garment exports are accounted for by ladies' outerwear—skirts, blouses and dresses—but Indian women usually do not wear western clothes.

Competitors

The prevailing industry structure is characterized by the existence of a few large and many small and medium scale firms. As in the diamond industry, the organization of production in the garment industry is also based on subcontracting. A typical garment exporter in northern India operates through a network of 10 to 20 subcontractors, each with an average size varying from 20-50 machines. This facilitates flexibility in the processing of relatively large as well as small orders. It also allows seasonal production and employment; reduces overhead costs; and distributes the burden of fixed capital among different operational units, enabling numerous small firms to enter the industry (Chatterjee and Mohan, 1993). On the negative side, subcontracting can cause quality control problems and delays.

Recently, there has been some movement towards more structured production, coupled with a geographical shift to southern India. Possible reasons for this shift are the presence of a more literate, stable and non-militant work force, proximity to ports, and better availability of fabric and other inputs and accessories. Tirupur, a small town in the south of India, is perhaps the most successful example. 70% of India's exports of cotton knitwear are now accounted for by the hundreds of firms, ranging in size from five workers to 500, that cluster at Tirupur. Clustering seems, in this case, to have improved the flow of information about export markets and how to serve them, reduced fears about buyer/supplier holdup that might prevail in smaller-number situations, and facilitated organized cooperative efforts in areas such as lobbying the government for infrastructure. Note, however, that it is also possible to think of clusters that have declined in the 1990s:

the several hundred thousand small-scale powerlooms in Bhiwandi, in the western state of Maharashtra, are a cautionary example from the textile sector.

Small-scale garment establishments, which are still favored by the Indian policy regime, are generally unable, acting on their own, to develop the design and marketing skills that would let them act as more than contract manufacturers for export. Some of the larger-scale operations set up in the 1990s—often as joint ventures with, or licensees of, international branded firms such as Benetton and Lacoste—would seem poised to surmount such barriers. Interestingly enough, however, most collaborations with foreigners seem to be aimed at the domestic market for garments. Only a few of the larger-scale operations, such as Gokuldas, focus on export markets.

Indian manufacturers' principal competition in export markets comes from other low-income countries such as Bangladesh, Indonesia and China, which is unsurprising given the labor-intensity of garment manufacture. While labor costs are somewhat higher in some of the countries that compete with India, their effect may be more than offset by shorter lead times, which are critical for seasonal, fashion-oriented products. For example, Indian lead times of 5-6 months are roughly twice as long as the lead times with which an average Chinese competitor might supply a Western buyer.

Lead times are longer for Indian exporters because of delays in ports and shipping, including customs and bureaucratic red tape, but also because of working capital problems. Indian banks generally will not lend money to small manufacturers until a detailed letter of credit is received from the importer. Before a letter of credit is received, the cost of capital is high, about 2% to 3% per month. For this reason, Indian exporters

are unwilling to stock fabric in inventory, and producing the fabric after an order is received adds up to 60 days to lead times (Jaikumar and Vaghul, 1995). Some of the other ways in which the supply of fabric affects the Indian garment industry are discussed in the next section.

Suppliers

The key input for the garment industry (other than labor) is fabric supplied by the textile industry. The textile industry continues to be the largest in India, employing 20 million people and accounting for 20% of total industrial output and almost 30% of total exports. The reforms seem to have had a more direct, positive impact on textiles than on the garment industry *per se*.

In particular, the reforms seem to have spurred the revival of larger-scale mills. The 1985 Textile Policy removed industrial licensing, opening the way for expansion and restructuring by such mills. The trade policy reforms of 1991 substantially reduced tariffs on equipment and generic intermediates, which, in turn, reduced the costs of acquiring new capacities and technology. Prior to the reforms, in 1989, the tariff on polyester fiber was 185%; on polyester filament yarn, 235%; on nylon filament yarn, 140%; and on viscose staple fiber, 60%. These were reduced to 65% for the first three categories and 25% for the latter by 1994. In the case of textile machinery, tariffs of 85% in 1989 were reduced to 20% by 1994. But large-scale mills continue to be restricted by a host of government regulations, the most troublesome of which may be restrictions on exit.

Much of the growth of the textile industry that has resulted from the reforms has been based on exports of fabric (see Table 5). The mill sector accounts for 43.9% of

India's fabric exports, while powerlooms account for 43.1% and handlooms for 13%. It also appears that mills that are trying to increase their export orientation have undertaken expensive technological upgradation and modernization (Roy, 1996).¹¹ Arvind Mills, which has become a world-class player in denim, is an oft-cited example.

The impact of improvements in the textile industry on the downstream garment industry seems, in contrast, to have been relatively limited to date. The variety of fabrics available domestically continues to be a significant issue for garment manufacturers (since fabric imports continue to be restricted). And even in cotton fabrics, the advantage of cheap cotton (whose export is restricted) is offset by higher processing costs in India (see Table 6). For that reason, Indian garment exports may have succeeded to the extent they have in spite of rather than because of the Indian textile industry.

