Transnational corporations, technology transfer and imports of capital goods: the recent Indian experience

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This article examines the determinants of an important mode of technology transfer—the import of capital goods—for India subsequent to the liberalization of trade in the mid-1980s. Imports of capital goods are shown to depend on the structure of the industry involved, the type of foreign involvement in the sample firms and firms' conduct. The principal conclusion is that the type of foreign involvement in a firm—notably, foreign equity participation and international licensing—influences the desire and ability of that firm to import capital goods and modernize its plant and equipment.

Introduction

The transfer of technology between countries has been recognized as a key issue in economic growth. The vehicles for such transfer take many forms—trade in goods, foreign direct investment (FDI), strategic alliances between independent firms, and labour mobility, including for education abroad. This article examines imports of capital goods, specifically machinery and equipment that embody knowledge and technology developed abroad, as a vehicle for the transfer of technology to India. The liberalization of trade that began in India in the mid-1980s offers an opportunity to study these imports in the context of significant industrial changes that subsequently occurred in that country.

Determinants of imports have been examined frequently in macro-economic models using key variables, such as increases in real income and relative price changes. At a less aggregated level, studies have been made of the import-substitution issue in developing countries and of the effects of import liberalization.[1] This study makes a contribution to the existing body of literature in three respects:

- First, it adopts explicitly a microeconomic approach, concentrating on several aspects of the environment in which a firm operates that can explain its reaction to the opportunities offered by import liberalization for renewing and expanding its industrial capacity. In adopting this approach, the importance of the macroeconomic variables noted above is not denied. In a time-series analysis, as distinct from the cross-section approach used here, such macroeconomic variables would clearly be of critical importance.

- Second, in analysing the determinants of capital-goods imports, possible differences in the behaviour of firms with different forms of international involvement—forms that are familiar from the ownership-location-internalization approach to explaining FDI (Dunning, 1993)—are considered explicitly. The following three forms of international involvement are considered here: (i) foreign affiliates (that is, firms that have foreign equity participation); (ii) locally-owned firms that are licensees or arm's-length importers of foreign technology against lump-sum and royalty payments; and (iii) locally-owned firms that have not entered into any foreign collaboration agreements in recent years. It is hypothesized that firms will respond differently in terms of imports of capital goods depending on which of these three organizational forms is involved. Research by Nagesh Kumar (1990) has already shown that the conduct of firms in India differs depending on the organizational form involved.

- Third, firms that imported capital goods during the sample period, as well as firms that did not, are considered here. The dependent variable, namely, capital-goods imports, would take the value "zero" for firms that did not import capital goods. Limited information dependent

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[1] For an analysis of the issues involved in aggregate import demand functions, see Urbain (1992). There is a large literature on import substitution in developing countries: for an application to India using a sectoral approach, see Sarma and Ram (1989). R. Faini *et al.* (1992) studied the effects of import liberalization in Morocco on the demand for consumer, intermediate and investment goods.

variable models, in particular Tobit models (explained below), have been used to estimate the regression equations.

In the next section, the analytical framework and the basic propositions regarding the behavioural determinants are discussed. The two subsequent sections address the regression variables, methodology and data, and present the statistical results. The final section contains a brief summary and the conclusions.

Framework and hypotheses

The basic propositions of the model are as follows:

- The import response of Indian firms to the liberalization that began in the mid-1980s is determined by the competitive structure of an industry and the conduct of firms.

- The competitive structure of an industry is measured by market shares, age and the international orientation of the firms in that country.

- The measures of international orientation are export intensity, imports of technology and foreign equity ownership.

- The conduct of the firms is expressed by several technological variables, specifically, the capital-output ratio, research-and-development (R & D) intensity and skill intensity (these variables are specified more precisely in the next section). In addition, the conduct of firms is expected to vary, depending on the form of international involvement (as mentioned earlier).

