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ABSTRACT

This paper examines the impact of the operations of foreign-owned multinational firms on the productivity growth of Mexican manufacturing industries, 1965-1984. It investigates both the extent to which the penetration of a sector by foreign-owned firms affects the productivity of local firms in that sector and whether there is any evidence of convergence between that industry's productivity level and that of the United States. The main results can be summarized as follows: First, productivity levels of locally-owned firms in Mexico have converged to those of foreign-owned firms. Second, both the rate of productivity growth of local firms and their rate of catch-up to the multinationals are positively related to the degree of foreign ownership of an industry. Third, the productivity gap between Mexico and U.S. manufacturing has diminished between the mid-1960s and the mid-1980s. Fourth, the rate of productivity growth of Mexican industries and its rate of convergence to the United States are higher in industries with a greater presence of multinationals. We conclude that multinational firms have contributed to a geographical diffusion of technology and acted as a bridge between advanced and less advanced countries.

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I. Introduction

An important strand of literature on economic development is the so-called convergence school, based on Gerschenkron's (1952) advantages of backwardness thesis, which has gained currency in recent years. It is argued that a country's potentiality for productivity growth is affected by the relative backwardness of the country vis-á-vis the advanced industrial nations. The more backward the country, the higher the rate of productivity growth achievable by acquiring the technology of the advanced nations. At least among industrialized countries, a strong inverse relation between the rate of productivity growth and the country's initial relative productivity level is indicated from Baumol (1986), Baumol and Wolff (1988), and Wolff (1988) on the aggregate level, and evidence from Dollar, Wolff, and Baumol (1987) and Dollar and Wolff (1988) suggests that these relations also hold on the individual industry level, at least in manufacturing.

With regard to developing countries, there has been almost no work on convergence. Indeed, results from Baumol and Wolff (1988) indicate that as a group, less developed countries (LDCs) have been diverging from the developed countries in terms of productivity over the postwar period. However, the performance among the LDCs has been far from uniform. This indicates that the realization of the potentiality for productivity catch-up simply because of backwardness depends strongly on another set of causes, some of which are internal, others external to the countries themselves (see Abramovitz, 1986).

Among the external factors that may influence a country's productivity, the multinational corporation (MNC) deserves special attention. In recent times the MNC has become one of the most important agents in the production of technology and it plays a major role in the international diffusion of new technology. However, despite the enormous amount of controversy over the transfer of technology by multinationals, both in their home and host countries, there are no studies dealing with the role of these firms in productivity convergence among countries.

In this paper we examine the impact of the operations of foreign owned multinational firms on the productivity growth of Mexican manufacturing industries. We investigate both the extent to which the penetration of a sector by foreign-owned firms affects the productivity of local firms in that sector and whether there is any evidence of convergence between that industry's productivity level and that of the United States. Thus, we concentrate on intra-industry influences and focus primarily on external effects or "spillovers" of foreign direct investment.

A few earlier studies have tried to test for the existence of such technology spillovers (e.g. Blomström, 1989, Caves, 1974, and Globerman, 1979), and they all found some support for the spillover benefit hypothesis. However, because of great methodological difficulties in investigating these effects, and a relative paucity of data, none of these studies was able to analyze the nature of spillover efficiency in any depth. Furthermore, none of them tried to evaluate the importance of such spillovers for productivity growth in the host country.

The remainder of the paper has two major sections: the first focuses on

the productivity spillovers between domestic and foreign firms in Mexico and the second on Mexico's international catch-up. There is also a brief summary section at the end.

II. Convergence between foreign and local firms in Mexico

A. Multinationals, Technology Transfer, and Convergence

The convergence hypothesis asserts that when the productivity level of one (or several) country(ies) is substantially superior to that of a number of other economies, largely as a result of differences in their productive techniques, then those laggard countries that are not too far behind the leaders will be in a position to embark upon a catch-up process. This catch-up process will continue so long as the economies that are approaching the leader's performance continue to have the possibility of learning from the leader. However, as the distance between the two groups narrows, the stock of knowledge unabsorbed by the laggards will grow smaller and approach exhaustion. The catch-up process will then tend to terminate unless some supplementary and unrelated influence fortuitously comes to play. Meanwhile, those countries that are so far behind the leaders that it is impractical for them to profit substantially from the leaders' knowledge will generally not be able to participate in the convergence process at all, and many such economies will find themselves falling even further behind.

