

The propensity for local innovation and inter-firm linkages in transnational corporations versus local enterprises in India*

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The issue of whether transnational corporations (TNCs) form complementary linkages with domestic suppliers and contribute to the process of creating appropriate new technologies in developing countries has not been systematically explored. Using a rich dataset of over 300 companies in India, we examine if the propensity of foreign affiliates to innovate and to create linkages in host countries is in any way different from that of their local counterparts. Our results show that foreign affiliates foster beneficial horizontal linkages with local suppliers of final goods but spend less effort than local enterprises to develop vertical inter-firm linkages and to create appropriate technologies for Indian markets.

Key words: transnational corporations, developing countries, India, innovation, linkages, discriminant analysis

1. Introduction

Foreign direct investment (FDI) has emerged as the most significant source of international capital flows to developing countries – accounting for 72% of all resource flows and six times higher than official flows (UNCTAD 2004, p 5). Despite its significance in terms of volume, its impact on the process of

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creating linkages and innovating appropriate new technologies in developing countries is far from clear. In the case of India, the issue of direct spillovers of TNC operations is yet to be analysed in a satisfactory manner. Indeed, empirical studies on this issue undertaken since the commencement of economic liberalization in 1991, when India began to seek FDI enthusiastically, do not go beyond anecdotal.

In this article, we examine certain qualitative aspects of FDI. In particular, we ask if it enhances or retards the process of local innovation and linkage creation activities compared to investment by domestic firms in India? We test for differences between foreign affiliates and local enterprises using a dataset of more than 300 companies in the context of India's economic liberalization since 1991 and an expansion of FDI inflows. Our results indicate that foreign affiliates do foster beneficial horizontal linkages with local suppliers of final goods but spend less effort than local enterprises to develop vertical inter-firm linkages, or create appropriate technologies for Indian markets. The results have implications for Indian policymakers as to how to devise policy mechanisms to assist the process of industrial development under a more liberal trade and investment regime. The article is organized as follows. The first section begins with a general discussion on innovation and linkages and their implications on industrial development in host countries. Next, some empirical evidence is considered, and the research hypotheses are outlined. Then the research methodology is specified, followed by the results and a discussion of the implications of the findings. The article concludes in the final section.

2. Theoretical underpinnings

Innovation – the introduction of new products or processes - does not only mean pushing the frontiers of knowledge; rather, innovation can be new to the world or just new to the user (UNCTAD, 2005). Promoting new uses of an existing technology by adapting it to serve local needs of a host country is often an innovation in itself (Lall, 1996). For

developing countries in particular, innovation is often aimed at creating locally appropriate technologies. *Linkages*, on the other hand, help the expansion of the local capacity for the production of specialized inputs. Direct and indirect linkages with local sources of components, raw materials, and equipment spur new industrial activity and industrial clustering (Lall, 1978; Park 2004). For instance, the production of semiconductors by TNCs in Singapore draws heavily upon a host of related local industries in silicon, air and water purifiers as well as cutters (Mathews, 1999; Ray and Venaik, 2001).¹ Such linkages increase the industrial depth and competitiveness of the economy (Porter, 1990).

However, TNCs may differ strategically from local enterprises in their innovatory activities, and the linkages they forge with local industries in host countries. Internalization, or global integration of economic activity, reduces the TNC's need for undertaking innovatory activities at their affiliates. Internalization of ownership-specific assets, such as proprietary technology, brand goodwill, and managerial skills, offers significant opportunities for benefiting from lower costs, higher quality as well as scale and scope economies (Buckley and Casson, 1991; Hymer, 1960).² However, the largest drawback of internalization lies in the reduction of the deeper learning processes and spillovers in the host economy. There is likely to be less effort to absorb, to adapt, to improve or to innovate technology in affiliates than would be the case when local companies buy a licence or equipment in the externalized mode of technology transfers and build upon the acquired technology (UNCTAD, 1999). On the whole, the literature suggests that major strategic decisions with regard to innovation are not usually delegated to the affiliates (Birkinshaw and Morrison, 1995). Birkinshaw (1996) found that there was a risk in having a product innovation mandate in the affiliate, because it may be

¹ A value system consists of the entire gamut of a production system embedded in the linkages of the firm with suppliers and buyers. See Porter (1980) for an analysis of value chains.

² A summary of these hypotheses is given comprehensively in Kumar (1991).

at variance with the corporate (parent) strategy. Even so, some TNCs often foster global competencies in local contexts (local for global - *a la* Nohria and Ghoshal, 1997). For example, the “local implementers” are plants that assemble a full range of products in the local market and also have the role of adapting global products to local standards (Jarillo and Martinez, 1990). We will develop some conjectural propositions about these configurations in the section on research hypotheses.

