

Technological Spill-Overs and Manpower Training:

A Comparative Analysis of Multinational and National Enterprises in Brazilian Manufacturing

Reinaldo Gonçalves*

I. Introduction

The transfer of technology by Multinational Enterprises (MNEs) may be a fast and efficient way of less developed countries (LDCs) to benefit from the technological progress of the advanced countries, although with some lag. It results from the fact that MNEs are among the largest and most aggressive firms in the capitalist system, and are responsible for a significant fraction of the bulk of innovations in products and methods of production. Thus, MNEs are dynamic economic agents with effective impact on the process of economic growth through high productivity of production factors derived from technological innovations in techniques of production, which they can use through direct investment or licensing to local firms. Indeed, the fact that MNEs have some ownership-specific advantages, mainly technology, is a central element of the so-called industrial organization approach to the determinants of foreign direct investment (Hymer; Caves, 1971).

An important part of the literature on the technology transfer by MNEs to LDCs has been related to the "cost" and "appropriateness" of this technology. The direct impact of MNEs on the external accounts of LDCs through the payments for technology,

* Assistant Professor of Economics, Federal University of Rio de Janeiro, Brazil.

prises (NAEs) so that the degree of significance in performance may be tested.

II. The Empirical Evidence

A. *The Sample*

During the second semester of 1978 a questionnaire was sent to 146 MNEs and 96 NAEs, which were selected at random from a list of the largest 500 enterprises in the Brazilian manufacturing industry. By the end of that year the firms which responded the questionnaire included 52 MNEs and 32 NAEs, that is, response rates of 35.6% and 33.3%, respectively.

The firms included in our sample had about 348 thousand employees in 1977, which was almost 10% of the total labour force of Brazilian manufacturing industries. MNEs had about 240 thousand employees and NAEs had about 108 thousand employees. They accounted for about 14% of the value of production of manufacturing industries in 1977; MNEs were responsible for almost 3/4 of the value of production of the sample firms. The MNEs included in our sample accounted for about 33% of total value of production and 27% of employment of a major sample of 647 MNEs, which included the most important MNEs in Brazil, and this major sample accounted for 32% of production and 23% of employment in the manufacturing industry (Gonçalves and Tavares).

By category of usage, the sample distribution is the following: capital goods (27 MNEs and 11 NAEs), intermediate goods (17 MNEs and 13 NAEs), consumer goods (6 MNEs, 8 NAEs). Two MNEs, which replied anonymously, did not specify their products. The size distribution of sample firms shows that 40% of MNEs and 43% of NAEs are medium size firms (i.e. net sales lower than Cr\$ 3 million in 1977), whereas the other firms were large or very large.

An regards the distribution of MNEs in the sample by country of origin, the United States is the leading country with about 45% of the total number of sample firms. In Brazil the four most important countries in terms of foreign investment are the United States, West Germany, Switzerland and Japan, which accounted

Table 1
EXTERNAL TRAINING AND TECHNICAL SUPPORT GIVEN BY SAMPLE FIRMS

Programme	Product	Consumer goods		Intermediate goods		Capital goods		Total		Matched pairs	
		MNE	NAE	MNE	NAE	MNE	NAE	MNE	NAE	MNE	NAE
Technical assistance for suppliers $\chi^2 = 2.153, \alpha = 15.0$ (*)		55	22	52	33	72	75	60	41	50	62
Technical assistance and/or training for final users of products $\chi^2 = 5.970, \alpha = 2.5$ (*)		75	0	60	47	78	75	71	41	62	38
Post-sales services for final users of products $\chi^2 = 2.147, \alpha = 15.0$ (*)		64	20	60	40	83	100	69	50	62	38
Technical assistance for independent distributors, service organizations or dealers $\chi^2 = 8.289, \alpha = 0.5$ (*)		80	0	58	33	76	63	67	31	50	13
Marketing services for independent distributors or dealers $\chi^2 = 6.729, \alpha = 1.0$ (*)		73	22	32	0	47	38	47	16	25	25
Technical assistance and/or marketing services for other firms besides customers, suppliers, service organizations, dealers or distributors $\chi^2 = 5.008, \alpha = 2.5$ (*)		40	11	16	0	24	0	25	3	0	0

Source:

Notes:

Questionnaire Survey, Brazil

Coefficients refer to the percentage of sample firms in each group having the mentioned programme.