The most important influence underlying this hypothesis is the transfer of technology that constantly takes place among economies. Technology may be transferred from one place to another through a variety of channels, but in the postwar period, the multinational corporations have become the most

powerful institution for the spread of new technology. Multinational firms not only establish subsidiaries abroad, but they also transfer technology through a number of other arrangements, including licensing, franchising, management contracts, marketing contracts, and technical service contracts.

Subsidiary production, or what we might call foreign direct investment, is still the dominant mode in which multinational firms exploit their intangible assets in foreign markets, and there are several ways in which such investment may facilitate diffusion of technology from advanced to developing countries. One is simply that the multinationals set up operations in developing countries that are beyond the technological capabilities of host country firms. Even if there is no leakage of the technology to local firms, there would still be a geographical diffusion of technology, but without any change in its ownership.

Technology transfer through foreign direct investment can also result in indirect productivity gains for host developing countries through the realization of external economies. Generally these benefits are referred to as "spillovers", which indicates the importance of the way in which the influence is transmitted. There are several ways in which these spillovers may occur. Presumably the most important channel is via competition (see Blomström, 1986). Existing inefficient local firms may be forced by the competition of foreigners to make themselves more productive by investing in physical or human capital or importing new technology.

Another source of gain to the host economy is the training of labor and management provided by the multinationals, which may then become available to the economy in general. Since such resources are in a short supply in

developing countries, this type of spillover efficiency is expected to be more important there.

A third potential source of spillover efficiency benefits is through the impact made by the foreign subsidiaries in the host economy on their local suppliers, by insisting that they meet standards of quality control, delivery dates, prices, etc. This aspect should be particularly important in countries like Mexico, where legislation requires domestic content.

While all these influences would cause positive long run effects on host country productivity there are, to be sure, also several offsetting forces at work. First, technology transfer within multinationals is far from free (see Teece, 1976). It involves a substantial commitment of real resources and a sequence of overlapping stages of activities. This will slow down the technology transfer process and make multinationals unwilling to share information. Second, the technology that is used by the MNC may be inappropriate for local firms in developing countries, because of the relative factor proportions that they face. Both of these positions would suggest little technology spillover between the MNC and the local firms in the country. Third, Lall (1980) argues that imports of technology through foreign investment may work as an important first injection to local technological development, but that too much reliance on foreign technology may retard the basic design and development activity in the host country, causing negative long run effects on productivity.

To determine whether the presence of MNCs acts as a catalyst or a hindrance to the productivity growth in Mexico we begin by investigating productivity convergence among foreign and local firms in Mexican manufac-

turing industries. For that purpose we use unpublished data from the Mexican Census of Manufactures 1970 and 1975 (see Appendix). These are the only two years for which data by ownership are available. Though the period is unfortunately short, the results are nonetheless quite strong. We first investigate trends within 20 broad manufacturing industries, and then perform a regression analysis.[1]

B. Aggregate Trends

It is clear from Table 1 that, in 1970, foreign firms displayed higher labor productivity than Mexican firms. The productivity of foreign firms, measured both in value-added and gross output, was more than 2 times that of local firms on average. Among Mexican firms, labor productivity was significantly higher in state-owned than in privately-owned firms, although the state companies were not as efficient as the affiliates of the multinationals.

To a large extent, the differences in labor productivity can be explained by differences in the firms' capital intensity. This can be seen in Table 2, which shows the firms' capital-labor ratio as a fraction of the overall capital labor-ratio of the industry. The capital intensity was 2.5 times higher in foreign firms than in the privately-owned Mexican, but, interestingly, about the same as in the state-owned firms. However, the greater efficiency of multinationals relative to both state-owned and privately-owned firms in Mexico still holds for total factor productivity (TFP). As Table 3 indicates, the foreign firms' TFP measured in gross output was 34 per cent higher than that of local firms on average, with the difference being highest in tobacco (150 per cent higher), petroleum (138 per

cent), rubber (89 cent), and transport equipment (78 per cent). In lumber and wood products, chemicals, and miscellaneous manufacturing, local firms' TFP exceeded that of the multinationals.