3. Empirical evidence

Existing empirical studies on linkages and innovation have methodological shortcomings, but serve to illustrate the evidence on the value of FDI in developing countries.

R&D activities of TNCs serve as a good indicator of innovatory activity in host countries.³ Fairchild and Sosin (1986) compared Latin American firms and TNCs and observed that domestic firms had a relatively higher level of internal innovatory activity, while foreign affiliates relied more heavily on external sources. In a survey of six Asian country studies, Enos (1988) found that there was a greater local technological effort associated with non-equity transfers: e.g. in Indonesia, the degree of technological mastery was greater in the local enterprises than in TNCs. For India, Ray and Rahman (2000) and Ray and Venaik (2001) found that local enterprises depended less on imported technology, as indicated by their lower expenditures on foreign patents, than foreign affiliates. Furthermore, in a survey of 32 R&D units of foreign affiliates in India, Reddy (1997) observed that a majority (56.2%) of TNCs performed wholesale transfers of technology, but the remaining TNCs, consisting of technology-intensive firms, assigned their affiliates global innovatory mandates and linked such innovatory activities to the overall transnational repository of capabilities. According to Cantwell (1995), TNCs tend to be *more* R&D intensive compared to their local competitors and are regarded

³ The bulk of the innovatory activities conducted in host countries is usually adaptive R&D (Kumar, 1998).

as the dominant agents of international technology diffusion (Findlay, 1978; Cantwell, 1995). Roth and Morrison (1992) propound that, in many TNCs, certain affiliates are given a “world mandate” and develop an entire product range to cover worldwide markets. In a survey of 2,109 affiliates, Holm and Pedersen (2000) found that 25.1% of the affiliates claimed that they conducted basic research while 54.3% were engaged in developing products or processes. The results also show that 4.5% of all the affiliates are “centres of excellence” for basic and applied research worldwide.

However, even though empirical evidence suggests that affiliates engage in and undertake basic and applied research, the question of whether the TNC’s innovatory activities contribute to the development of appropriate new technologies - for developing countries in particular - has not been addressed in these studies. Studies by Rugman (1988), Hennart (1986), Kumar (1991) and Ray and Venaik (2001) appear to suggest that TNCs differ from local enterprises in that they tend to be more import-intensive in their procurement practices.⁴ Toth (2000) found that, in Hungary, the share of input procured from Hungarian suppliers is markedly higher in domestic enterprises (59-62%) than in foreign affiliates (39%).⁵ Siddharthan and Kumar (1990) argue that, in India, TNCs tend to procure capital goods internally - thus import more - because they would not like the new technology embodied in capital equipment to spill over to unrelated parties. For Nigeria, Landi (1986) reported that foreign affiliates had a higher propensity to import than their local counterparts.⁶ In a study of Singapore’s electronic

⁴ Studies by Langdon (1981) and by O’Loughlin and O’Farrel (1980) suggested that TNCs are more import intensive than local enterprises. Empirical studies by McAleese and McDonald (1978) and Lall (1978) concluded that TNCs competing in low-technology, labour-intensive and export oriented production are less likely to establish local linkages than local enterprises.

⁵ Cited in UNCTAD (2001, p. 134).

⁶ However, Carvalho’s (1977) study for Brazil, Colombia and Mexico indicated that foreign firms are no different from domestic firms in terms of their import trends. Cohen (1975) also reports similar findings for TNCs in Singapore.

industry, Lim and Pang (1982) noted that while European firms bought a substantially share of their input locally (40-50%), Japanese firms purchased 20% of their input locally and United States firms a mere 10%.⁷

Thus, no conclusive evidence emerges, either way, whether TNCs contribute more (or less) to linkage creation and innovatory activities in host countries in comparison to their local counterparts. These studies also suffer from methodological shortcomings. Most studies were conducted on industry-level, rather than firm-level, data. Almost without exception, the number of variables in these previous studies was smaller. Above all, these empirical findings need to be validated using more sophisticated measures, especially for India, where there has been much debate in both academic and political establishments about the value of FDI (Saha, 2004).

4. Research hypotheses

In this section, we formulate a set of hypotheses based on our earlier discussion of adaptive innovation and linkages.

i) Group effects on innovation

We first hypothesise that TNCs and local enterprises belong to two different strategic groups,⁸ and hence display dissimilar propensities in their use of foreign technology and efforts towards product differentiation. Our propositions concerning foreign royalty payments, R&D spending and advertising expenditures, are complementary descriptors of innovatory activities, discussed next.

⁷ See Lall (1978) for a comprehensive review of empirical studies.