Software

While export success in diamonds and garments is recognized as stemming from India's cheap unskilled labor, the software industry is seen as being on the leading edge of the technology revolution. As one software executive put it, "In this industry, we are paid for our brains, not brawn." This is perhaps the reason that the software story is somewhat different from, and more complicated than, those laid out so far. It will accordingly be presented in a bit more detail.

Markets

¹¹ Investment rate in terms of gross capital formation as a percentage of value-added in the mill sector (on the basis of ASI data) grew from 51% in 1986-87 to 106% in 1991-92.

India's software exports increased from \$128 million in 1990-91 to \$1.1 billion in 1996-97, implying a compound annual growth rate of 43%, while their share of world exports almost tripled from 0.13% to 0.37% (see Table 7). Developed countries, which account for approximately 90% of the world market, absorbed the lion's share of India's software exports; the United States, in particular, accounted for 58% of Indian exports in 1994-95, versus its world market share of roughly 40%. Since the reforms, there has been some geographic diversification, including modest levels of exports to other developing countries, particularly Asian ones.

The competitive strength of Indian software firms lies in their ability to deliver large software efforts with good quality, on time and at low costs. But several potential problems could impede the industry's continued growth potential. These include a concentration on the low end of software services and shortages in the supply of skilled manpower. Table 8, based on data provided by India's software industry association, NASSCOM, indicates that prior to the reforms, professional services performed on-site (at the client site) accounted for 72% of India's software exports. Indian exporters concentrated on the low-end of this segment: on support services, maintenance and the like, in which low cost manpower is decisive, rather than on higher-end services such as application solutions and software consulting. But changes in the U.S. market, such as visa restrictions and wage parity rules, as well as the costs of moving manpower and access to telecommunication facilities, have made onsite projects less profitable. By 1995-96, this percentage had declined to somewhere between 29% (if one accepts the carve-out of consulting and training services into a separate category) and 55% (if one regards the

carve-out as largely an attempt to defuse tensions over low-end “body shopping”). Professional services performed off-site (in India, not at the client site) maintained their share of Indian exports at 18-20%. Finally, standardized products and packages, which typically require large investments in R&D and marketing, increased their share from 5% to 12%; however, Indian exporters concentrated, once again, on the low-end of this segment: on systems software and utilities and niche products for other developing countries rather than, for example, mass-market applications. To keep these percentage changes in perspective, it is worth recalling that with the explosive growth of exports over this period, even revenues from on-site professional services more than tripled (in dollar terms).

A key characteristic of the Indian software industry is the segmentation of the domestic and export markets. The domestic market for software has increased substantially in the post-reform period, but it has not grown nearly as fast as exports: starting from a very small base, the domestic market has grown to Rs. 25 billion in 1996-97, compared to Rs. 39 billion for exports. Most software packages for Indian domestic use are imported. Turnkey projects dominate the domestic market, implying high levels of customization. In 1995, out of a total turnover of Rs. 11 billion, 45% of software activity was for turnkey projects, 35% was for packages, 8% for consulting, 8% for training and 4% for data processing.

The reforms, particularly devaluation, undoubtedly enhanced the attractiveness of export activities relative to serving the domestic market. But the domestic market had generally been less profitable than export markets even prior to the reforms, for a number

of reasons. First, a number of export incentives, including tax exemptions for export income and better access to imported inputs for (re)export purposes, were already in place. Second, domestic demand was subject to several limitations: poor per capita income coupled with the high income-elasticity of demand for software; backward integration by buyers rather than outsourcing; the dominance of what demand there was by the government and public-sector enterprises, many of them capital-constrained; and a tendency to invest in (expensive) hardware rather than software, reinforced by a general attitude (and sanctioned by the weak protection of intellectual property rights) that software ought to be free. Third, efforts to achieve economies of scale or learning across domestic and export markets were undercut by the customization of much of the work in each segment, the niche nature of much of standardized Indian software, such as products and packages, and large differences across the two segments in characteristics valued that were related to both horizontal and vertical product differentiation.¹²

The differences between domestic demand and developed country demand are particularly important because the components of software development—the information systems used, the hardware architectures selected, project management skills, etc.—must be matched to the type of software to be produced. A major orientation towards the American market does provide an advantage in language (and in the time zone difference). But the different types and levels of user needs in the U.S. market and the domestic

¹² For example, a software package called Banks 2000 developed by a leading Indian software company, Infosys, for retail banking in the domestic market can not be marketed in developed countries because of higher end needs of banking services, although it has been exported to a few other developing countries. Similarly, another package called Eagles that Infosys developed for warehouse management for the U.S. market is too sophisticated for domestic users. Like other Indian niche products, both packages are marketed directly to business customers.

market segments the industry. The lack of a strong domestic user base and unsophisticated user needs mean firms have to develop different capabilities for export and the domestic market. Thus (technological) learning from exports may not be of immediate use in the domestic market, and vice versa.