However, the data in Table 4 indicate that Mexican firms caught up with the multinationals over time. Between 1970 and 1975, the multinationals' productivity lead in terms of labor productivity diminished in the manufacturing sector as a whole, as well as in three-fourths of the individual manufacturing industries. There was also a tendency towards convergence in total factor productivity over the same period, but these figures should be interpreted with great caution, since the capital stock figures for 1970 and 1975 are not directly comparable (see the Appendix).

In sum, we find rather large productivity differences between foreign and local firms in Mexico, but that the foreign firm's lead has been diminishing. To examine whether this productivity catch-up is related to the presence of multinationals and the existence of spillovers between foreign and local firms, we will now relate the latter productivity growth to the presence of foreign firms in various industries.

C. Regression Analysis

Two regression forms are used. The dependent variable, in the first, is the rate of productivity growth of local firms within an industry, and, in the second, it is the rate of convergence in labor productivity levels between local and foreign firms within a sector. These variables are related to the degree of foreign ownership of the industry and the gap in labor productivity between local and foreign-owned firms in 1970, as well as two other explanatory

variables.

As Table 5 shows, the results are consistent in the two regression forms. Both productivity growth in local firms and productivity convergence between local and foreign firms are faster in industries with a greater share of employment accounted for by multinationals.[2] Mexican firms' productivity growth and the rate of catch-up to the MNCs are also higher in sectors where the initial disparity in productivity levels between local and foreign firms is greater, a result which accords well with the advantages of backwardness thesis. Furthermore, in sectors with higher capital-labor ratios, the productivity growth of locally-owned firms and the rate of catch-up are lower. This suggests that spillover gains from the new technology of multinationals are easier to incorporate when the investment requirements are small. Finally, convergence seems to be faster in industries with slower output growth, but output growth does not affect the rate of productivity growth of local firms. This suggests that the competitive pressures from the presence of multinationals in an industry is greater in relatively stagnant industries. In rapidly-growing sectors, inefficient local firms can continue to survive without improving their productivity, but in slow-growing industries, the inefficient local firms could be driven out by the multinationals.[3]

The results so far suggest that there exist technology spillovers from foreign direct investment, with a resulting convergence in productivity between foreign and local firms in Mexico, but are these spillover benefits large enough to generate an international catch-up? We now turn to this question by looking at the extent to which there has been a convergence of labor productivity levels between Mexico and the United States.

III. International catch-up?

A. Aggregate Trends

We begin by comparing the productivity levels of foreign and domestic firms in Mexico with those of the United States in 1970.[4] As Table 6 shows, foreign firms were very close to the U.S., both in terms of labor productivity and TFP, while local firms in Mexico were far behind. The MNCs' labor productivity and TFP both averaged 93 per cent that of the United States, and in several industries they even exceeded the U.S. levels. Labor productivity in Mexican firms, on the other hand, averaged only 39 per cent of the United States. However, the technology gap, as measured by TFP, was smaller, at 60 percent, which reflects the considerably higher capital intensity of U.S. production. The productivity levels for foreign and local firms taken together correspond rather well with those reported in Maddison and van Ark (1989).

The finding that the foreign affiliates were so close to the United States in terms of productivity while local firms were lagging behind, certainly suggests that multinational firms have contributed to a geographical diffusion of technology and acted as a bridge between advanced and less advanced countries. But is this international diffusion of technology enough for an international catch-up? Table 7 presents the convergence in productivity between Mexico and the United States 1970-1975. Overall, there seems to be no catch-up going on over the 5-year period, but it varies a lot among industries. In seven industries the U.S. productivity lead diminished, while it increased in 13 industries. Results on convergence are similar for the 2-digit industry sample which includes only 4-digit Mexican industries with

MNCs present, though, as expected, the Mexican productivity figures are higher. This is suggestive. Since foreign participation varies among industries it may very well be that foreign investment is related to international catch-up in one way or another. We will come back to this question below in our regression analysis.[5]

With data from the United Nations we were able to examine the convergence of labor productivity between Mexico and the United States between 1965 and 1984 (Table 8).[6] During this longer period there was a clear convergence of productivity levels in all industries for which data are available. The biggest catch-up took place during the second half of the 1960s, but slowed down thereafter. Between 1970 and 1975 there was very little convergence, just as the census data in Table 7 suggested.