Some firms would be in a stronger position to search out and utilize efficiently foreign capital goods in response to the opportunities presented by trade liberalization. In other cases, they may be forced to use foreign capital goods in order to survive competition from local or foreign firms. In general, firms that are R & D and skill-intensive, or have high capital-output ratios and strong international links, are more likely to be able to locate, adapt and use capital goods efficiently. They may also be under more pressure to do so given high fixed costs and international competition. The reverse would be the case for firms with fewer skills and less international orientation.

The above approach emphasizes the capacity to locate and absorb capital-goods imports efficiently, on the one hand, and the competitive pressures to do so, on the other. A different issue arises when one considers the organizational form through which capital goods are imported. There are at least two reasons for a further, closer examination of this point. The first is that there is a relationship between the independent variables and the organizational forms; for example, foreign equity ownership is positively related to R & D and a large market share, judging from many studies of the characteristics of FDI.[2] One way to minimize the problem of interrelation is to classify firms on the basis of group affiliation, i.e. firms with foreign financial (equity) participation, firms that purchase technology through arm's-length transactions, and all remaining firms, and to run separate regressions for each of these three groups.

The second reason is the interest in the conduct of these organizational forms as reflected in FDI theories, market failures and alliance strategies (Dunning, 1993; Anderson and Gatignon, 1986). From the point of view of capital-goods imports, FDI theories and the empirical evidence do not offer clear-cut propositions. The FDI internalization theory would argue in favour of a positive relationship between imports of capital goods and transnational corporations (TNCs). The results of studies based on the internalization theory (Buckley, 1990, 1991; Casson, 1992; Hennart, 1986, 1989; Rugman, 1982) suggest that TNCs have a higher import propensity. Following one aspect of transaction-cost economics, it would be expected that TNCs internalize the market for capital goods because some of these goods are likely to be R & D intensive or embody newly developed technologies, and TNCs might not be willing to sell such capital goods to unrelated parties since that would represent an important mode of technology diffusion (Siddharthan and Kumar, 1990). Furthermore, W. H. Davidson and D. G. McFetridge (1985) have showed that technology transfers are more likely to be internalized if the parent firm already has an affiliate in the import-receiving country. Several studies showed that foreign affiliates were more or less integrated with the parent firm and imported more equipment and intermediate products than did local counterparts that had no foreign affiliation (McAleese and McDonald, 1978; Jo, 1980).

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[2] For the relationship between R & D and FDI, see Hymer (1960); Caves (1974); Buckley and Dunning (1976); Rugman (1980); Kim and Lyn (1987); Dunning, 1993; Siddharthan and Lall (1982); and Lall and Siddharthan (1982). For evidence relating to firm size, market share and FDI, refer to Horst (1972); Owen (1982); Grubaugh (1987); Kumar (1990); and Siddharthan and Lall (1982).

Evidence from the literature on transfer pricing also supports the hypothesis of a positive relationship between TNCs and intra-firm trade in machinery, equipment and components (Rugman and Eden, 1985). In addition to factors such as avoidance of taxes, exchange controls and restrictions on profit repatriation, the advancement of TNC strategic objectives has been cited as a crucial factor responsible for transfer pricing and intra-firm trade (Burns, 1980). The existence of price controls has also been cited as an important reason for transfer pricing and intra-firm trade (Lecraw, 1985). This factor is relevant here because India had price controls on many commodities, as well as exchange controls, during the sample period.[3] These considerations could favour intra-firm trade in machinery and equipment.

In brief, the absorption approach discussed above (also based on the internalization approach as far as newer or more complex capital goods are concerned) suggests that those firms with foreign equity and technology alliances import more capital goods because of the industry structure and firm conduct variables. The Indian firms in these cases may also import their foreign partners' capital goods for their own use or resale. Studies show that in R & D- and skill-intensive industries intra-firm trade dominates mainly because of lower transaction costs and internalization advantages (Siddharthan and Kumar, 1990).