These demand-related limitations and differences may be eased, over time, by several apparent trends that can, with varying degrees of directness, be related to the reform process. Incomes are increasing. The fraction of demand accounted for by the public sector is going down, while the fraction accounted for by the private corporate sector is going up. Potential buyers in both the public and the private sector seem to face increased pressures to streamline and integrate their internal operating processes (and they also seem more prepared to outsource). Intellectual property rights and their enforcement have been bolstered (through the 1994 amendment to the Copyright Act to restrict software piracy. And on the technological side, the globalization of IT standards, while far from complete, is progressing. A limited amount of package development for both home and abroad does appear to be taking place. Nevertheless, the current picture and the near-term outlook continues to be that of two highly-segmented markets, with foreign demand leading domestic demand where the two do connect.

Competitors

In 1996-97, the top five software exporters accounted for 33% of Indian exports, down from about 60% in 1990-91. The inability of the largest firms to hold on to their share of an exploding market was accompanied by significant entry: according to Eximbank data, the number of firms exporting software from India went up from 157 to

340 between 1990-91 and 1994-95. Still, average exports per firm did double in dollar terms and triple in rupee terms over that period, and there are suggestions that they have continued to increase since then. These data suggest more of a role for medium-scale enterprises, as opposed to small-scale enterprises (conventionally defined as those with less than Rs. 10 million in revenues), in Indian software exports.

More disaggregated data also suggest changes in the pattern of geographic location and product specialization. According to Eximbank data, the share of south India in software exports increased from 25% in 1991-92 to 34% in 1994-95, while the northern region's share declined from 27% to 19% (and the western region's from 43% to 41%). The establishment of a large software cluster in Bangalore and the emergence of smaller clusters in Chennai (formerly Madras) and Hyderabad played key roles in the recent rise of the south.

In terms of product specialization, a number of the steps taken by the largest firms have significantly increased their revenues per employee since the reforms (Bhatnagar and Madon, 1997). The largest firms led the way into offshore development, which requires large-scale investments in telecommunications, power generation and technology upgradation. They also pushed harder into higher-end, on-site services such as consulting and training. And recently, they began to turn to smaller firms as subcontractors or sources of manpower for low-end projects such as coding.

Domestic sales of software are and historically have been significantly less concentrated than export sales: the concentration of domestic sales among the five largest firms (including foreign ones) decreased from 35% in 1990-91 to 25% by 1995-96.

Products and packages, which have recently become the largest domestic market segment, are also the most concentrated—and exhibit significant foreign presence. Other domestic segments (software services) tend to be much more fragmented, especially toward their lower ends. Lower concentration domestically than internationally in the provision of software services appears to be attributable to the differences between domestic and export markets that were cited earlier, particularly the pattern of vertical differentiation between the two. The lower sophistication of domestic demand, broadly defined, apparently enabled successful entry into professional services by a larger number of smaller firms.

As a result of these differences, firms that do hold significant positions in both the export and domestic markets (typically, domestic firms, e.g., Tata Consultancy Services, Wipro and NIIT) tend to operate in the two markets in loosely coupled or even decoupled ways. Thus, NIIT's principal domestic business of training programmers is very different from the slick training packages that it puts out primarily for developed markets. More generally, the capabilities required to compete in domestic and export markets seem different enough to rule out integrated approaches.

Foreign companies involved in India's software industry also seem to specialize in terms of whether they focus on India as a market or as an export base. Foreign vendors of packaged software (or of hardware) tend to take the former approach, but many other types of foreign companies tend to take the latter, and collectively account for an estimated 30% of India's software exports. The foreign companies involved in software exports range from specialized software developers to users with significant requirements

for information technology for reasons such as design-intensity and data-intensity—reasons that include not just IT specialists but also leading companies from industries as diverse as pharmaceuticals and airlines that have set up, respectively, development centers and data processing operations in India.

Overall, foreign presence in the Indian software industry is significantly higher than in most other Indian exporting industries. This no doubt reflects the Indian government's traditionally liberal attitude to foreign investment in this area even prior to recent reforms: industrial licensing was not required and foreign ownership with 100% equity was permitted. What the sum total of governmental incentives has most favored, however, are joint ventures between Indian and foreign firms. As a result, 47 technical and 346 financial foreign collaborations, totaling Rs.16.4 billion, were approved in the Indian software industry between 1991 and 1996. As in other industries, such alliances have proved somewhat unstable, but the level of local acrimony about them seems relatively muted. Many Indian firms as well as independent observers seem to regard foreign presence in the Indian software industry as having facilitated its internationalization by improving credibility, technology and local skills in terms of training, support, marketing, communication, scheduling and delivery, and documentation (Heeks, 1996). Clustering in cities such as Bangalore appears to have aided this process.

Governmental openness is also evident in another recent change: duties on software imports, previously pegged at 110%, were reduced to 10% in 1995 and were eliminated in 1997. Software packages and tools can be imported without government permission.

Suppliers

The key inputs for the software industry, other than software itself, are hardware, infrastructure and skilled labor. In terms of computer hardware, the Indian government historically followed import substitution policies, with severe controls on imports and licensing. Recent reforms have eased the availability of foreign hardware in India. In particular, import duties for computer hardware have been reduced to 20% for complete systems and 10% for components.