8. Regression Analysis

Since the main purpose of this study is to analyze the role of MNCs in productivity convergence among countries, we will, finally, by regression analysis, try to go deeper into that question by relating a sectors' productivity catch-up to the degree of foreign ownership. As mentioned above, there are both direct and indirect effects on total industry productivity of foreign direct investment. The direct effect is that an increase in the share of multinationals in an industry will increase the productivity level of the whole industry, simply because MNCs have higher productivity than local firms. The indirect effect, on the other hand, is the technological spillover between the multinationals and the local firms. Because of data availability for the pre-1970 and the post-1975 period, these two effects cannot be separated in

the regression.

As before, two regression forms are used. The dependent variable, in the first, is the rate of productivity growth of Mexican industries (local plus foreign firms), and, in the second, it is the rate of convergence in labor productivity levels between Mexican and U.S. industries. These variables are related to the degree of foreign ownership of an industry in Mexico and the initial Mexican-U.S. productivity gap. Both foreign ownership and the initial productivity gap are significantly related to productivity growth within the Mexican industry and its speed of catch-up to the corresponding U.S. productivity level (see Table 9). This holds for both the longer 1965-77 and 1965-84 period, as well as the shorter 1970-75 period.[7] The capital-labor ratio is again significant and negative for productivity growth in Mexico, suggesting that catch-up with the United States is faster when the investment requirements are lower. Finally, output growth is here statistically insignificant.

IV. Conclusion

Four principal findings emerge from this study. First, productivity levels of locally-owned firms in Mexico have converged on those of foreign-owned firms. Second, both the rate of productivity growth of local firms and their rate of catch-up to the multinationals are positively related to the degree of foreign ownership of an industry. Third, the productivity gap between Mexico and U.S. manufacturing has diminished between the mid-1960s and the mid-1980s. Fourth, the rate of productivity growth of Mexican industries and its rate of convergence to the United States are higher in industries with

a greater presence of multinationals. The results support the advantages of backwardness thesis in two senses: first, between more advanced and more backward countries and, second, between more modern and more backward segments of an industry.

The results also suggest that local firms in Mexico have gained productivity "spillovers" from the presence of multinational firms in the Mexican economy. However, there is another possibility, namely, that competitive pressure from multinationals forces out the inefficient local firms. This is consistent with the finding that convergence between local and foreign firms is faster when output growth is lower, though this finding might also be due to greater efficiency gains of local firms during periods of slack demand. With the data at hand, we cannot distinguish between these two possibilities.

There is strong evidence that the presence of multinational firms acts as a catalyst to the productivity growth in Mexico and that foreign direct investment speeds up the convergence process between Mexico and the United States. However, the available data do not allow us to say whether this is due to productivity "spillovers" or simply to the fact that MNCs are more productive than Mexican firms. Although we could not reject the spillover benefit hypothesis, the productivity convergence between Mexico and the United States might also be due, wholly or in part, to the direct effect of foreign investment. This possibility is strengthened by the finding that the productivity levels of the foreign affiliates in Mexico were very close to those in the United States, while the Mexican firms were lagging far behind. Thus, an increase in the share of multinationals within an industry will increase the level of productivity within the total Mexican

industry, without any productivity growth among local firms. Furthermore, the importance of this direct effect is strengthen by the fact that the largest catch-up effect was registered between 1965 and 1970, a time when Mexico received a large injection of foreign investment.[8]

In general, we conclude that multinational firms have contributed to a geographical diffusion of technology and acted as a bridge between advanced and less advanced countries.

Footnotes

[1]Data on the proportion of output and employment accounted for by foreign firms in Mexican manufacturing industries are provided in Blomström (1989).

[2]Results are similar for the share of industry output accounted for by MNCs.

[3]This "excise effect" will be explored more fully in a later paper. Regressions were also performed on the 4-digit industry level. The results were similar, but less robust, probably because of the greater noise in the data at the more disaggregated level.

[4]As indicated in the footnote of Table 6, the exchange rate was used to convert Mexican pesos to U.S. dollars. See Maddison and van Ark (1989) for a discussion.

[5]It should be noted that this period is atypical, since 1975 was a recession year in Mexico, but not in the United States.

[6]Compared to the data used earlier, the UN data are based on samples of firms. Most likely, large firms are over-represented in the sample data, since they show higher labor productivity than do the Census data (compare figures in Tables 7 and 8). An interesting question for future research is, therefore, whether only parts of the Mexican industry (the "modern" part) is converging, while others (the "traditional" sector) are not. Such a pattern was suggested in Blomström (1986), and should be examined further.

