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The effects of trade liberalization on R&D investments: the case of the Uruguayan manufacturing industry

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THE EFFECTS OF TRADE LIBERALIZATION ON R&D INVESTMENTS: THE CASE OF THE URUGUAYAN MANUFACTURING INDUSTRY. [1]

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Abstract

In this paper we study the effects of increasing imports and foreign firm supply, as a consequence of trade liberalization policies, on the innovative activities of firms in a small developing economy. This is an interesting case as very little research exists on the R&D investments of firms in developing countries. The results show that foreign presence has a positive but not always significant effect, while import competition has a negative and significant effect on R&D investments. Firms that are able to export are also more innovative. The process of reallocation of resources from import substituting industries towards export-oriented industries, caused by the opening of the economy, seems to have reduced the incentives for R&D investments for firms in traditional industries, while increasing those for export-oriented firms. Taking into account the defensive and imitative nature of innovative activities of firms in developing countries, these results go in contrast with the evidence from developed countries, where foreign direct investments and imports seem to show positive effects on innovative activities.

1.   INTRODUCTION

Most South-American countries adopted import-substitution policies as the main strategy for developing an indigenous manufacturing industry. One of the main justifications for this type of strategies based on considerations about technologies from abroad. Policy makers were hopping that, by licensing innovative technologies from abroad, domestic industries would eventually develop the technological capabilities that would allow them to start producing in-house innovations. The evidence of this period does not seem to indicate that this process of technological transfer ever took place.

The shift towards trade liberalization and export orientation changed radically the environment and incentives for firms in developing countries. The final effects of trade policy reform on innovation are nevertheless not easy to predict and have not been studied for developing countries.

The main purpose of this paper is to present evidence on the effects of an increase in imports, due to a more open economic environment, on the investments in R&D of manufacturing firms of a developing economy.

One of the main features of economic policy in Uruguay, as in other South-American countries, was an import-substitution strategy based on strong foreign trade restrictions. After reaching levels of unparalleled prosperity in the region during the first half of the century, the Uruguayan economy stagnated and entered into a period of increasing monetary and fiscal instability, which peaked at the beginning of the 1970s. The military regime that took power in June 1973 adopted initially an accommodating economic policy towards the oil price shock of 1973, but had no success. A serious balance of payment crisis developed, and this triggered the appointment of a new economic team in July 1974, which started a trade liberalization program. The program included elimination of quantitative restrictions, the gradual reduction of tariffs (with programmed stages at 1980, 1981 and 1982) and the liberalization of capital flows and foreign exchange transactions (for a detailed account of this program and an assessment of its effects on the allocation of resources see Favaro and Spiller, 1991 and Kokko, Tansini & Zejan, 1996). Liberalization policies were accompanied by market deregulation for a significant number of economic activities. The program was stalled in 1982, while the economy was in a deep recession. After the return of a democratic regime in 1984, a program of gradual tariff reduction was implemented, and trade barriers have been steadily falling thereafter.

Trade liberalization implies a process of reallocation of resources in the economy. In the case of manufacturing industries resources will be reallocated from import-competing into export-oriented sectors. Export-oriented industries should become therefore more dynamic, with an associated increase in profit opportunities. This in turn will cause an increase of firm turnover due to a reduction in the importance of entry barriers. The effects of this reallocation process on innovative activities are not clear, since existing theoretical explanations give often-ambiguous results.

Existing theories suggest that increased import competition and the shift of

resources towards export-oriented firms may affect the R&D performance of domestic firms. As Caves (1974) suggests, the dynamic efficiency of domestic firms will change as a response to the increased competition by foreign firms. In general a higher level of efficiency should be expected, with a consequent increase in R&D investments. This is not always true, as suggested by Lake (1979), since the profitability of domestic firms may fall and may cause a decrease in R&D expenditures. On the other hand, the spillovers generated by foreign firms may substitute R&D domestic investments, reinforcing the incentives to decrease R&D investments.

Veugelers and Vanden Houte (1990) propose a game theoretic model that attempts to evaluate the effects of multinational firms on domestic R&D for product innovation. These effects depend crucially in their model on the relative cost-margins between multinational and domestic firms, and on product substitutability. They find evidence of this negative effect using a sample of Belgian firms. Scherer and IIuh (1992) analyze the effects of high-technology imports on R&D expenditure of US firms, finding also partial support for a negative effect.