⁸ A strategic group is a group of firms in an industry following a similar strategy. The concept of strategic groups helps us to understand the competitive role of TNCs and their affiliates - a concept which follows from the theory of industrial organization. Some firms are vertically integrated or diversified while others are not; some produce a full product line, whereas others specialize; some advertise heavily, whereas others do not.

Innovation and appropriate new technology

The creation of appropriate new products for the local market, given its strategic importance as the “home base”, is of paramount importance for local Indian enterprises in particular.⁹ Not having a global presence nor being at the forefront of knowledge frontiers, Indian enterprises need to set up in-house R&D facilities to develop products specifically for their home market (Ray 2001b; Kumar and Agarwal, 2000; Agarwal, 2002). Even with imported technologies, substantial developmental effort is required to piece together disembodied technologies (Lall, 2002). In contrast, TNCs tend to concentrate most of their R&D activities near their headquarters, given its strategic importance for their global operations (Kumar, 1991). Indeed, growth in corporate R&D activity remains highly concentrated in the main advanced industrial economies of the world, more specifically, Canada, France, Germany, Italy, Japan, the Netherlands, the United Kingdom and the United States (Pearce and Singh 1992). Therefore, R&D expenditures of foreign affiliates, which mostly import technologies, tend to be proportionately lower than R&D expenditures of local enterprises.

Hypothesis 1.1: Foreign affiliates are likely to spend a lower proportion of their revenue on new product R&D in the host country than local enterprises.

It may also be financially advantageous for TNCs to integrate their systems of technology over several countries, as this allows quick internal transfers of global technological know-how. Having ready access to global reservoirs of technological know-how leads foreign affiliates to import more technology,¹⁰

⁹ See Porter (1990), in which he elaborates on the importance of the home base as the ground where local firms draw their competitive advantage.

¹⁰ The need for TNCs to devote R&D expenditure to the invention of appropriate technologies in developing countries, rather than simply importing technologies from developed countries, has been underscored by several scholars (see Lall and Streeten, 1977; Streeten, 1991).

rather than creating new technologies exclusively for local markets.¹¹ For local enterprises, though, in-house technology development and linkages with local technology providers enhance their ability to customize products for local markets. This lowers their dependence on foreign technology know-how. A higher amount of imported technology by foreign affiliates would result in higher royalty fees paid to the parent firm, which lead us to the following hypothesis.

*Hypothesis 1.2: Foreign affiliates are likely to use more imported technology and pay higher foreign royalties as a proportion of sales than local enterprises.*¹²

Product differentiation through advertising

It is often not enough to have world-class technologies on their own, but firms must advertise their benefits and, make the product known to the consumers. Because TNCs tend to be better at establishing global brands for their products than national firms, they typically devote more resources to product promotion (Caves, 1974, 1982). For example, the consistent theme in Philips' advertising strategy in India was its image of *international pedigree* and technological leadership in electronics (Ray, 2005).¹³ High levels of advertising expenditure (non-price mode of rivalry) also serve to elevate the barriers to

¹¹ In this connection, a CEO of Alcatel in India observed that "The core [technology] strategy [in the subsidiary] cannot be any different because the core strategy is driven largely, in industries of this nature, by technology. ... Since technology emanates from the centre, automatically everyone has to follow. It is not that globally Alcatel is developing product A and I find the market for product B. We cannot make product B because the volume of product B for the local market will not justify spending on R&D for product B in the Indian market" (Ray, 2001, pp. 540-541). The CEO of Siemens India remarked that "we are not here to reinvent the wheel!" (Ray, 2005). See also Saha, (2004).

¹² R&D expenditures, and the royalty and technical know-how fees paid in foreign currency (as a ratio of sales), are used as measures of the firm's internal dynamism, or its lack thereof.

¹³ Philips India Ltd., Interview Transcript, Calcutta, February 1995.

entry. In contrast, local competitors with fewer financial resources tend to focus on price competition and, hence, their advertising outlays are modest when compared to the expensive media campaigns of TNCs.¹⁴

Hypothesis 1.3: Foreign affiliates are more likely to engage in product differentiation strategy through higher advertising intensity in comparison to local enterprises which focus on price competition.

ii) Group effects on inter-firm linkages

Enterprises create both forward (e.g. with distributors of their output) and backward (e.g. with the supplier of raw material and components) linkages. Both types of linkages can result in creating economy-wide spillover benefits. Here, we hypothesize that the main differences between TNCs and local enterprises will be in distribution, export intensity, the extent of local outsourcing, local content, vertical integration, import of finished goods and capital goods deployed.