The Indian government also engaged in an ambitious effort to set up software technology parks (STPs) to provide infrastructural support to software companies in the form of superior power, roads and telecommunications services. Given how widely the original STPs were spread around the country, the recent concentration of software activities in the south might reasonably be interpreted as having occurred in spite of, rather than because of, this governmental program. The failed STPs, which are conspicuous everywhere but especially so in the eastern region, also suggest that naïve attempts to set up clusters without looking at the propitiousness of underlying basic conditions are likely to encounter problems (in the eastern region, for example, with the limited supply of skilled manpower as well as the false presumption that infrastructural services could be supplied much more efficiently than before without fundamental institutional reform). Of course, the attraction of STPs was also (appropriately) undercut by the long-standing policy of offering software exporters who chose to go it alone duty-free access to the latest telecommunications technology. In 1991, further reductions in telecommunications charges and duty-free import of telecommunication equipment into export processing units

were implemented. On the negative side, none of these changes eliminated the difficulties of dealing with India's international telecommunications monopoly, VSNL. To get around those difficulties, a number of large software companies, particularly foreign ones, set up private satellite links between their operations in India and overseas.

Turning, finally, to human resources, perhaps the most interesting distinction between the Indian software industry and most other leading Indian export industries (including diamonds and garments) is that software is more knowledge-intensive and requires commensurately skilled personnel. It is not surprising, therefore, that skilled personnel appear to have become the potential bottleneck that most threatens to limit the growth of Indian software exports.

The availability of an adequate supply of skilled personnel cannot be taken for granted in this context because of market failures and lags in adjustment. Problems in this regard were already apparent several years ago. A 1993 World Bank study estimated supply and demand for software personnel in India and predicted that the latter would outstrip the former by 1995, especially for programmers, systems analysts and software engineers (Hanna, 1994). And a cross-country analysis performed at roughly the same time by the *Economist* indicated that while the costs of skilled personnel continued to be much lower in India than in advanced markets, they already exceeded the cost levels in countries such as Russia and China (see Table 9). The escalation of personnel costs in India has, if anything, subsequently accelerated. This has prompted some to issue dire warnings about the future of the software industry in India (e.g. Kaye, 1997). Others, however, see the large salary increases in Indian software as a relatively benign example of

the “pass-through” of economic surplus to the resource that happens to be the scarcest: in this context, skilled personnel.

While this debate is likely to continue, two points seem reasonably clear. First, no end to the salary increases for particularly skilled personnel is in sight, putting enormous pressure on companies to upgrade what they do with those personnel. Second, full realization of the Indian software industry’s potential will require large increases in India’s pool of skilled personnel: upgradation of the projects or products to which existing personnel are applied will not suffice on its own.

The existing pool of skilled personnel is due, in large part, to past governmental investments in higher education, including the creation of institutions such as the Indian Institutes of Technology and regional engineering colleges. It also seems, however, that private sector efforts will loom larger than public sector ones in further upgradation or augmentation of this pool.¹³ The larger private-sector software companies in India have stepped up their own training efforts and have, on occasion, even collaborated with others in this regard. Specialized, large-scale training institutions such as NIIT and Aptech have sprung up as well. And since good software managers are as scarce as good software engineers, a few companies such as Infosys have revamped their management systems by emphasizing professionalization and incentive compensation/stock ownership programs. But the challenges continue.

Conclusions

¹³ Such displacement could, at the margin, be reduced through the revamping of state-run educational efforts. Thus, it might be useful to broaden the offering of separate courses of study in software engineering.

Our analysis of markets, competitors and suppliers in three key Indian export industries—diamonds, garments, and software—sheds light on the effects of India's recent economic reforms on export competitiveness. It also calls attention to the imperative to upgrade in international competition. And finally, it affords some insight into the process of such upgrading in the context of a relatively poor country.

The Effects of the Reforms

The reforms have clearly helped the three exporting industries compete internationally in a number of ways. The devaluation of the Indian rupee is the most obvious example of a policy change that generally helped exports (although as noted above, it had a less positive impact on the diamond cutting-and-polishing industry, partly because of low domestic value addition). Liberalization of foreign direct investment has facilitated the formation of alliances for technology transfer and international marketing, which, in turn, can enhance access to international markets. Between 1991 and 1996, over 4800 financial and almost 4200 technical foreign collaborations and investments were approved, worth more than Rs. 780 billion. In addition, by allowing freer imports of raw materials, intermediate goods, and capital goods, the reforms have reduced the dependence on suboptimal domestic inputs and technology. In relation to diamonds, the loosening of restrictions on importing and selling gold has facilitated a significant increase in the share of Indian exports accounted for by diamond-studded gold jewelry. Garments and, to an even greater extent, textiles, have benefited from the reduced tariffs on capital goods and the easing of licensing/tariff bottlenecks upstream in the fiber chain (Patibandla, 1997b). In the software industry, liberal import policies have reduced prices of inputs

such as software tools and hardware and collapsed technology lags. And more broadly, the increased role played by competitive forces in determining market outcomes must have been of some independent help.