Sample size = 52 Multinational Enterprises (MNEs) and 32 National Private Enterprises (NAEs).

Number of matched pairs = 8

χ^2 : Chi-square test. It refers to data on total number of firms.

α = : The approximate probability of rejecting the null hypothesis when it is true.

(*) : The null hypothesis states that there are differences between MNEs and NAEs.

(*) : Rejection of the null hypothesis. The predetermined cut-off for rejecting the null hypothesis was the 20 percent significance level.

ing and technical support given by MNEs and NAEs.

Although, there is some evidence that in general MNEs may have important technological spill-overs, and even greater than NAEs, there is also some evidence for the thesis that taking into account pairs of firms (MNEs and NAEs) which produce similar products and are of similar size, there is no significant difference in their comparative technological spill-overs as a result of product-skill complementarity. It has to be noted in connection with this point that taking into account matched-pairs of MNEs and NAEs in Brazilian manufacturing there are no marked differences in the average capital-labour ratios and in the determinants of choice of technique by MNEs and NAEs (Gonçalves). Thus, given a specific social and economic milieu in which MNEs and NAEs operate, there seems to be no a priori reason why they should have significantly different technological spill-overs, whose magnitude would be related directly to the nature of their products.

C. Manpower training

We also tried to obtain some data on different types of educational and training programmes given by MNEs and NAEs, which would be more internal to the firm. Our evidence suggests that, apart from training abroad for Brazilian employees, there seem to be no marked differences between MNEs and NAEs. Looking at Table 2, we note that regarding job-entry training and work-study programme for students, MNEs seem to have a better performance than NAEs in the sectors producing consumer and capital goods; whereas regarding job-entry training, upgrading and renewal training, programmes during non-working hours, and work-study programmes for students, NAEs seem to have a better performance than MNEs. As regards 'other programmes,' which include participation in seminars, external courses, short courses for development of department chiefs, programmes for apprentices, financing of different types of courses, participation in the SENAI training programme and so on, there seem to be no significant differences between MNEs and NAEs.²

² SENAI (Serviço Nacional de Aprendizagem Industrial - National Service for Industrial Apprenticeship) is an organization financed by a tax on payroll costs (from 1% to 1.2%) whose objective is the training of industrial workers.

Taking into account differences in size we note that regarding job-entry training, upgrading and renewal training, and other training programmes, the NAEs of medium size seem to perform better than MNEs of medium size, while the large and very large MNEs seem to perform better than the large and very large NAEs regarding all training programmes. As regards work-study programme for students and training abroad for Brazilian employees MNEs have a better performance than NAEs, regardless of their size.

We also obtained some evidence regarding training for specific categories of the labour-force (see Table 3). Our findings suggest that there seems to be no difference between MNEs and NAEs regarding training for the categories of unskilled and semiskilled labour, skilled labour and technicians, and administrative and professional labour. But, there seems to be significant difference between MNEs and NAEs regarding training of sales personnel and managerial staff. Taking into account the different groups of products, regarding the three first categories of labour-force mentioned, there seems to be no clear pattern of marked differences between MNEs and NAEs; however in the last two categories, namely, sales personnel and managerial staff, in all different groups of products MNEs seem to have a better performance than NAEs.