Local distribution strategy and export intensity

The literature on forward linkages in India is rather anecdotal in scope (see Khanna and Palepu, 1998). Indian markets are geographically fragmented and very regional, characterized by widespread income disparities and a rural-urban divide (Prahalad and Oosterveld, 1999; Bartlett and Ghoshal, 2000). In most parts of the country, consumers' purchasing power is generally low; infrastructure is poor; and the markets are culturally dissimilar. These features of the Indian market make mass-marketing a particularly difficult proposition. TNCs, competing with a narrow range of differentiated goods, tend to

¹⁴ The marketing literature makes a clear cut distinction between short-term, localized *sales promotion* campaigns which are suitable for price competition, and *advertising campaigns* of TNCs, which have much higher "reach" (populations served) and "frequency" (number of times the advertising message is shown to prospective buyers).

focus on metropolitan cities, rather than to compete in each and every geographical segment of the country (Ray, 2001a).¹⁵ Such a “focused strategy” (Khanna and Palepu, 1997) lowers TNCs’ distribution outlays vis-à-vis that of local firms. Smaller local enterprises usually draw their revenue from serving fragmented markets over a large geographical area (Prahalad and Liberthal, 1998). Thus, distribution expenses for local enterprises tend to be higher.

Hypothesis 2.1: Foreign affiliates are more likely than local enterprises to engage in niche-market strategy through lower distribution to sales ratios.

As TNCs possess better overseas marketing networks than local firms, firms with higher foreign ownership may have a greater propensity to export. Export orientation disciplines firms, increasing competitiveness and decreasing the risk of technological sloth (Lall, 1995). However, the impact of foreign ownership on export orientation cannot be uniquely predicted. Market-seeking FDI is unlikely to result in much export activity. Some affiliates are established purely to serve the local market (Birkinshaw, 1997). In the case of India, evidence suggests that domestic enterprises, rather than foreign ones, are more export intensive (see Kumar and Agarwal, 2000). This finding is corroborated for industries such as drugs and pharmaceuticals and electrical machine tools (Ray, 1999; Ray and Venaik, 2001). Thus, we hypothesize that local enterprises have a higher export to sales ratio (EXP) than foreign affiliates.

Hypothesis 2.2: Foreign affiliates are likely to have lower exports to sales ratios than local enterprises.

¹⁵ Semi-urban and rural markets in India sell goods in smaller pack sizes. Besides, the nature of packaging used by local enterprises makes containerization difficult. Selling agents need to visit customers many more times than in developed countries. TNCs with superior packaging and focusing on niche markets do not have to expend the same distributional resources as those of their local counterparts.

Horizontal linkages in final product markets

If the output of TNCs consists of a narrow range of differentiated goods, but the demand is for a wide range of substitutes, foreign affiliates may extend their product range by outsourcing production to local companies. By so doing, TNCs can quickly fill uncovered niches of the markets. In particular, when markets are dynamic, and the threat of entry is high, it is a good strategy to use existing capacity of (potential) competitors.¹⁶ It also helps to create horizontal linkages with local suppliers through cooperation (see Ray, 1999; Ray and Venaik, 2001).

Hypothesis 2.3: Foreign affiliates are more likely than local enterprises to outsource finished goods to extend their product lines.

Secondly, it is easier for foreign affiliates to obtain a range of final products that cannot be efficiently produced locally – from their parents or their foreign suppliers (Caves, 1996). This implies that foreign affiliates would rely more on finished goods imports. Empirical evidence suggests that local enterprises in India, in contrast, manufacture a wider range of products in-house, so as to capture economies of scope through multi-plant integration. Local manufacturers thus have lower expenditure on finished goods imports compared to their foreign rivals (cf. Ray, 2000; 2001a).

Hypothesis 2.4: To exploit the global economies of scale in their parent companies, foreign affiliates are likely to be more import-intensive in finished goods in comparison to local enterprises.

Vertical (backward) linkages in factor and intermediate markets

¹⁶ In the marketing literature, this is known as flanking strategy - i.e. reinforcing the “flanks” at the two ends of the product line spectrum so as to stave off attacks from competitors.

Using proprietary machinery from the parent firm (or designated suppliers) serves to elevate a foreign affiliate's product-differentiation in quality. Moreover, under internalized transfer of capital equipment, there is lesser chance of the newly developed technology spilling over to unrelated third-parties. Hence, foreign affiliates internalize the procurement of capital goods and import more of such high technology equipment. Higher imports of complementary raw materials also occur because TNCs often have established international supply chains (Siddharthan and Safarian, 1997). Foreign suppliers, in comparison to local ones, are more likely to have the capability to keep up with changing technologies (UNCTAD, 2001, p 133). In contrast, domestic enterprises that cannot find suitable local suppliers must undertake higher *local* (backward) vertical integration to overcome quality and supply uncertainties in arms-length transactions (D'Costa, 1995).