There are also other studies that find positive effects. Zimmermann (1987) and Bertschek (1995) analyze both product and process innovation. Zimmerman finds, for the case of US firms, that for exporting firms there is a positive effect of imports on product innovation, but there is a negative effect for non exporting firms, and in general for monopolistic competition where theoretically the effects of imports and foreign direct investment (FDI) on R&D should be positive. She finds supporting evidence using a sample of German firms for the period 1983-1988.

All these studies have been carried out using data from developed countries. Kokko (1994) has studied the relation between technological spillovers from FDI and the characteristics of multinational enterprises for Mexican industries. The main finding is that spillovers are larger in industries with less technology gaps and high foreign shares. On the other hand, Raut (1995) presents evidence on the existence of technological spillovers on Indian private firms. Kokko, Tansini & Zejan (1995) analyzed the characteristics of inward FDI in Uruguay during two different trade regimes - the import-substituting period that lasted until 1973 is compared to the subsequent, more outward-oriented policy environment - and examines differences in the productivity spillovers from the foreign MNCs that entered during the two regimes. Their results indicate that the foreign MNC affiliates established during the import-substituting regime have positive productivity spillover effects on local firms, but there are no signs of productivity spillovers from the affiliates established during the outward-oriented period. One possible explanation for these findings is that import-substituting foreign affiliates bring in production technologies that are not well developed in the host country, which creates a large potential for learning and transfers of production technology to local firms. Export-oriented foreign affiliates, by contrast, may base their operations on production technologies that are not very different from those used by local firms, and instead build their competitiveness on skills in international marketing and distribution. While these studies present empirical evidence on the existence of spillovers, there is little evidence on the effects of imports and FDI on the innovative activities of private firms in developing countries.

The innovative activities of private firms in developing countries are themselves quite different from the strategies that firms in developed countries adopt towards innovation. It has been argued that little technological innovation is taking place in developing countries. This is only true if innovation is defined in a very narrow sense, as referring only to the introduction of new products and processes. But in a broader sense innovation also refers to the imitative phase in any industry where new processes or products are being adapted. Freeman (1989) has proposed three categories that may be useful to describe the strategies of firms in developing countries: a) imitative firms are defined as firms that follow the leaders in established technologies with an important lag (to deal with this lag, imitative firms need compensating advantages such as control over captive markets or cost advantages), b) dependent firms, which are sub-contracting firms depending on the technology supplied by the contractor and c) traditional firms, that are non-innovative and are not pushed by markets to introduce technological change into their products.

In this paper we use data on R&D and product improvement expenditures for Uruguayan manufacturing firms. Our main purpose is to unveil the effects of imports and FDI on the decisions of firms with respect to this type of expenditures.

The paper is organized as follows. In section 2 we discuss a theoretical framework that can help in interpreting the evidence. Section 3 provides a description of the data used, as well as a general introduction to the Uruguay manufacturing sector. Section 4 presents the main results and finally section 5 concludes.

2 THE MODEL

We adopt here the framework proposed by Dasgupta and Stiglitz (1980a,b). Suppose that under certainty firm i, $(i = 1,2,....,N)$ chooses its level of output q_i and R&D investments for process innovation R_{1i} and product innovation R_{2i} assuming that this choice has no effect on the choice of domestic rivals (Cournot conjectures). Domestic firms take also into account the output supplied by foreign firms, denoted by Q^F, either by imports M or by FDI, S^F:

$$Q^F = M + S^F$$

The inverse demand function takes then the following form:

$$p = p\,(q_i + Q^D, Q^F, R_{2i})$$

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It is assumed that product innovation shifts prices up while any increase in supply, be it domestic or foreign, shifts prices down. The individual decision of firm i can be expressed by the following maximization problem:

$$\max{}_{q_i R_{1i} R_{2i}} [p \ (q_i + Q^D, Q^F, R_{1i} - c \ (R_{1i})] q_i - R_{1i} - R_{2i}$$

Where process innovation is supposed to reduce costs. The first order conditions are given by the following equations:

$$\frac{\delta p}{\delta q_i} q_i + (p - c) = 0$$

$$-c' q_i - 1 = 0$$

$$\frac{\delta p}{\delta R_{2i}} q_i - 1 = 0$$

where the omitted arguments for *p(.)* and *c (.)* are as above. Taking into account the first order conditions and the strategic interaction between domestic and foreign firms, a solution for *q_i*, *R_{1i}* and *R_{2i}* can be found. These can be represented by the following functions:

$$q_i = q_i (Q^D, Q^F, M)$$

$$R_{1i} = R_{1i} (Q^D, Q^F, M)$$

$$R_{2i} = R_{2i} (Q^D, Q^F, M)$$

Without further assumptions the comparative static with respect to *Q^D*, *S^F* and *M* cannot be determined. These comparative effects would depend on domestic market characteristics and the strategic interaction between domestic and foreign firms.