Studies dealing with technology transfer and TNCs that emphasize product-life cycles, intangible assets and certain other aspects of transaction costs would expect the market mode to be more efficient in the transfer of technology than other modes when that technology is embodied in capital goods. Studies based on the product-life cycle (Vernon, 1966, 1979) would anticipate intra-firm technology transfer through FDI mainly during the second stage of the product life cycle when the technology is relatively new and still evolving. During the third stage, when technology is standardized and can be codified, firms would prefer to transfer technology in arm's-length transactions through the market. Many studies have argued in favour of licensing technologies and other property rights in intangible assets as an alternative to FDI in cases involving mature technology that could be codified (Magee, 1977; Contractor, 1984; Telesio, 1979). Following the

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[3] During the sample period (1987-1990), the rupee was not convertible and an import licence was necessary for importing capital goods. The rupee became partially convertible in 1991-1992 and freely convertible on the current account only in 1994. However, in 1985, the policy on imports of capital goods was changed. Before that date, it was not easy to secure permission for such imports, but subsequently imports were substantially liberalized within the framework of an exchange control system.

argument of these studies, the market should be a preferred mode of transfer if the technology is transferred through exports of equipment. It is true that much of the transaction-costs theory (Teece, 1976; Dunning, 1993) suggests that firms are likely to internalize technologies that are new and evolving, have substantial tacit elements, or enjoy goodwill and brand names. In other words, intra-firm transfer will be preferred where transaction costs are high. High transaction costs themselves are associated with market imperfections. However, it could be argued that transaction costs and market imperfections would be low in the case of technology transfer through goods (including machinery and equipment) and therefore markets could be a preferred mode of transfer. In addition, some studies (Contractor, 1984, 1990) support the view that government controls could encourage technology transfer through the market (licensing and import of equipment) and discourage FDI. In particular, F. Contractor (1990) showed that as a result of economic liberalization and deregulation, countries attract more FDI than licensing and technological collaborations. This result implies that, during periods of controls, transactions through the market would be favoured.

Regression variables

The dependent variable is *capital goods import intensity* (MK), defined as the value of the import of capital goods divided by the sales turn-over of the firm. As for the independent variables, it was noted above that inter-firm differences in the import of capital goods consequent on the deregulation measures introduced in the mid-1980s would be determined by the competitive structure of the industry, including international involve-ment, and the conduct of the firms. Since the relative importance and the impact of these determinants will vary according to the group affiliation of the firms in the sample, separate regressions are estimated for each of these groups.

Variables representing competitive structure and international orientation

- *Market share* (MS), represented by firms' sales as a percentage of industry sales. This variable represents the relative size of a firm. Large firms in concentrated market structures are likely to take advan-tage of economic liberalization and licensing deregulation to maintain,

if not to increase, their current market share. Firms operating in oligopolistic market structures give importance to future market shares rather than to maximizing their current profits (Marris, 1964; Hay and Morris, 1991). A notable entry deterrence strategy often adopted by the dominant firms is the pre-emption of future capacity (Dixit, 1980; Gilbert and Lieberman, 1987). The import of capital goods and investment in plant and machinery would play a vital role in a strategy to improve market shares. In implementing that strategy, relatively larger firms will have both tangible and intangible resource advantages compared with smaller ones. Thus, a positive relationship between a firm's market share and capital-goods imports is predicted. However, for foreign affiliates the relationship between the size of the Indian firm and imports of capital goods need not be strong. The resource advantages of foreign affiliates are not determined by the size of the affiliate alone, since the affiliate enjoys the tangible and intangible assets of the TNC system as a whole. Thus, MS is expected to be relatively more important for the two other strategic groups than for foreign affiliates.