These achievements notwithstanding, much more could be done to boost the international competitiveness of these and other industries: the Indian reform process remains seriously incomplete. For one thing, India retains significant levels of protection against imports despite its recent “opening up”. Complaints from domestic industries that would otherwise be swamped by imports are understandably rare. Complaints from the exporters’ corner remind us of the host of problems that protectionism can pose for managers trying to secure access to world-class inputs and technology as part of their drive to sell to world markets. Thus the gold jewelry industry complains about the high tariffs on non-gold inputs (e.g., alloys), the garment industry about continued restrictions on imports of fabric and non-fabric inputs (e.g., zippers), and the software industry about the duties levied on imports of computer chips.

Other opportunities to become more internationally competitive are associated with reform possibilities in areas other than trade. In diamonds and garments in particular, the modernization of manufacturing by somewhat larger, more automated establishments has been held back by two sets of social policies: (a) continued restrictions on working conditions in, and exit from, the organized sector, and (b) preferences, plus some reservations, for small-scale enterprises (with size cutoffs defined at microscopic levels). Small-scale bias has probably also spilled over to affect activities other than manufacturing, such as marketing and design.

Another, less obvious, opportunity for broad reforms is provided by the prevailing tax structure. The excise duty structure, in particular, remains grossly distorted. Reforming it could lead to obvious efficiencies. In addition, such tax reforms may be necessary to enable other reforms. Thus, the prevailing excise duty structure in textiles makes domestic producers pay higher taxes than imports under reduced tariffs. It will have to be reformed before or at least in conjunction with reductions in tariffs on fabric imports.

At perhaps the broadest level, we can cite the many aspects of the Indian institutional context—health and education, the availability of infrastructure, the financial system, the enforcement of property rights, etc.—that have a significant influence on India's international competitiveness. The Indian government has influenced these significantly, but usually not positively. Discussing all the reforms that are possible in these areas would take us significantly beyond the scope of this chapter.

The Importance of Upgrading

Consider three other commonalities among the three industries studied in this chapter that taken together, have some striking implications. First, in all three industries, Indian exports started out in low-end niches within discrete product categories, where they have tended to remain stuck. This is perhaps not too interesting on its own: a number of models of vertical differentiation and technology ladders predict that relatively poor countries are likely to start out by exporting low-end goods targeted at the lower-income segments in richer countries.

Second, each of the three Indian industries studied in this chapter is currently subject to significant pressures to upgrade its exports by moving up the vertical differentiation ladder. These pressures come from different sources. In diamonds, the major problem is the saturation of the (large) niche in small diamonds by Indian competitors. In garments, international competitors for the low-end that are also upgrading (e.g., China) are a major stimulus for Indian industry to upgrade if it is to compete in the post-MFA world. In software exports, upgrading is being forced by both foreign restrictions on body-shopping and the soaring salaries of skilled Indian personnel.

Third, there is nothing that is automatic or easy about the process of upgrading. Again, the sources of difficulty vary. In diamonds, upgrading to larger stones is blocked by the market power of the CSO/De Beers; as a result, the Indian industry has made a significant horizontal (as opposed to vertical) move, into gold jewelry. In garment exports, there are several concerns: restricted availability of fabrics; operation at economically suboptimal scales; a general dearth of cooperative activity in areas such as the sourcing of raw materials, the training of personnel, marketing, and design, etc.; and the distractions of the growing domestic market. Finally, in software, the cost and availability of skilled personnel are key issues; so, probably, is managerial discipline in striking a balance between the pursuit of short-run opportunities (e.g., body-shopping or fixing the millennium bug) versus the development of capabilities to compete in the longer run.

The managerial challenges of upgrading appear to extend beyond the three industries studied here to other Indian industries, net exporters and net importers, if the

widespread adoption of “total quality management” efforts by Indian companies is any indication.¹⁴ It is tempting to conjecture that the same challenges apply to at least some of the many other low-to-middle income countries that have recently opened up to foreign trade (Sachs and Warner, 1995). The reason for this conjecture is that a domestic firm or industry that starts on the lowest rungs of the vertical differentiation ladder and that needs to change can only think of moving in one vertical direction, upward.

Upgrading in a Poor Context

The importance of upgrading has not passed unremarked in previous writings on international competition. Perhaps the most prominent work in this line is that of Porter (1990), who also proposed a “diamond” framework for collecting and classifying determinants of international competitiveness in terms of four categories of drivers: (a) basic factor (resource) conditions, (b) rivalry, structure and strategy, (c) demand conditions and (d) related and supporting industries. Porter developed his framework by adding to the existing literature (most obviously, the factor-based theory of comparative advantage) on the basis of insights derived from his own study of internationally competitive industries in a sample of (relatively) rich countries.¹⁵ Our sample of exporting industries from a very poor country sheds some preliminary light on the extra-sample validity of this influential framework.

To start with basic factor conditions, all three of the internationally competitive Indian industries studied in this chapter rely for the bulk of their comparative advantage on

¹⁴ Total quality management advocates and offers some guidance on the cost-effective improvement of product attributes *and* internal processes over time.