Hypothesis 2.5: Foreign affiliates are likely to be more import-intensive in raw materials, supplies and equipment than local enterprises.

Hypothesis 2.6: Foreign affiliates are likely to have lower vertical integration than local enterprises.

Higher capital intensity is also a feature of foreign affiliates since it is easier to use capital-intensive techniques that are proven abroad. With higher capital intensity, TNCs may form an indirect linkage to local infrastructure providers – possibly attracting FDI from transnational infrastructure service providers, such as those in energy industries. In time, this may improve the local infrastructure. In fact, the bulk of FDI that flowed into India from 1991 to 1996 was in power, transportation and communications industries, where demand far exceeded supply due to the lack of capital and technology (Ganesh, 1997).

Hypothesis 2.7: Foreign affiliates are likely to have higher capital intensity than local enterprises.

5. Research methods

We used the Prowess database provided by the Centre for Monitoring the Indian Economy (CMIE), which has by far the most comprehensive and reliable information available to date, and includes 7,500 registered companies. The dataset in this study consists of firm specific data of 338 enterprises from three industry clusters, randomly chosen from a list of industries. Through a procedure using stratified random sampling, large enterprises with sales revenues of Rs. 400 million (\$10 million) or above were selected, as it was deemed that smaller enterprises were not comparable to foreign affiliates (see Lall and Mohammad, 1983; Jenkins, 1990; Kumar and Agarwal, 2000). We allowed a gap of five years after the introduction of economic liberalization, for foreign affiliates and local enterprises to adapt to changed conditions, and constructed a data set based on the financial performance for the period 1997-1998 of foreign affiliates and local enterprises. The 338 firms comprise: a) chemicals industries (n=169), consisting of 42 foreign affiliates and 127 local enterprises; b) electronics industries (n=71), consisting of 29 foreign affiliates and 42 local enterprises; and c) transport equipment industries (n=98), consisting of 34 foreign affiliates and 64 local enterprises. The pool of foreign affiliates comprises foreign-controlled firms with over 20% foreign equity.¹⁷ A further test of foreign control was attempted by scrutinizing local ownership through the shareholding patterns of the top 50 (local) shareholders, so as to ensure that their equity did not exceed foreign equity. Also scrutinized, in the case of local enterprises, was foreign dividends paid, so as to exclude any local enterprise with overt foreign interests. Finally, to control for firm size, all variables were re-scaled as their ratio to sales as follows:

<i>ADVT</i>	<i>advertising expenditure as a percentage of net firm sales</i>
<i>DIST</i>	<i>distribution expenditure as a percentage of net firm sales</i>

¹⁷ The internationally accepted definition of a foreign affiliate uses a lower threshold of 10%.

<i>R&D</i>	<i>research and development expenditure as a percentage of net firm sales</i>
<i>IMP_ROY</i>	<i>foreign royalty paid as a percentage of net firm sales</i>
<i>TOT_EXP</i>	<i>total exports revenue as a percentage of net firm sales</i>
<i>IMP_FIN_GOODS</i>	<i>import of finished goods expenditure as a percentage of net firm sales</i>
<i>TOT_IMP</i>	<i>import of raw materials expenditure as a percentage of net firm sales</i>
<i>PUR_FIN_GOODS</i>	<i>purchase of finished goods expenditure as a percentage of net firm sales</i>
<i>VAL_ADD</i>	<i>value added as a percentage of net firm sales</i>
<i>ENERGY</i>	<i>energy consumption expenditure as a percentage of net firm sales.</i>

6. Results

Table 1 summarizes the predictions and corresponding results of means and standard deviations of the variables under each ownership group. Subject to tests of significance, these findings reveal the overall discriminating characteristics of foreign affiliates and local enterprises.

Univariate analysis and partial F values

The results indicate that 9 out of 10 variables are significant. The only variable not significant is R&D. We report the results of the discriminant function analysis next.