- *Age of plant and machinery* (AGE), measured by the ratio of depreciation reserves to stock of plant and machinery (i.e. older firms will have a higher ratio). In considering the relationship between the age of existing plant and machinery and imports of capital goods, it is essential to consider the role of policy in India. In the pre-1985 regime, expansion of capacity, imports of capital goods and the modernization of plant were not permitted without an industrial licence and a capital-goods import licence. The procedures for obtaining these licences were complex, and many firms were denied permission to modernize their plant or import capital goods. Since imports of finished goods were not allowed either, firms already established using outdated machinery and equipment did not have much cause for complaint. However, after the deregulation in 1985, most firms could have opted for speedy imports of capital goods to modernize their plant. Not all firms could do so, because it would not have been feasible to modernize without scrapping their existing machinery and plant since the capital goods available for import were not compatible with their existing obsolete plant. However, those firms that had relatively new plant and equipment could import capital goods compatible with their existing machinery. Therefore, it would be expected that firms with relatively recent plant and machinery would import more capital goods after liberalization. Firms with older equipment would postpone the deci-

sion to import, since that would involve discarding their existing plant. Thus, a negative relationship between the age of existing capital goods and imports of capital goods can be hypothesized. This relationship is not likely to differ among the three strategic groups.

International orientation

- *Export intensity* (X), measured as exports as a ratio of sales.

- *Import of technology* (MT), measured as royalties, technical fees and lump-sum payments to foreigners for technology imports as a ratio of sales. This variable represents arm's-length purchases of technology through the market.

- *Foreign equity participation* (FE), measured as the share of foreign equity in total equity, is not available. The proxy used is dividends paid in foreign currency as a percentage of total dividends, the assumption being that this ratio will approximate the share of foreign equity in total equity.

It is not possible to formulate unique and unambiguous hypotheses regarding the impact of the international orientation variables on the import of capital goods for the three groups of firms, that is, where FE exceeds zero, where MT exceeds zero and where neither is the case. As discussed earlier, internalization theories expect TNCs to internalize some transactions that could be conducted through the market. According to this hypothesis, foreign affiliates will import capital goods, purchase technology at arm's length and export goods to other affiliates abroad. Thus MT and X will emerge as more significant for the first group of firms compared with the other groups. The competing hypothesis would expect TNCs to transfer mainly intangible capital intra-firm. More mature technologies that are amenable to codification will not be transferred on an intra-firm basis. According to this hypothesis, MT will be more important for the second group of firms than for the first group.

In the case of India, one would expect exports to be more important for the first group of firms. Transnational corporations enjoy better marketing networks overseas compared with the other groups of firms. Furthermore, until recently, in granting import licences to a firm the export performance of the firm was given significant weight. In other words, in granting import licences (including licences for imports of capital goods),

government policy favoured export-oriented firms. In addition, firms that are export oriented have a greater urgency to modernize, compared with purely domestically oriented firms, in order to maintain their exports.

The foreign share variable (FE) is relevant only for the first group of firms. There are several reasons for expecting a positive relation between foreign equity participation and capital-goods imports. Foreign affiliates have better information on capital goods and a better capability to absorb new and more sophisticated capital goods. They may be importers of capital goods from other foreign affiliates either for their own use or for resale. In the past, the Government had not approved foreign equity participation in local firms in the absence of technology transfer, which was often in the form of capital goods. However, for the first group of firms, since all firms have foreign equity participation, the extent of foreign equity need not emerge as a significant variable. Being a foreign affiliate is more relevant than the exact level of foreign equity participation. Foreign equity participation beyond 40 per cent was rarely permitted during the sample period. By and large, most firms had either 39 per cent or 25 per cent foreign equity. Inter-firm variations were not considerable.

Conduct variables

- *R & D expenditures as a percentage of sales* (RD). The sign of this variable could be either positive or negative. H. Odagiri (1983) distinguished firms doing innovative R & D, in which case technology imports are deemed to be a substitute, from firms doing adaptive R & D, in which case technology imports can be considered as a complement. Following this reasoning, one could argue that Indian firms doing a great deal of R & D would find the knowledge embodied in capital-goods imports a substitute (negative relation), while the reverse would be the case for Indian firms doing little R & D. However, evidence from J. I. Bernstein (1991, p. 128) for Canada suggests that in industries with a high propensity to spend on R & D there is a complementary relation between intra-industry spillovers and R & D investment occurring in both Canadian-owned and foreign-owned firms. Such spillovers and investment in R & D are substitutes in industries with low propensities to spend on R & D. In fact, most Indian firms with public equity (which form the basis for the sample) do little and largely adaptive R & D (Siddharthan, 1992). A mild positive relation between R & D and capital-goods imports is hypothesized.