¹⁵ South Korea was by far the poorest country in Porter’s sample and did not seem to exert a disproportionate influence on his cross-country conclusions.

cheap labor: in the case of diamonds and garments, on relatively unskilled labor, and in the case of software, on relatively skilled labor. Reforms such as devaluation of the rupee have boosted the surplus available from low-cost labor. In addition, although capital intensity varies significantly within and across the three industries, it seems “light” rather than “heavy” in traditional manufacturing terms. All this is perfectly consistent with standard theories of international trade as well as with Porter’s diamond framework.

A second, more original component of Porter’s framework is rivalry, structure and strategy, a broad category in which rapid rates of new business formation, ambitious goals and vigorous rivalry play particularly important roles. These conditions generally seem to apply in the three industries studied. The studies also warn, however, against treating the number of competitors in an industry as a proxy for vigorous rivalry and induced efficiency: both diamonds and garments, at least, may be too fragmented for their own good. And while the formation of geographic clusters (another important element of the Porter framework) is observed in the case of some export successes, one does not have to look very far afield to find instances of clusters aggravating industry failure. The limited efficacy of the Indian government’s past efforts to nurture specific clusters also raises questions about the limits to an activist clustering policy as opposed to a minimalist one that would let clusters grow and contract organically.

Demand conditions comprise the third component of Porter’s framework: he argues, in effect, that domestic demand conditions that are favorable in terms of size or, more importantly, quality of customer requirements underpin success at meeting foreign demand by internationally competitive industries based in rich countries. This would not

seem to fit any of the three industries studied in this chapter: in all these cases, domestic demand is still very different from export demand. The former seems to have been historically small and low-end, and it usually tends to be significantly less sophisticated than (even low-end) export demand when the twain do meet. Note the corollary that differences in demand requirements may defeat attempts to simultaneously upgrade in international markets and build or maintain strong domestic positions in domestic markets: a strategic choice may be necessary.

The fourth category in Porter's framework emphasizes the role of strong related and supporting industries, including upstream industries, in fostering international competitiveness by offering superior access to needed inputs, facilitating coordination, and improving the flow of information about innovations and new technological improvements. Once again, this pattern does not appear to be characteristic of the three industries studied in this chapter: none can be said to benefit significantly from strong domestic positions in ancillary industries (with the possible exception of garments, although their dependence on domestic fabrics has hardly been unproblematic). Instead, as noted above, one of the major ways in which the recent trade reforms have helped India's exports is by reducing dependence on uncompetitive domestic inputs or technology (presumably from "related and supporting" industries). Another pattern, also suggestive, is that the three industries studied seem to have weaker linkages, in standard input-output terms, with other domestic industries than, say, most engineering industries (in which India tends to be very uncompetitive on the international stage). Note the intriguing hypothesis that internationally competitive industries in poor countries are more likely to emerge in

industries characterized by relatively weak inter-industry linkages rather than strong ones: thus strong linkages with other domestic industries within an underdeveloped and generally uncompetitive domestic context are more likely to drag down international competitiveness than to increase it.

Taken together, our somewhat unexpected inferences about demand conditions and related and supporting industries suggest the following testable hypothesis: internationally competitive industries from poor countries will tend to have a standalone character, at least initially. That is, they will be relatively detached from both domestic demand and domestic related and supporting industries. Suggestively, a recent study of Argentina (Ingham, 1995) finds a somewhat similar pattern of isolated “islands of international competitiveness.” While it is possible to insist that such detachment or isolation is bound to prove suboptimal in the long run (e.g., by arguing that it is better to have all four aspects of the diamond in synch rather than just two), such an argument is unsatisfying because it focuses on a period that is often a decade or a generation or even more distant and ignores all that must happen in between. A far more fruitful approach would be to conduct additional empirical work that looks longitudinally and in some detail at the coevolution of the international competitiveness of industries from poor countries with their changing environments. Indian policymakers, meanwhile, must continue to address the incompleteness of India’s economic reforms.