[7]The fact that the results are slightly weaker for the 1965-84 period than for the 1965-77 period is likely due to the effects of the debt crisis on Mexican productivity performance after 1982.

[8]We know that the United States dominates the foreign investment activities in Mexico. For instance, the U.S. Department of Commerce reports that in 1977, U.S. multinationals employed 302,000 people in Mexican manufacturing industries. The closest year for which Mexican data are available is 1975, and then all foreign firms in manufacturing employed 312,549 people. Between 1966 and 1977, the employment in U.S. majority-owned affiliates in Mexico increased from 102,000 to 171,000 (there are no data on minority-owned affiliates for 1966).

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Table 1

Comparison of Labor Productivity Levels Between Foreign and Domestic Firms in Mexico, 1970[a]

Productivity Level by Segment as a Fraction of The Overall Productivity Level of the Industry

	Value Added per Employee				Gross Output per Employee			
		Locally-Owned		Total		Locally-Owned		Total
Industry[b]	MNC	State	Private	Domest.[c]	MNC	State	Private	Domest.[c]
20-Food	2.19	0.78	0.85	0.84	2.12	0.79	0.86	0.85
21-Tobacco	1.17	--	0.16	0.16	1.16	--	0.19	0.19
22-Textile Mill	1.43	0.62	0.96	0.94	1.38	0.60	0.97	0.95
23-Apparel	2.48	1.75	0.95	0.96	2.31	1.92	0.95	0.96
24-Lumber & Wood	2.41	1.42	0.92	0.95	2.58	1.13	0.93	0.94
25-Furniture	1.41	1.85	0.94	0.97	1.10	1.93	0.95	0.99
26-Paper	1.33	1.51	0.87	0.91	1.52	1.22	0.83	0.86
27-Printing & Publishing	2.00	0.99	0.95	0.95	1.72	0.86	0.97	0.97
28-Chemicals	1.28	0.94	0.75	0.77	1.17	1.20	0.82	0.86
29-Petroleum & Coal	2.04	1.63	0.54	0.74	1.87	1.60	0.60	0.78
30-Rubber & Plastics	2.50	--	0.65	0.65	2.36	--	0.68	0.68
31-Leather	1.87	1.36	0.98	0.98	1.70	3.36	0.98	0.98
32-Stone, Clay & Glass	1.74	0.88	0.90	0.90	1.84	0.81	0.89	0.88
33-Primary Metals	1.13	1.13	0.79	0.92	1.16	1.11	0.78	0.91
34-Fabricated Metals	1.51	3.70	0.87	0.89	1.42	4.22	0.89	0.91
35-Non-Elec. Equip.	1.47	1.54	0.75	0.76	1.59	2.21	0.68	0.69
36-Electric Equip.	1.49	--	0.74	0.74	1.47	--	0.75	0.75
37-Transport Equip.	1.37	1.07	0.62	0.75	1.53	1.06	0.47	0.65
38-Instruments	1.54	--	0.75	0.75	1.68	--	0.69	0.69
39-Miscel. Manuf.	1.45	--	0.90	0.90	1.25	--	0.95	0.95
Total Manuf.	1.88	1.33	0.75	0.79	1.85	1.53	0.75	0.80

a. Basic data are from worksheets provided by la Direccion de Estadistica de la Secretaria de Industria y Commercio in Mexico. See the Appendix for details.

b. Industries are classified by U.S. SIC code and include all four-digit SICs in each industry. See the Appendix for detailed Mexican industry codes included in each U.S. SIC code.

c. The total domestic sector is defined as the sum of state-owned and privately-owned firms, a separation which is available only for 1970.