- *Skill intensity of workforce* (SKILL). This is measured as the proportion of salaries paid to highly-paid employees as a percentage of the total wage bill of a firm. Firms with high skill intensity can utilize imported, often sophisticated, machinery more efficiently. Foreign affiliates with considerable resources are likely to attract a more skilled workforce than Indian firms. They can offer better salaries, training facilities overseas and better working conditions. Hence, this variable is likely to be more important for the first group of firms.

- *Capital-output ratio* (COR). The literature suggests that foreign affiliates and licensees of foreign technology employ more capital-intensive techniques than do local firms. Therefore, the variable is likely to be more important for the first two groups of firms.

Industrial sectoral dummy variables

Five intercept dummy variables representing five industries, namely, *electrical and electronic goods* (DEL), *chemicals* (DCH), *automobiles* (DAU), *automobile components* (DCO) and *industrial machinery* (DMA), were introduced in order to capture the industry effects. The constant term of the regressions represents a sixth industry, *textiles*. The textile industry is less technology-intensive than the other five industries included in the sample. Since firms operating in more technology-intensive industries are likely to incur more expenditures aimed at modernization of their plant and machinery, all industry dummy variables are expected to have positive values. This would indicate that the import intensities for machinery and equipment for firms operating in these industries would be higher than the import intensity of textile firms after the influence of the independent variables has been taken into account.

Data and methodology

The variables were constructed from the Reserve Bank of India's data tapes on 640 large corporations whose equities are listed on India's stock exchanges. A pooled cross-section data set was used covering three (fiscal) years (1987-1988, 1988-1989 and 1989-1990). The sample covers 90 per cent of companies with a paid-up capital of more than 10 million rupees (approximately US$ 600,000). However, only six manufacturing industries

Table 1. Tobit estimates for different types of foreign participation

VARIABLE	FE > 0	FE = 0 MT > 0	FE = 0 MT = 0
CONST	-0.007 (-1.496)	-0.034 (-3.255)	-0.142 (-2.510)
MS	-0.009 (-0.550)	0.476 (3.346)	5.198 (2.205)
AGE	-0.002 (-1.918)	-0.012 (-1.152)	-0.122 (-2.222)
X	0.015 (1.918)	-0.040 (-1.308)	0.042 (0.502)
MT	0.267 (5.780)	0.471 (1.678)	
FE	-0.004 (-0.740)		
RD	0.265 (1.332)	1.330 (1.400)	3.020 (0.742)
SKILL	0.007 (2.289)	-0.004 (-0.241)	0.191 (1.495)
COR	0.013 (5.199)	0.018 (3.829)	0.013 (0.593)
DEL	0.015 (3.104)	0.000 (-0.017)	0.124 (2.422)
DCH	0.000 (-0.004)	0.022 (2.710)	0.073 (2.710)
DAU	0.010 (1.836)	0.006 (0.468)	
DCO	0.000 (-0.045)	0.008 (0.700)	0.024 0.341
DMA	0.003 (0.578)	0.016 (1.775)	
NOB	399	356	126

Source: Author's estimates.
NOTE: t statistics in brackets.

were selected and, consequently, only 294 companies were used, giving a total of 882 observations over the three years. The six manufacturing industries (as mentioned earlier) are cotton textiles, electrical and electronic goods, all chemicals taken together (drugs, pharmaceuticals, dyes and industrial chemicals), automobiles (cars, medium and heavy vehicles, motor cycles, scooters and three-wheelers), automobile components and industrial

machinery other than electrical. The following manufacturing industries were not included because they are now reserved for non-corporate small-scale units: food products, leather products, matches, structural clay products, pottery and earthenware, and wood products. Metal and metal products are not included either because the Government dominates these industries, and restrictions on the growth of private-sector involvement were widespread during the sample period. Non-manufacturing and trading industries were also not considered.