Bertschek (1995) adopts a monopolistic competition framework. The effects of imports and FDI in this setting are straightforward, due to the zero profit assumption. This implies that foreign supply, be it FDI or import competition, shifts prices down and

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thus domestic firms have to respond by increasing their investments in product and process innovations to reestablish their profitability.

Veugelers and Vanden Houte (1990), instead, model explicitly the behavior of domestic firms and multinationals in the presence of entry barriers. In their case the effects of foreign presence crucially depend on the relative cost-margins between domestic and foreign firms, as well as on the degree of reduction in R&D investments that can be predicted.

We will now investigate empirically these effects using a sample of Uruguayan manufacturing firms.

3.   R&D and foreign presence in the Uruguayan industry

The data used in this paper comes from the yearly survey on manufacturing industries conducted by Statistical National Institute of Uruguay and from a complementary survey of the Department of Economics of the University of Uruguay. The data corresponds to the period 1988-1990. It includes all firms with more than 5 workers in manufacturing industries at a 4-digits level.

There are two variables related to R&D investments. The first one represents the total R&D expenditure, including investments, salaries and other costs, while the second one corresponds to quality control investments. Despite the fact that we have information about the monetary values of R&D expenditures, we prefer to consider only the binary decision (investing or not investing), since it is likely that there are large measurement errors on the reported values of R&D investments.

For general R&D investments, excluding quality control, we define a dummy variable, which takes the value 1 if the firm incurred in any R&D expenditure and 0 otherwise, and we denote it as **RD**. For the second type of expenditure, investments in quality control, we define another dummy variable, **Qc**. Hence **RD** may be intended both for product and process innovations, while **Qc** is by definition only directed towards product innovation, and these will be our dependent variables.

To include a variable that describes the size of the firm, we define the variable **SCAL** as firm's sales over total industry sales at a 4-digit level. The relationship between the size of firms and R&D activity has been always a matter of debate. The Schumpeterian tradition postulates a positive relation, while strategic considerations suggest that there could be an inverse relationship for some industries, as bigger firms are usually associated with non competitive environments where there are less incentives towards innovation.

We define total domestic sales, **DOM**, as imports plus total industry sales at a 4-digit level. We deflate this variable to 1988 prices. Foreign presence is accounted for by two variables. First, we compute the importance of foreign direct investment in each

industry, **FDI**, through the ratio of the sales of foreign owned firms over total domestic sales. We also compute the importance of imports, **M**, at each industry through the ratio of imports over total domestic sales.

We finally define a dummy variable, **EXP**, that takes the value 1 if the firm has exported and 0 otherwise. We also define dummies for firms in the food, raw materials, investment goods and consumption goods sectors (**FOOD, RAW, INV** and **CON**) and dummies for years, **DUM88**, **DUM89** and **DUM90**.

Descriptive statistics for all the variables are presented in Table 1. It can be seen that as expected, only a reduced number of firms engage in R&D expenditures of any kind, accounting for only 12% of the total number of firms. A slightly higher number of firms make expenditures related to quality control, implying that product improvements may be more important that process innovation. Foreign firm supply represents in average 16% of industry sales, while imports represent around 25% of domestic sales.

The time variation is not very important. The only noticeable changes over time are an increase in the expenditures in quality control, an increase in import competition and an increase in the number of exporting firms, which is likely related to the fall of trade barriers.

We provide now a more detailed description of the allocation of innovative activities at the different industries. The first six industries with respect to their share in total Gross Value Added are 3111 (meat products), 3211 (spinning, weaving and finishing textiles), 3530 (petroleum refineries), 3116 (grain mill products), 3220 (wearing apparel, except footwear) and 3112 (dairy products). With the exception of petroleum refineries (a public monopoly) the rest are industries with a clear export orientation. There is another set of industries with export orientation and an intermediate importance in total Gross Value Added. These are 3121 (food products n.e.c.), 3233 (whips and riding crops), 3114 (canning, preserving and processing of fish, crustacean and similar foods), 3521 (paints, varnishes and lacquers), 3240 (footwear except rubber or plastic) and 3213 (knitted and crocheted products). These are in general industries with younger firms than the previous group.