Table 2

Comparison of Capital-Intensity Levels Between Foreign and Domestic Firms in Mexico, 1970[a]

Industry[b]	Capital-Labor Ratio by Segment as a Fraction of The Overall Capital-Labor Ratio of the Industry			
	MNC	Locally-Owned State	Locally-Owned Private	Total Domestic[c]
20-Food	2.06	2.32	0.75	0.86
21-Tobacco	1.13	--	0.37	0.37
22-Textile Mill	1.48	0.58	0.95	0.94
23-Apparel	2.48	1.62	0.95	0.96
24-Lumber & Wood	4.67	1.24	0.84	0.87
25-Furniture	1.14	1.50	0.97	0.99
26-Paper	1.61	2.95	0.69	0.83
27-Printing & Publishing	2.33	1.44	0.92	0.94
28-Chemicals	1.28	1.33	0.70	0.76
29-Petroleum & Coal	1.01	1.36	0.92	1.00
30-Rubber & Plastics	1.95	--	0.78	0.78
31-Leather	2.45	1.59	0.96	0.96
32-Stone, Clay & Glass	1.75	0.65	0.90	0.89
33-Primary Metals	1.10	0.92	0.96	0.94
34-Fabricated Metals	1.66	3.52	0.84	0.86
35-Non-Elec. Equip.	1.65	3.69	0.63	0.66
36-Electric Equip.	1.43	--	0.77	0.77
37-Transport Equip.	1.31	1.25	0.60	0.79
38-Instruments	2.25	--	0.43	0.43
39-Miscel. Manuf.	1.62	--	0.87	0.87
Total Manuf.	1.85	1.85	0.73	0.80

a. Basic data are from worksheets provided by la Direccion de Estadistica de la Secretaria de Industria y Commercio in Mexico. See the Appendix for details. The 1970 capital stock figures are based on capital invertido.

b. Industries are classified by U.S. SIC code and include all four-digit SICs in each industry. See the Appendix for detailed Mexican industry codes included in each U.S. SIC code.

c. The total domestic sector is defined as the sum of state-owned and privately-owned firms, a separation which is available only for 1970.

Table 3

Comparison of TFP Levels Between
Foreign and Domestic Firms in Mexico, 1970[a]

	TFP Level by Segment as a Fraction of The Overall TFP Level of the Industry							
	Value Added Index				Gross Output Index			
		Locally-Owned		Total		Locally-Owned		Total
Industry[b]	MNC	State	Private	Domest.[c]	MNC	State	Private	Domest.[c]
20-Food	1.29	0.42	1.02	0.93	1.25	0.42	1.03	0.94
21-Tobacco	1.05	--	0.35	0.35	1.05	--	0.42	0.42
22-Textile Mill	1.14	0.80	0.98	0.98	1.10	0.77	0.99	0.98
23-Apparel	1.37	1.31	0.97	0.98	1.28	1.43	0.98	0.98
24-Lumber & Wood	0.82	1.26	1.00	1.02	0.87	1.00	1.01	1.01
25-Furniture	1.31	1.45	0.95	0.98	1.03	1.52	0.97	1.00
26-Paper	0.98	0.71	1.06	1.01	1.12	0.57	1.02	0.95
27-Printing & Publishing	1.20	0.81	0.99	0.98	1.04	0.70	1.01	1.00
28-Chemicals	1.08	0.77	0.93	0.90	0.99	0.99	1.01	1.01
29-Petroleum & Coal	2.03	1.28	0.58	0.74	1.86	1.25	0.64	0.78
30-Rubber & Plastics	1.57	--	0.75	0.75	1.49	--	0.79	0.79
31-Leather	1.10	1.05	1.00	1.00	1.00	2.61	1.00	1.00
32-Stone, Clay & Glass	1.22	1.09	0.95	0.95	1.29	1.01	0.94	0.94
33-Primary Metals	1.07	1.20	0.81	0.96	1.09	1.17	0.80	0.94
34-Fabricated Metals	1.11	1.56	0.95	0.97	1.04	1.78	0.97	0.99
35-Non-Elec. Equip.	1.07	0.61	0.95	0.94	1.16	0.87	0.86	0.86
36-Electric Equip.	1.20	--	0.85	0.85	1.18	--	0.86	0.86
37-Transport Equip.	1.16	0.93	0.81	0.85	1.30	0.92	0.61	0.73
38-Instruments	0.92	--	1.09	1.09	1.00	--	0.99	0.99
39-Miscel. Manuf.	1.11	--	0.97	0.97	0.96	--	1.01	1.01
Total Manuf.	1.24	0.87	0.90	0.90	1.22	1.01	0.90	0.91

a. Basic data are from worksheets provided by la Direccion de Estadistica de la Secretaria de Industria y Commercio in Mexico. The 1970 capital stock figures are based on capital invertido. TFP is measured as a ratio of an industry's output Y to a weighted average of employment (L) and capital stock (K):

$$TFP = Y/[\alpha L + (1-\alpha)K]$$

where α is the industry's wage share.

b. Industries are classified by U.S. SIC code and include all four-digit SICs in each industry. See the Appendix for detailed Mexican industry codes included in each U.S. SIC code.

c. The total domestic sector is defined as the sum of state-owned and privately-owned firms, a separation which is available only for 1970.