Table 1. Indian Imports and Exports, 1990-96

	1995-96		1994-95		1993-94		1992-93		1991-92		1990-91	
	Rs (mn)	\$ (mn)	Rs (mn)	\$ (mn)	Rs (mn)	\$ (mn)	Rs (mn)	\$ (mn)	Rs (mn)	\$ (mn)	Rs (mn)	\$ (mn)
Imports												
Food, live animals chiefly for food	20840(1.7)	623	39860(4.5)	1469	16510(2.3)	526	19110(3.0)	660	8040(1.7)	326	9170(2.1)	
Crude materials, inedible oils except fuels	80310(6.6)	2401	64830(7.3)	2065	42730(5.8)	1362	47700(7.5)	1649	32680(6.9)	1326	33630(7.8)	
Mineral fuels, lubricants, related materials	282210(22.3)	8438	208370(23.1)	6636	195080(26.7)	6219	185250(29.2)	6396	141600(29.6)	5744	114060(26.9)	
Animal/vegetable oils, fats/waxes	21860(1.8)	654	6120(0.7)	195	1680(0.2)	54	1680(0.3)	58	2490(0.5)	101	3260(0.8)	
Chemicals, related products	184420(15.2)	5514	130770(14.7)	4165	93170(12.7)	2970	89130(14.1)	3077	75240(15.7)	3053	54470(12.6)	
Manufactured goods classified by materials	193610(15.9)	5789	146220(16.5)	4657	146190(20)	4661	124550(19.7)	4300	91930(19.2)	3729	86380(20.0)	
Non-ferrous metals	30370(2.5)	908	26890(3)	856	1504(2.1)	480	11440(1.8)	395	8390(1.8)	340	11020(2.6)	
Capital goods	278650(22.9)	8331	196110(22)	6246	16630(22.7)	5300	131230(20.7)	4531	104320(21.8)	4232	104650(24.2)	
Others	154560(12.7)	4621	947680(10.7)	3018	69340(9.5)	2211	35030(5.5)	1209	22200(4.6)	900	24310(5.6)	
Total	1216470(100)	37279	887050(100)	28251	731010(100)	23306	633750(100)	21882	47885(100)	19411	431930(100)	2
Exports												
Food, live animals chiefly for food	183430(17.2)	5484	119450(14.5)	3804	108510(15.6)	3459	80840(14.0)	2791	68610(15.6)	2783	46650(16.1)	
Beverages, tobacco manufactures	1180(0.1)	35	1200(0.2)	38	1390(0.2)	44	1600(0.3)	55	1020(0.2)	42	700(0.2)	
Crude materials, inedible oils except fuels	66240(6.2)	1980	48940(5.9)	1559	49010(7)	1563	27980(4.8)	966	30220(6.9)	1226	29260(10.1)	
Mineral fuels, lubricants, related materials	15180(1.4)	454	13040(1.6)	415	12480(1.8)	398	13790(2.4)	476	10220(2.3)	415	9380(3.2)	
Animal/vegetable oils, waxes/fats	7980(0.7)	239	4760(0.6)	152	3570(0.5)	114	1620(0.3)	56	1690(0.4)	69	890(0.3)	
Chemicals, chemical products	102100(9.6)	3053	79410(9.6)	2529	60000(8.6)	1913	41980(7.3)	1449	41460(9.4)	1682	27220(9.4)	
Manufactured goods classified by materials	562690(52.9)	16823	458070(55.6)	14589	382230(54.8)	12186	307520(53.1)	10618	235400(53.4)	9549	170850(59.0)	
Capital goods	91050(8.6)	2722	73280(8.9)	2334	61660(8.8)	1966	49640(8.6)	1714	40340(9.2)	1645	3087(1.1)	
Others	54060(5.8)	1564	37980(4.6)	1209	28180(4.1)	898	5354(9.2)	376	11250(2.6)	457	1750(0.6)	
Total	1064650(100)	31831	823380(100)	26233	697490(100)	22237	57851(100)	18501	440410(100)	17868	289787(100)	11

Table 2. The World Market and India's Exports of Polished Diamonds

World Jewelry	Sales		Indian Polished	Exports	
	\$ (m)	Index		\$ (m)	Index
Year			Financial year		
1984	20,502	100	1984/85	1,002	100
1985	22,108	107.8	1985/86	1,065	106.2
1986	22,238	108.4	1986/87	1,511	150.8
1987	34,159	166.6	1987/88	1,877	187.3
1988	39,140	190.9	1988/89	2,904	289.8
1989	40,907	199.5	1989/90	2,986	298
1990	41,254	201.2	1990/91	2,641	263.5
1991	41,854	204.15	1991/92	2,500	249.5
1992	42,005	205.8	1992/93	2,867	286.1
1993	42,514	207.3	1993/94	3,598	359.0
1994	45,010	219.5	1994/95	3,960	395.2
1995	47,275	230.5	1995/96	4,593	458.3

Source: Diamond International, January/February 1997.

Table 3. Trends in Nominal and Real Effective Exchange Rate of Rupee (Base: 1985=100)

Year	Nominal Effective Exchange Rate (NEER)	Real Effective Exchange Rate (REER)
	5-Country Index *	5-Country Index
1985	100	100
1986	84.62	91.63
1987	75.68	86.15
1988	67.77	81.67
1989	60.58	77.55
1990	54.07	71.43
1991	42.15	61.65
1991-92	38.74	58.56
1992-93	31.84	52.89
1993-94	29.59	52.82
1994-95	28.51	55.7
1995-96	26.13	53.55

Note: These are export-weighted indices with weights based on direction of exports in 1992-95. The U.S.A., Japan, U.K., Germany, and France are included in the 5-Country Index.

Source: Economic Survey, 1996-97, Government of India.