Multivariate Analysis

A step-wise discriminant analysis was employed to estimate the discriminant functions using the Mahalanobis D squared. Discriminant analysis is used to classify cases into the values of a categorical dependent variable (foreign affiliates or

Table 1. Means of variables by ownership groups and test for significance

	F	Significance	Hypothesis	Three industries together	
				TNC	LE
Local innovation	0.223	0.637	H1.1: $R\&D_{TNCi} < R\&D_{LEi}$	0.238	0.295
	22.734	0.000*	H1.2: $IMP_ROY_{TNCi} > IMP_ROY_{LEi}$	0.412	0.096
	4.022	0.046**	H1.3: $ADVERT_{TNCi} > ADVERT_{LEi}$	1.200	0.664
Inter-firm linkages	4.153	0.043**	H2.1: $DIST_{TNCi} < DIST_{LEi}$	1.342	1.855
	11.384	0.001*	H2.2: $TOT_EXP_{TNCi} > TOT_EXP_{LEi}$	10.058	20.878
	15.863	0.000*	H2.3: $PUR_FIN_{TNCi} > PUR_FIN_{LEi}$	7.443	2.576
	11.598	0.001*	H2.4: $IMP_FIN_{TNCi} > IMP_FIN_{LEi}$	1.158	0.058
	17.260	0.000*	H2.5: $VAL_ADD_{TNCi} < VAL_ADD_{LEi}$	24.438	24.438
	10.152	0.002*	H2.6: $ENERGY_{TNCi} < ENERGY_{LEi}$	2.612	4.838
	7.146	0.008*	H2.7: $TOT_IMP_{TNCi} > TOT_IMP_{LEi}$	16.820	12.205

Source: authors' calculation.

* significant at 0.01; ** significant at 0.05.

local enterprises) – usually a dichotomy. A discriminant function, also called a *canonical root*, is a latent variable which is created as a linear combination of discriminating (independent) variables. Consider for example, the following function:

$$\text{foreign affiliates/local enterprises} = c + b_1x_1 + b_2x_2 + \dots + b_nx_n,$$

- where the b's are discriminant coefficients, the x's are discriminating variables, and c is a constant.

The discriminant analysis usually involves fewer violations of assumptions (independent variables need not be normally distributed, linearly related, nor have equal within-group variances), is robust, handles categorical as well as continuous variables, and has coefficients that many find easier to interpret (Hair et al, 1998). The Mahalanobis D squared procedure performs a step-wise analysis, designed to develop the best one-variable model, followed by the best two-variable model, and

so forth, until no other variables meet the desired selection rule, which is to maximise Mahalanobis D squared between two groups (local enterprises and foreign affiliates). A smaller sample size of $n = 190$ (groups of equal size; foreign affiliates = 95; local enterprises = 95) was used for this part of the analysis.

We present two results individually, one for innovation and another for linkages. The main differences between foreign affiliates and local enterprises in innovation are in foreign technology imports. In linkages, the differences are in exports; imports of raw materials and equipment; vertical integration; distribution; and outsourcing of finished goods. The classification accuracy is 74.7%, which implies that the results are statistically valid.

Table 2. Test of significance in discriminant analysis

Variables	Sig. of F	Mahalanobis D Squared
Foreign royalty payments	0.020**	1.405
Finished goods outsourcing	0.003*	1.299
Exports	0.003*	1.297
Imports	0.002*	1.295
Vertical Integration	0.010*	1.367
Distribution	0.032**	1.429

Source: authors' calculation.

*significant at 0.01; ** significant at 0.05.

The discriminant functions are as follows:

Local enterprises: $Y_{LE} = -5.982 + 0.046 \text{ PUR_FIN_GOODS} + 0.249 \text{ VAL_ADD} + 0.051 \text{ TOT_IMP} + 1.291 \text{ IMP_ROY} + 1.147 \text{ DIST} - 0.020 \text{ TOT_EXP}$

Foreign affiliates: $Y_{TNC} = -5.349 + 0.109 \text{ PUR_FIN_GOODS} + 0.209 \text{ VAL_ADD} + 0.103 \text{ TOT_IMP} + 2.213 \text{ IMP_ROY} + 0.922 \text{ DIST} - 0.048 \text{ TOT_EXP}$

7. Discussion

i) Local Innovation

Significantly higher royalty payments (IMP_ROY) imply foreign affiliates (2.213) are relying more on foreign technological know-how; conversely, for local enterprises (1.291), their dependence on foreign technological know-how is lower. The purpose of drawing on local sources of technology by the latter group is presumably to design and to develop locally oriented products for the Indian market. In-house developers or local providers of knowledge are, by definition, *better integrated in the local institutions of learning and practice; hence they are able to customize products to local requirements more efficiently*. However, there is no significant difference between TNCs and local enterprises in the extent of their spending on R&D. The insignificance of the difference in R&D does not, in our view, provide a sufficient rationale for rejecting the hypothesis that local enterprises customize product technologies for local needs. It is possible that TNCs do not have high levels of R&D, because the size of the local market does not justify customizing products (see Alcatel's explanation in footnote 11). In the case of local enterprises, though, their first mover advantages in in-house R&D laboratories and returns from R&D efforts in precious years make their current R&D expenses appear rather modest.¹⁸ Either way, R&D spending across *both* ownership groups seems limited or, at least, no different from each other. We need to bear in mind that R&D is only an input of innovation, not its output, and is not always a robust indicator of technological dynamism. Moreover, R&D spending is not always reported or often inaccurately reported in India (Lall and Mohammad, 1983; Kumar and Aggarwal, 2000). Therefore, it would be more appropriate to discriminate on the aspect of foreign royalties paid (IMP_ROY) – i.e. the output of innovation

¹⁸ A similar finding was reported by Ray (2005) in the case of BPL Ltd. (a TV manufacturer) which claimed it had lagged returns from previous investments in R&D and advertising.