Table 1: Descriptive Statistics (528 observations per year)

	Variable Name	Mean	Standard Error	Min.	Max.
Dummy for total R&D expenditure (1 if firm made any expenditure)	R&D88	0.12	0.32	0	1
	R&D89	0.12	0.32	0	1
	R&D90	0.12	0.33	0	1
Dummy expenditure in quality control (1 if firm made any expenditure)	QC88	0.26	0.44	0	1
	QC89	0.27	0.44	0	1
	QC90	0.27	0.44	0	1
Scale	SCAL88	0.11	0.18	0	1
	SCAL89	0.11	0.18	0	1
	SCAL90	0.11	0.18	0	1
Foreign Direct Investment	FDI88	0.16	0.20	0	0.87
	FDI89	0.16	0.19	0	0.85
	FD190	0.16	0.21	0	0.83
Imports	M88	0.22	0.26	0	1
	M89	0.22	0.26	0	1
	M90	0.24	0.26	0	1
Domestic Competition (current millions pesos)	DOM88	33.8	40.4	0.1	135.9
	DOM89	60.9	70.8	0.2	241.8
	DOM90	124.7	146.7	0.7	526.1
Dummy for exports (1 if firm made any exports)	EXP88	0.33	0.47	0	1
	EXP89	0.34	0.48	0	1
	EXP90	0.36	0.48	0	1
Type of industries	FOOD	0.24	0.43	0	1
	RAW	0.18	0.39	0	1
	INV	0.20	0.40	0	1
	CON	0.28	0.49	0	1

Total number of firms and average size is also smaller in this group. In both groups of industries approximately 10% of the firms engage in R&D expenditures, and 30% of the firms invest in quality control. These are mostly industries related to the import-substitution period, with some exceptions (most notably 3521 and 3112).

Industries where imports are important are 3843 (motor vehicles), 3522 (drugs and medicines), 3560 (plastics products n.e.c.), 3512 (fertilizers and pesticides), and 3511 (basic industrial chemicals except fertilizers). These are older industries than those in the previous group and with a greater variability of average sizes. In this set of industries 20% of the firms incur in R&D activities, and 40% invest in quality control. These are industries that have experienced some growth as the economy started being opened to foreign competition.

A third set of industries is formed by those mainly oriented towards domestic markets and with small import competition. Industries in this group are 3117 (bakery products), 3134 (soft drinks & mineral water), 3411 (pulp, paper and paperboard), 3819 (manufactured metal products except machinery and equipment n.e.c), 3140 (tobacco products), 3523 (soap and cleaning preparations, perfumes, cosmetics and other toilet preparations), 3559 (rubber products n.e.c.), 3133 (malt liquors and malt) and 3118 (sugar factories and refineries). In this set of industries 12% engage in R&D investments and 25% in quality control.

Finally, foreign presence in manufacturing industries is significant. We define foreign firms in a discrete way: if more than 50% of assets are hold by non resident owners, then we consider a firm as foreign. The importance of foreign firms in manufacturing industries, measured as share on gross value of production, is increasing during the 1980s. It increased from 10% in 1980 to 25% in 1988. At the end of this decade foreign firms represented a 5% of manufacturing firms, 16% of the labor force and 23% of exports.

In Table 2 we show the industries at a 3-digit level with the highest participation of foreign firms. Foreign firms are in general of larger size than domestic firms. Entry of foreign firms was especially important during the period 1931 to 1955, as shown by the survivors in 1988. Entry of foreign firms is smaller during the 1970s and 1980s, but the importance of foreign firms is increasing. Foreign firms that entered before 1973 are usually oriented towards the domestic market. These were firms that usually entered with the objective of substituting imports to supply the domestic market. Foreign firms that entered after 1973 usually have a higher export orientation.

Table 2: Industries with the highest foreign participation

Industry	SIC-code	Participation in gross value of production
Beverages	313	72%
Pharmaceuticals and medicines	352	67%
Food	312	66%
Basic chemical	352	55%
Machinery	383	43%
Metal products	381	39%
Iron and steel	371	35%
Textile	321	34%