As far as the priority attributed to each category is concerned there seem to be no major differences; moreover, both groups, MNEs and NAEs, gave the highest priority to training of skilled labour and technicians, and it seems to be true in all different types of products. It is worth mentioning that NAEs seem to give higher priority to the training of unskilled and semiskilled labour than MNEs.³

Taking into account differences in size we find that for all categories of labour force there seems to be no difference between MNEs and NAEs, apart from the fact that very large MNEs seem to have a better performance than very large NAEs regarding training of sales personnel, and medium NAEs have a better performance than medium MNEs in the training of unskilled and

³ The findings on the priority of training programmes measured by average scores attributed by sample firms are not presented in the tables, but can be obtained directly from the author.

semiskilled labour. Again, in all different groups of size we find that MNEs and NAEs give the highest priority to the training of skilled labour and technicians. It is also worth mentioning that within each group NAEs seem to give higher priority to the training of unskilled and semiskilled labour than MNEs.

A possible explanation for the above empirical findings is that, insofar as the regulations regarding employment of foreign personnel are not sufficiently restrictive, the main reason for the apparently extensive programmes of manpower training in MNEs seems to be the fact that the Brazilian industrial workforce achieved a high stage of development during the industrialization process of the last three decades. It is not uncommon in LDCs that "local personnel, after adequate training, were frequently more economical than foreign personnel from the standpoint of both salary and allowances" (Reuber).

The cost disparity between imported and local manpower⁴ and the substitutability between foreign and local personnel — due to the high stage of industrial development in Brazil — led MNEs as well as NAEs to carry out training programmes for their workers in order to adapt them to the specific requirements of their organization methods and production techniques.

An evidence which may support the above argument is found in a study by Watson on the growing replacement of foreign managers of MNEs in Brazil by Brazilian managers. This study, which was based in a sample of 69 subsidiaries of U.S. MNEs in Brazil in 1970, showed that in the management positions related to Finance, Engineering and Technical, Marketing and Sales, and Production, about 2/3 were occupied by Brazilian citizens, while in Accounting and Personnel the participation of Brazilian citizens were 87% and 98%, respectively. On the other hand, only about 35% of the highest-level positions were occupied by Brazilian citizens. These data show us that in Brazil there is a managerial and professional class which has been replacing foreign executives in management positions in MNEs. The above study also found that high-level Brazilian managers are not significantly different from high-level American managers with respect to some specific traits and characteristics.

⁴ The differential cost between foreign and local personnel was already substantial at the end of the fifties in Brazil. See Shearer, p. 119.

Brazilian manufacturing industry seem to give some support for the hypothesis that MNEs have substantial indirect effects on LDCs. In addition, the study shows that there seem to be no significant differences in manpower training and technological spill-overs (taking into account the case of skill-product complementarity) between MNEs and NAEs. However, these findings must be seen as suggestive rather than conclusive, insofar as it was not possible to obtain information on the effectiveness of technological spill-overs, the quality of training programmes, and data on volume of resources devoted to such programmes.

Bearing this limitation in mind, we may say that regarding technological spill-overs (external training and technical assistance), although MNEs seem to be more active than NAEs, it might be explained by the different types of products manufactured by MNEs and NAEs, in the sense that MNEs would tend to produce certain types of goods which would require the provision of external training and technical assistance, due to a certain product-skill complementarity.

As regards internal training and educational programmes we found that, apart from training abroad for Brazilian employees, in which MNEs have a better performance than NAEs, there seems to be no marked difference between MNEs and NAEs. As far as internal training programmes to specific categories of the work force are concerned, we also did not find any marked difference between MNEs and NAEs; moreover, both groups of enterprises, MNEs and NAEs, seem to give the highest priority to the training of skilled labour and technicians.

To conclude, the empirical findings above suggest that the traditional analysis of the indirect effects of MNEs in LDCs requires some qualifications. In new industrializing countries like Brazil, where there exist a relatively sophisticated industrial sector and a skilled work force — which, without any doubt, were to a certain extent influenced by MNEs' presence —, the national private enterprises may also be in a position to have a comparable performance in terms of technological spill-overs and manpower training. Thus, it is important to reconsider the cost and benefit analysis of foreign direct investment and its policy implications, as well as the perspectives of a technology transfer process which relies heavily on MNEs.