As noted earlier, a large number of firms considered in the sample did not import capital goods during the sample period. In other words, the sample consists of firms that imported machinery and equipment, as well as firms that did not. Thus, the dependent variable had zero values for many firms. The use of ordinary least squares (OLS) in this case would be inappropriate, as it would yield biased parameter estimates. Under these circumstances, Probit, Logit and Tobit models are used. Probit and Logit models consider the dependent variable as a zero/one variable; that is, they give a value of one for firms that import capital goods and zero for the rest. In other words, Logit and Probit models are designed to explain why certain firms import capital goods while others do not. They cannot explain why some firms spend more on imports of capital goods compared with others. Tobit models are designed to explain both the decision to import capital goods, and the differences in the sum spent on capital-goods imports by firms. Unlike the other models, the Tobit model takes into account the zero observations as well as the actual positive observations. The Tobit model is considered to be the most appropriate for the analysis here (Greene, 1991, pp. 727-733; Dhrymes, 1986).

Regression results

Table 1 examines the determinants of capital-goods imports by firms classified according to three types of foreign participation: foreign affiliates for which FE exceeds zero; licensees for which FE is zero, but where there is technical exchange; and domestically oriented firms for which neither foreign equity nor international technical exchange is involved.[4]

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[4] There are very few firms with foreign equity, but without any technical exchange agreements.

Table 1 presents maximum likelihood Tobit estimates for the three different forms of foreign participation. Goodness-of-fit statistics, such as R^2, are not mentioned since, in the context of Tobit models, it is not possible to define a single statistic that would be meaningful. This is mainly because the Tobit model serves a multiplicity of purposes. In this case, it separates the zero observations from the positive observations and explains the variations in the positive observations. No single goodness-of-fit statistic could cover both. Hence, in interpreting the results one should go by the ''t'' values (Greene, 1991, chap. 21; Dhrymes, 1986). The LIMDEP package is used for estimation purposes. Following the standard practice, LIMDEP does not give R^2 for Maximum Likelihood Estimates. R^2 for OLS estimates is available, but OLS estimates are biased in favour of zero observations and are not reliable (Greene, 1991).

Table 1 demonstrates some major differences in the behaviour of the three groups of firms classified by type of foreign involvement. There were very few automobile and machinery manufacturing firms that were purely domestically oriented, or that did not have any foreign technical or financial collaboration. More than 70 per cent of the firms in the third group of firms did not import capital goods. Thus, from the point of view of the analysis, the group of firms for which both FE and MT are zero is of limited importance. For that group, market share and age were the two main determinants. The results for this group also show that electrical and chemical manufacturing firms imported more capital goods than firms in other industries.

While the market share was important for the second group (MT > 0), it was not consequential for the first group (FE > 0), that is, foreign affiliates. Perhaps for TNCs, gaining access to the tangible and intangible assets of the overall firm is more important than the size of the Indian affiliate. Even the AGE variable differed between the two groups of firms: for the foreign affiliates it was significant, while for the second group of firms it was not. The export variable was important only for the foreign affiliates. Conceivably, foreign affiliates are more export-oriented than the rest of the firms, and they are also more likely to import capital goods to foster their exports. MT was more important for foreign affiliates than for the second group of firms, thus indicating a strong complementarity between the three forms of technology imports, or a ''package'' approach to technology transfer. The degree of foreign equity (FE) was not significant, and this indicates that the existence of foreign involvement is more important than the extent

of foreign financial participation in a firm's equity. Skill intensity was important for the first, but not for the second group of firms. Foreign affiliates have skill advantages over local firms and, if one goes by the "package" approach, skill and technology imports belong to the same "package". Capital intensity was important for the first two groups of firms, but not for the third group. Foreign affiliates in the electrical and automobile industries imported more capital goods than foreign affiliates in other industries, while in the second group chemical and industrial machinery manufacturing firms imported more than firms in other industries. The difference was more pronounced in the case of chemicals. This could be due to the lower degree of protection offered by India for intellectual property in parts of this industry.