Table 4

Productivity Convergence Between Foreign and Domestic Firms in Mexico, 1970-75[a]

	Ratio of Productivity Levels Between Domestic Firms and Foreign Firms						
	All 4-Digit Industries					4-Digit Ind. With MNCs	
Industry[b]	Value Added per Employee 1970	Gross Output per Employee 1970	Gross Output per Employee 1975	TFP 1970	TFP 1975	Gross Output per Employee 1970	Gross Output per Employee 1975
20-Food	0.39	0.40	0.50	0.75	0.54	0.48	0.59
21-Tobacco	0.14	0.16	--	0.40	--	0.16	--
22-Textile Mill	0.66	0.69	0.65	0.89	0.87	0.79	0.64
23-Apparel	0.39	0.42	0.71	0.77	1.36	0.42	0.72
24-Lumber & Wood	0.39	0.37	0.44	1.16	1.19	0.36	0.44
25-Furniture	0.69	0.90	0.53	0.97	0.71	0.91	0.53
26-Paper	0.68	0.56	1.02	0.85	0.79	0.56	1.02
27-Printing & Publishing	0.48	0.56	0.76	0.96	0.86	0.56	0.76
28-Chemicals	0.60	0.73	0.69	1.02	0.84	0.75	0.70
29-Petroleum & Coal	0.36	0.42	0.59	0.42	0.69	0.53	0.64
30-Rubber & Plastics	0.26	0.29	0.46	0.53	0.93	0.29	0.46
31-Leather	0.52	0.58	0.72	1.00	1.16	0.59	0.73
32-Stone, Clay & Glass	0.52	0.48	0.57	0.72	0.84	0.52	0.62
33-Primary Metals	0.81	0.78	0.79	0.87	0.75	0.78	0.79
34-Fabricated Metals	0.59	0.64	0.68	0.95	1.00	0.64	0.68
35-Non-Elec. Equip.	0.52	0.44	1.04	0.74	1.09	0.44	1.06
36-Electric Equip.	0.49	0.51	1.13	0.73	1.23	0.51	1.13
37-Transport Equip.	0.55	0.42	0.36	0.57	0.45	0.43	0.36
38-Instruments	0.49	0.41	0.54	0.99	1.36	0.49	0.57
39-Miscel. Manuf.	0.62	0.76	0.66	1.06	1.01	0.76	0.68
Total Manuf.	0.42	0.43	0.61	0.75	0.79	0.47	0.64

a. Basic data are from worksheets provided by la Direccion de Estadistica de la Secretaria de Industria y Commercio in Mexico. The TFP figures are based on gross output in each year, but for 1970 the capital stock figures are based on capital invertido, while for 1975, they are based on activos fijos brutos. Since the two concepts differ, comparisons based on the TFP figures in columns four and five of the table should be interpreted with caution. See the Appendix for details.

b. Industries are classified by U.S. SIC code. The results in the first five columns are based on all four-digit SICs in each industry. The results in the last two columns are based on only the four-digit SICS in which MNCs are present in either 1970 or 1975. See the Appendix for detailed Mexican industry codes included in each U.S. SIC code.

Table 5

Regression Analysis of Productivity Catch-Up between Foreign and Locally-Owned Firms in Mexico[a]

	Dependent Variable:			
Independent Variables	LPGLOC	LPGLOC	LPGLOC	CONVLF
Constant	-0.048	0.147*	0.172**	0.219**
	(1.52)	(2.94)	(3.47)	(3.06)
FORSHARE	0.351**	0.245**	0.372**	0.734**
	(3.59)	(3.34)	(4.06)	(5.53)
LFLPGAP70		-0.318**	-0.313**	-0.446**
		(4.35)	(4.24)	(4.18)
OUTPGRTH			-0.188	-0.166**
			(0.89)	(5.41)
KL1970			-0.482*	-0.709*
			(2.15)	(2.18)
R^2	0.42	0.72	0.79	0.80
$\bar{R}^2$	0.38	0.69	0.73	0.75
Std. Err σ	0.078	0.055	0.051	0.074
Sample Size[b]	20	20	20	20