Table 4. Exports of Textiles and Garments (Rs. million)*

Sector	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96
Ready-made Garments	22,780 (52.0)	34,722 (54.0)	46,396 (55.0)	63,273 (52.0)	88,410 (54.0)	116,480 (55.0)	139,216 (52.3)	148,065 (49.7)
Cotton Textiles	13,408 (31.0)	18,251 (28.0)	24,613 (29.0)	38,330 (31.0)	48,620 (30.0)	63,000 (29.0)	87,387 (32.9)	103,900 (34.9)
Man Made Fibers	2,777 (6.0)	6,009 (9.0)	6,347 (8.0)	11,146 (9.0)	14,360 (9.0)	18,430 (9.0)	24,635 (9.3)	31,094 (10.4)
Woolen Textiles	1,380 (3.0)	1,745 (3.0)	1,903 (2.0)	1,998 (2.0)	4,220 (2.5)	6,050 (3.0)	5,375 (2.0)	6,607 (2.2)
Silk Textiles	3,305 (8.0)	4,006 (6.0)	4,403 (6.0)	6,756 (6.0)	7,340 (4.5)	7,890 (3.7)	9,373 (3.5)	8,431 (2.8)
Total	43,884 (100.0)	65,134 (100.0)	84,134 (100.0)	122,210 (100.0)	162,950 (100.0)	211,850 (100.0)	265,986 (100.0)	298,097 (100.0)

Source: Annual Reports of Ministry of Textiles, Government of India; Koshy, 1997.

*Figures in parentheses are percentage share in totals.

Table 5. Export-Driven Growth of the Large-Scale Mill Sector (%)

	1990	1996
Exports : Sales ratio		
Textiles	17.0	30.0
Cotton/blended	8.5	22.5
Synthetic	1.5	6.4
Investment : Value Added Ratio		
Textiles	5.0	41.0
Cotton/blended	30.0	148.0
Synthetic	13.0	27.0

Source: CIME.

Table 6. Cost Comparisons, Cloth Production (1993)*

	Brazil	India	Italy	Japan	Korea	Thailand	USA
Raw Material Cost (US \$/Yard of Woven Fabric)	0.273	0.161	0.229	0.243	0.243	0.241	0.220
Manufacturing Costs (in National Currency):							
Labor	686 (9.0)	0.653 (6.0)	336 (42.0)	20.8 (37.0)	29.9 (13.0)	0.56 (8.0)	0.137 (35.0)
Power	647 (8.0)	1.151 (11.0)	85 (11.0)	7.8 (14.0)	26.6 (12.0)	1.07 (16.0)	0.031 (8.0)
Auxiliary Material	907 (11.0)	1.078 (10.0)	59 (7.0)	5.6 (10.0)	44.0 (19.0)	0.95 (14.0)	0.042 (11.0)
Depreciation	3662 (46.0)	4.176 (39.0)	174 (22.0)	15.9 (29.0)	84.0 (36.0)	2.24 (33.0)	0.122 (32.0)
Interest	2134 (27.0)	3.770 (35.0)	141 (18.0)	5.8 (10.0)	45.9 (20.0)	1.91 (28.0)	0.054 (14.0)
Total Manufacturing Cost	8036 (100.0)	10.828 (100.0)	795 (100.0)	55.9 (100.0)	230.4 (100.0)	6.73 (100.0)	0.386 (100.0)
Total Manufacturing Cost (US \$ / Yard of Fabric)	0.322	0.344	0.521	0.521	0.282	0.266	0.386
Opening Hours Per Year	7300	8400	6500	6000	8250	8400	7000
Customs, Sales Tax, etc. (% of Machinery Price)	20	20	0	0	9	5	5
Capital Interest Rate (%)	10	18	13.5	5.5	10.2	15	7.5

Source: ITMF, 1993, Zurich.

* Figures in parentheses are percentage share in totals.

Table 7. India's Software Exports, Domestic Sales and Imports (Rs. Billion/\$ Million)

Year	Exports	Domestic Sales	Exports/ Total Sales (%)	Software Imports	Hardware Imports
1987-88	Rs. 0.70 \$52	Rs. 1.00	41	*	\$154
1990-91	Rs. 2.50 \$128	Rs. 2.25	52	\$25	\$14
1991-92	Rs. 4.30 \$164	Rs. 3.20	57	*	\$22.5
1992-93	Rs. 6.70 \$225	Rs. 4.90	57	\$56	\$18
1993-94	Rs. 10.20 \$330	Rs. 6.95	59	\$60	\$33
1994-95	Rs. 15.30 \$485	Rs. 10.70	59	\$100	\$7
1995-96	Rs. 25.20 \$735	Rs. 16.70	60	\$133	*
1996-97	Rs. 39.00 \$1110	Rs. 25.00	61	*	*

* Figures not available.

Sources: Nasscom; Heeks [1996].

Table 8. India's Software Exports by Activity
(Percentage of total software exports)

	1990-91	1995-96
Professional Services:		
a) Off-shore	18	19
b) On-site	72	29
Consultancy and Training	*	26
Data Processing	0	10
Other Services	5	4
Products and Packages	5	12
Total	100 (Rs. 2.5 billion)	100 (Rs. 25.2 billion)

* Included in On-site Professional Services in 1990-91.

Source: Nasscom.

Table 9. Software Industry Cost Comparisons (Indexed)

Country	Programmer	Systems Analyst
USA	1164	1124
Japan	1293	1185
Germany	1351	1196
France	1135	1307
Britain	781	1287
Mexico	652	658
India	100	100
Russia	80	84
China	75	80

Source: The Economist (1994).

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