Summary and conclusions

In analysing technology transfer, most studies concentrate on FDI (intra-firm transfer of technology) or licensing and other related arm's-length purchases of technology.[5] The choice of the mode of transferring technology depends on transaction costs, transfer costs and internalization advantages. Evidence supports the view that intra-firm transfer of technology through FDI is preferred in cases in which the technology is new and still evolving, while arm's-length purchases or licensing are preferred in cases in which the technology can be codified and transferred through design and drawings.

Another important mode of technology transfer is through the sale of machinery and equipment that embody the latest technologies. By and large, the FDI literature has neglected this prominent mode of technology transfer.[6] An attempt was made here to fill this gap. As discussed in the introduction, the relationship between this mode of technology transfer and the other two modes is a complex one. The exact relationship depends on industry-specific characteristics, government policy and organizational characteristics of different groups of firms. The characteristics that determine inter-firm

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[5] There is a growing literature on a wide range of international corporate alliances that involve bilateral or multilateral technology sharing between separate firms as distinct from a largely unilateral transfer of technology. This organizational form appears to be less widespread in India than the three forms presented here.

[6] By contrast, trade theories frequently utilize modes of international technology diffusion wherein trade in goods embodies knowledge transfers (e.g. Coe and Helpman, 1995). Until quite recently, such trade models often omitted FDI as a mode of technology transfer.

differences regarding imports of capital goods are identified here. The main determinants of firm behaviour as regards imports of capital goods considered here are the market share of firms, age of the capital stock, export intensity, expenditures on technology imports (royalties, technical fees and lump-sum payments), foreign equity participation, in-house R & D expenditures, skill content of the workforce and capital intensity. The three groups of firms considered here, namely, foreign affiliates, licensees of technology and unaffiliated firms, behave differently with regard to the imports of capital goods. And in explaining foreign affiliates' behaviour, the presence of foreign equity is more important than the extent of foreign equity participation.

The behaviour of the three groups of firms considered here is quite distinct as regards imports of capital goods. This finding is important, as the current literature on TNCs does not postulate a clear and distinct difference in the behaviour of foreign affiliates and unaffiliated firms with regard to imports of capital goods. Theories of FDI propounded during the 1970s and early 1980s emphasized the ownership of mostly intangible assets and internalizational advantages in explaining these investments. Capital goods, by contrast, are tangible assets that can be transferred through the market to third parties. The results presented here do not support theories of FDI that are based only on internalization advantages. They do support the postulate that TNCs are global profit maximizers that offer a package that includes technology, capital, management, marketing and trade (both imports and exports). In principle, it is possible to unbundle this package and transact each item through the market. However, in the presence of external economies and internalization advantages, TNCs would opt for transferring the whole package, including capital, machinery and equipment. In the equation explaining the behaviour of foreign affiliates, exports, licensing payments for the import of technology and skill intensity turn out to be important, and this finding supports FDI theories that advocate the package approach, and also supports the importance of intra-firm trade.

The findings presented here not only enhance our understanding of TNCs, but also have implications for host countries, particularly those that are pursuing liberalization programmes. In the mid-1980s, India began to liberalize its economy mainly to promote modernization and technological upgrading of its industries through imports of machinery and licensing of technology. Foreign affiliates, taking advantage of liberalization, imported capital goods and undertook modernization expenditure mainly in the electrical and electronic goods and automobile industries. However, they did not

undertake modernization expenditure in the chemicals and pharmaceuticals industries. In those industries, licensees and unaffiliated Indian firms invested more in modernization. One of the reasons for foreign affiliates' lack of interest in expanding or modernizing in these industries could be the lack of intellectual property protection. Indian patent laws are more or less on a par with the patent laws of the rest of the world in most industries, but not in chemicals and pharmaceuticals. The findings presented here support the argument that trade liberalization and deregulation are necessary but not sufficient for attracting FDI in chemicals and pharmaceuticals in the absence of intellectual property protection. ■

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