4. Estimation results

According to the discussion of section 2, we propose the following two equations for estimation:

$$RD = \beta_0 + \beta_1 SCAL_i + \beta_3 FDI_i + \beta_4 M_i + \beta_5 \log DOM_i +$$

$$\beta_7 EXP_i + \beta_8 RAW + \beta_9 INV + \beta_9 CON +$$

$$\beta_{10} DUM88 + \beta_{11} DUM89 + \varepsilon_i$$

$$Qc = \gamma_0 + \gamma_1 SCAL_i + \gamma_3 FDI_i + \beta_4 M_i + \gamma_5 \log DOM_i +$$

$$\gamma_7 EXP_i + \gamma_8 RAW + \gamma_9 INV + \gamma_9 CON +$$

$$\gamma_{10} DUM88 + \gamma_{11} DUM89 + \omega_i$$

where we introduce some non-linearity by including the square value of **SCAL** and **DOM** in logs, plus two dummy variables to account for differences across years (**DUM88**, **DUM89**). Stochastic errors are denoted by ε and ω. Given the binary nature of our dependent variables we adopt a probit approach. The results of the estimation are presented in Table 3. The test for the joint significance of the coefficients (-2 log L) rejects the null hypothesis at a 5% level.

The results can be interpreted as follows. Using **RD** or **Qc** the estimations do not change in any significant way. **RD** gathers investments intended for both product or process innovation while **Qc** are expenses directed to product improvements. In previous studies, for instance Zimmermann (1987), imports have a positive effect on product innovation, but negative on process innovations. In our case, the main

difference is that the coefficient for **FDI** is positive and significant at a 10% level in the first case, while it is not significant in the second case, but the coefficient for imports is negative in both cases. We have to take into account that in our case we do not have a pure process innovation variable.

The firm size variable, **SCAL**, enters non-linearly but with a positive effect. The result is in line with the Schupeterian conjectures that big firms carry out most innovative activities, and in contrast with the Arrow conjecture pointing out that the incentives for innovation are more reduced in concentrated industries, due to a decrease in competitive pressures.

The results for **FDI** and import competition, **M**, seem to go in the same line as Zimmermann (1987) and Veugelers and Vanden Houte (1990), but contrasting with Bertschek (1995). FDI has a positive sign but is not always significant, while M is negative and highly significant. This is not surprising, as the nature of the innovative activity of German firms studied in the Bertscheck paper, are very different in nature to the innovative activities of firms in developing countries. Innovative activities are a competitive strategy for the former, while are of a defensive and imitative nature for the latter. In the Belgian case, as suggested by Veugelers and Van de Houte, multinationals and foreign capital in general may also prefer to locate in developing countries' industries due to their low R&D intensity. This negative effect of foreign presence on local R&D investments may be related with the lower scale and profitability of domestic firms as compared to foreign firms, or a low degree of substitutability between their products, as suggested by Veugelers and Vanden Houte.

Exporting firms seem to be more innovative than non-exporting. This is shown by a positive sign of the **EXP** variable. This seems to be an effect of the opening of the economy. Furthermore, even considering these imitative and defensive strategies towards innovation, industries belonging to the previous import-substituting period will reduce their innovative practices, while firms that are able to export will increase this type of activities.

Comparing to the food industries (base case) and the consumption goods industries, the raw materials and investment goods industries show a higher intensity of R&D activities. It seems that the main inter industry process of reallocation of resources is taking place from the food and consumption goods industries, that were protected and were the main target of import-substituting policies, towards non traditional industries especially raw materials and investment goods industries. Finally, the coefficients for the time dummies are not significant, as expected from section 3.

In sum, the results of this paper seem to show that in the case of a small developing country, domestic firms tends to reduce their R&D investments in the presence of foreign firm competition, especially through imports. In the case of exporting firms the incentives for R&D investments are higher.

Table 3: Probit estimation

Variable	Dependent Variable R&D	Dependent Variable Qc
Intecept[a]	-5.75 [a] (0.74)	-5.03 [a] (0.58)
SCAL	6.45 [a] (0.73)	4.96 [a] (0.66)
$SCAL^2$	-4.99 [a] (0.85)	- 3.87[a] (0.80)
FDI	0.42 [b] (0.23)	0.20 [c] (0.19)
M	-0.79 [a] (0.26)	-1.30 [a] (0.23)
log DOM	0.23 [a] (0.04)	0.24 [a] (0.03)
EXP	0.19 [b] (0.10)	0.43 [a] (0.08)
DUM88	-0,04 [c] (0,11)	-0,04 [c] (0,09)
DUM89	- 0.02 [c] (0.11)	-0.02 [c] (0.09)
RAW	0.44 [a] (0.15)	0.43 [a] (0.12)
INV	0.51 [a] (0.17)	0.30 [a] (0.14)
CON	-0.02[c] (0.12)	-0.08[c] (0.10)
-2 log L (Chi-square)	196.4	269.7

a Significant at a 5% level except otherwise noted.
b Significant at a 10% level.
c Non significant.
Standard Error are in parentheses.