- which is significantly higher for TNCs, meaning that they make intensive use of foreign technologies in comparison to their local counterparts.

In terms of product differentiation, we found no significant difference in advertising propensity between TNCs and local enterprises in the multivariate framework. ADVERT may be a good discriminator on its own in the F test, but it does not add further to the discriminating information contributed by the other significant variables. Current advertising expenditures by foreign affiliates are not always a true reflection of the scale of their advertising activity, since they do not account for the spillovers from worldwide advertising investments made over time by their parent and associates (Kumar, 1991). Another reason could be that the large-scale entry of TNCs from 1991 has forced the oligopolistic local enterprises to increase their advertising spending in order to protect their market share. Hence, the current indicator of advertising spending has limitations in representing the scale of TNCs' advertising activities on the one hand and, the behaviour of local counterparts on the other, which have become more advertising-intensive since 1991. The insignificance of this difference does not automatically nullify our hypothesis that foreign affiliates are bigger spenders on advertising.

ii) Local Linkages

In the main, differences between TNCs and local enterprises emerged in exports, imports, vertical integration, distribution and outsourcing of finished goods. As hypothesized, local enterprises (1.147) appear to be significantly more distribution intensive (DIST) than TNCs (0.922). Consequently, they end up with higher physical distribution costs than foreign affiliates. This corroborates our hypothesis that foreign affiliates tend to focus on marketing in metropolises, rather than to spread their distribution to cover a wider geographical area.

Local enterprises are also found to export more (TOT_EXP). As hypothesized, a plausible explanation is the

motivation for FDI: market-seeking FDI is likely to result in lower exports than resource- or efficiency-seeking FDI (Dunning, 1998). Moreover, there is no reason to expect that the parent firm will give a mandate to its affiliate in India to export to a third country in competition with other affiliates located elsewhere. Also, a lack of adequate product differentiation, as revealed in the results, between what is produced in India and other parts of the world, could contribute to lower export activity. The finding on exports is consistent with earlier analyses of Kumar (1991) and Kumar and Aggarwal (2000), which found that TNCs in India displayed lower propensities to export than local enterprises.

A finding of some interest here is the tendency of foreign affiliates (0.109) to have more local outsourcing (PUR_FIN_GOODS) than local enterprises (-0.046) (see Table 2). Business process outsourcing serves the important function of instantly extending the TNC's product range by using existing surplus capacity in the economy. This act of "strategic alliance" with competing firms serves two important additional functions, namely a) it eliminates the prospect of competition from those local enterprises who might otherwise enter the market and b) it benefits suppliers of final products through the knowledge spillovers, transferred designs and technologies from TNCs. Such practices tend to have beneficial effects on final goods industries and serve to increase the industrial depth and competitiveness of the host economy. However, the insignificance of differences with respect to imports of finished goods (IMP_FIN_GOODS) leads us to conclude that both foreign affiliates and local enterprises depend as much as each other on finished goods imports to boost their product range. An example of this tendency was found in the Indian television industry, where local enterprises imported more intensively in order to compete against foreign affiliates, which had introduced their global range of models after economic liberalization (Ray, 2001a).

Two other features are of significance here: first, the import propensity amongst local enterprises for raw materials

and capital equipment (TOT_IMP) is lower – with the coefficient for local enterprises being 1.291 and for foreign affiliates 2.213. Second, local enterprises appear to produce a greater proportion of output in-house – i.e. they appear to be more (backward) vertically integrated (VAL_ADD) - suggested by the higher value of the coefficient (0.249) for local enterprises compared to that of foreign affiliates (0.209). This corroborates our hypothesis that local enterprises are vertical integrated to a greater extent to circumvent market failures in intermediate goods. Frequent interruptions in supply, quality variance and transaction costs lead local enterprises to internalize much of the value-adding activities in-house, confirming the finding in D’Costa (1995). It is also possible that local enterprises are yet to realize the benefits of specialization and subcontracting and, hence, tend to favour vertical integration. Even so, the higher value-added generated in-house by local enterprises generate greater benefits to the domestic economy, since it enhances national income and learning within “infant” enterprises. The finding also supports our hypothesis that TNCs vertically integrate globally, hence lowering the scope of *local* value addition of the affiliate.