5. Conclusions

There is ambiguous evidence about the impact of increasing imports or FDI on the innovative activities of firms in developed countries. While some studies seem to show a positive effect, especially when industries are competitive and their innovative activities can be defined as a competitive strategy, for other countries with oligopolistic industry structures, the presence of foreign competition seems to reduce R&D investments.

In this paper we have studied this issue for a developing country. We use information on the Uruguayan manufacturing sector to assess the impact of increased import competition and foreign firm presence, caused by a trade liberalization process, on the innovative activities of firms.

The results show that FDI has a positive but not always significant effect on R&D investments, while import-competition has a negative and significant effect. This result goes in line with the evidence for developed countries with industries that have an oligopolistic structure and there are significant entry barriers. This is also consistent with the nature of innovative activities for firms in developing countries, which have an imitative and defensive nature.

Another relevant result is that export-oriented firms seems to have a higher incentive to invest in R&D than traditional firms in industries originally targeted by import-substituting policies. This seems to be one of the main effects of trade liberalization policies with respect to R&D investments. Not only there is an important shift of resources from import-substituting sectors to export-oriented sectors, but, if we adopt a broad definition for innovation that includes also imitative and adaptive practices, export-oriented firms become more innovative than firms in traditional industries.

The overall effects of trade liberalization processes on the technological capacity are not clear. It is clear that the impact of trade policy reform on economic performance will be crucially influenced by the domestic capacity in assimilating new technologies. The cases of successful industrialization in East Asia have been always associated with heavy investments in R&D. If firms exposed to foreign competition tend to reduce their investments in R&D, as suggested by our data, there is scope for selective industrial policy directed to the creation of a local technological base, especially targeted to the sectors that are already successful in exporting high value-added products.

References

- BERTSCHEK, I. (1995), "Product and Process Innovation as a Response to Increasing Imports and Foreign Direct Investment ", Journal of Industrial Economics, 33(4): 341-357.

 CAVES, R. (1974). "Industrial Organization", in Dunning, J., editor, *Economic Analysis of the Multinational Enterprise.* Allen & Unvin, London.

- DASGUPTA, P. & STIGLITZ, J. (1980a), "Industrial Structure and the Nature of Innovate Activity", Economic Journal, 90: 266-93.

- DASGUPTA, P. AND J. STIGLITZ (1980b), "Uncertainty, Industrial Structure and the Speed of R&D", Bell Journal of Economics, 11: 266-93.

- FAVARO, E. & SPILLER, P. (1991). "Uruguay" in Papageorgiu, D., M. Michaely, and A. Choski, editors, *Liberalizing Foreign Trade*, volume 1, chapter 3, pages 321-407. Blackwell, Cambridge: Massachusetts.

- FREEMAN, C. (1989). *The Economics of Industrial Innovation.* Francis Pinter, London. 2nd edition.

- KOKKO, A. (1994), "Technology, market characteristics, and spillovers", Journal of Development Economics, 43: 279-293.

- KOKKO, A., TANSINI, R. & ZEJAN, M. (1995) "Trade Liberalization in Uruguay. Domestic and Foreign Firms". Presented at 70th Annual WEA International Conference, San Diego, California, USA.

- KOKKO, A., TANSINI, R. & ZEJAN, M. (1996) "Local Technological Capability and Productivity Spillovers from FDI in the Uruguayan Manufacturing Sector". Journal of Development Studies, Vol. 32, N. 4, April.

- LAKE, A. (1979). "Technology Creation and Technology Transfer by Multinational Firms", in Haawkins, R., editor, *The Economic Effects of Multinational Corporations*, pages 133-177. JAI Press, Greenwich.

- RAUT, L. (1995). "R&D Spillover and Productivity Growth: Evidence from Indian Private Firms", Journal of Development Economics, 48: 1-23.

- SCHERER, F. & HUH, K. (1992), "R&D Reactions to High-technology Import Competition", Review of Economics and Statistics, 2: 202-212.

- VEUGELERS, R. AND P.VANDEN-HOUTE (1990), "Domestic R&D in the Presence of Multinational Enterprises", International Journal of Industrial Organization, 8: 1-15.

- ZIMMERMANN, K. (1987), "Trade and dynamic efficiency", Kiklos, 40: 73-87.