Thus, with regard to linkages, significant differences arise in five out of seven measures, whereas with regard to innovation, differences arise in one out of three measures. The present study acknowledges that local innovation and linkages are not a one-off, but a dynamic process. At the initial point of entry, a foreign affiliate is likely to be tightly integrated with the parent, internalizing most of its tangible and intangible asset flows. With time, it may begin assembly-orientated production, thereby taking advantage of the low-cost labour.¹⁹ Once these affiliates undertake higher value-creating activities in the host country, development of greater capability should follow.

¹⁹ Ray (1999) verified this inference by actual field study observation of four different transnational affiliates in India.

8. Conclusion and future directions

What concerns policymakers in India is not so much whether firms are foreign or locally owned *per se*, but the implications of the difference in behaviour given their level of foreign ownership. The objective of host country governments in promoting or restricting foreign ownership in locally domiciled enterprises is to influence and to enhance the development of favourable local and foreign linkages (Ray and Venaik, 2001). Linkages developed in competitive environments and accompanied by efforts to enhance suppliers' capabilities are likely to be technologically beneficial and dynamic (UNCTAD, 2001). Given their foreign ownership and pressures for global integration, foreign affiliates appear somewhat less proactive than local enterprises in undertaking vertical inter-firm linkages with factor and intermediate goods markets; nonetheless, they forge favourable horizontal linkages with finished goods suppliers by means of business process outsourcing.

Promoting linkages, in our view, will require a much more robust support infrastructure, which, as is well-known, is woefully inadequate in India. A positive development in this regard has been the inflows of a large quantity of FDI in power, transport and communications industries, which should improve the efficiency of vital infrastructure services. The Government also needs to be mindful of the wide variance in the quality of manufactures in ancillary industries. Through the Indian Standard Institution (ISI), the Government of India is slowly implementing a national supplier accreditation system like the ISO 9000 certification. This quality accreditation system may encourage both foreign affiliates and local enterprises to have more confidence in outsourcing raw materials and intermediate products. Policymakers also need to encourage clustering and co-location of related industries, usually best done in technology parks – Bangalore being a prime example. Clustering makes it easier to form backward and forward linkages, to reduce transport and communication delays as well as to increase the

potential for positive externalities. The recent inflows of FDI into India have facilitated further clustering, as the studies of Kathuria (2002) and Park (2004) demonstrate.

Insofar as India strives to promote greater local innovation, more attractive tax allowances for conducting R&D than those recently implemented by the Government of India need to be put in place.²⁰ Finally, policymakers need to be watchful of the net impact of FDI, by taking into account all the inflows and outflows of resources through the operations of TNCs as well as the impact of their operations on innovation and inter-firm linkages. Progressive indigenization and local R&D could harmonize and align TNCs' goals with the national objectives. All this needs careful monitoring and reinforcement. We point out certain unavoidable limitations of this study. Arguably, the question of externalities, such as productivity increases arising from FDI in related industries, is not accounted for in this analysis. Furthermore, the analysis presented here has a smaller number of foreign affiliates as compared to local enterprises, and hence the comparative analysis was restricted to a small sample size. Finally, the analysis is not sufficiently dynamic. Ideally, it would have entailed a much more elaborate time-series analysis. One hopes that future studies would also focus on some unique aspects of firm behaviour – technology development, product differentiation and vertical integration – as the bases for discrimination across industries.

In conclusion, we believe our study makes three significant contributions to the literature on TNCs. First, our multi-dimensional methodology provides a comprehensive statement about the quality of FDI in India, and the contribution it makes to linkage creation and innovatory activities. Second, it shows that TNCs display a relatively low inclination to adapt products to suit local markets, but appear to assist the process of knowledge spillovers to local sub-contractors through

²⁰ Weighted tax deduction of 125% (raised to 150% in 2000) on R&D expenditure was introduced in specific sectors like pharmaceuticals, electronic equipment, computers, telecom equipment and chemicals in 1998, with aircraft and helicopter industries added in 1999.

activities involving business process outsourcing. Third, it shows that TNCs are not superior to local enterprises in terms of vertical inter-firm linkages they generate with ancillary suppliers. We are not, of course, claiming that these are the final words on innovation and linkages, but there seems to be enough evidence in support of these assertions. Meanwhile, a careful appraisal of the host country's goals can illuminate the need for innovation and development of linkages – one that would lead to a better understanding of the dynamic interaction between the firm and its host environment. ■

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