[a] Estimated coefficients are shown together with the absolute value of the t-statistic in parentheses. Key:

LPGLOC: annual rate of growth of gross output per employee in locally owned firms, 1970-75.
FORSHARE: share of employment in foreign-owned firms in total industry employment, averaged between 1970 and 1975.
LFLPGAP70: ratio of gross output per employee in local firms to gross output per employee in foreign firms, 1970.
OUTPGRTH: average annual rate of growth of industry output, 1970-1975.
KL1970: industry capital-labor ratio in 1970.
CONVLF: ratio of LFLPGAP75 to LFLPGAP70.

[b] Basic data are from worksheets provided by la Direccion de Estadistica de la Secretaria de Industria y Commercio in Mexico. Industries are classified by 2-digit U.S. SIC code and include all four-digit SICs in each industry. See the Appendix for details.

* Significant at the .05 level (two-tailed test).
** Significant at the .01 level (two-tailed test).

Table 6

Mexican Productivity Level by Segment and Industry
As a Proportion of U.S. Productivity Level by Industry, 1970[a]

Industry[b]	Value Added per Employee			TFP		
	MNC	Domestic	Total	MNC	Domestic	Total
20-Food	0.94	0.36	0.43	1.05	0.64	0.71
21-Tobacco	0.45	0.06	0.39	0.46	0.15	0.43
22-Textile Mill	1.09	0.72	0.76	1.17	0.95	0.98
23-Apparel	1.65	0.64	0.67	0.65	0.51	0.51
24-Lumber & Wood	0.69	0.27	0.29	0.50	0.43	0.43
25-Furniture	1.03	0.71	0.73	0.82	0.62	0.63
26-Paper	0.84	0.57	0.63	0.92	0.85	0.87
27-Printing & Publishing	0.82	0.39	0.41	0.64	0.48	0.49
28-Chemicals	0.85	0.51	0.66	1.15	0.87	1.01
29-Petroleum & Coal	0.48	0.17	0.24	1.15	0.42	0.57
30-Rubber & Plastics	1.66	0.43	0.67	1.76	0.71	1.00
31-Leather	0.97	0.51	0.52	0.50	0.47	0.47
32-Stone, Clay & Glass	0.79	0.41	0.46	0.85	0.59	0.63
33-Primary Metals	0.76	0.62	0.67	1.07	0.94	0.99
34-Fabricated Metals	0.55	0.33	0.37	0.58	0.46	0.48
35-Non-Elec. Equip.	0.66	0.34	0.45	0.57	0.47	0.52
36-Electric Equip.	1.10	0.54	0.73	0.96	0.66	0.79
37-Transport Equip.	0.73	0.40	0.53	0.78	0.55	0.65
38-Instruments	0.87	0.42	0.56	0.42	0.56	0.48
39-Miscel. Manuf.	0.51	0.32	0.35	0.51	0.42	0.44
Total Manuf.	0.93	0.39	0.49	0.93	0.60	0.69

a. Basic data are from worksheets provided by la Direccion de Estadistica de la Secretaria de Industria y Commercio in Mexico. The U.S. data for GDP by Industry in current dollars and full-time and part-time employees are from NIPA tables. 1970 Mexican value added was converted to 1975 pesos on the basis of the Mexican GDP deflator and then to 1975 US dollars on the basis of the 1975 exchange rate. The 1970 U.S. value added was converted from 1982$ to 1975$ using the U.S. GDP deflator. The TFP index is based on value added. The Mexican 1970 capital stock figures are based on capital invertido; the U.S. capital stock figures are from: Musgrave, John C., "Fixed Reproducible Tangible Wealth in the United States: Revised Estimates," Survey of Current Business, Vol. 66, No. 1, January, 1986, 51-75. Since the two concepts differ, the last three columns should be interpreted with caution. The productivity ratios are relative to the productivity levels of the whole U.S. industry.

b. Industries are classified by U.S. SIC code and include all four-digit SICs in each industry. See the Appendix for detailed Mexican industry codes included in each U.S. SIC code.

Table 7

Convergence in Productivity between Mexico and the U.S.:
Ratio of Mexican to U.S. Value Added per Employee, 1970 & 1975[a]

	All 4-Digit Mexican Industries Included			Only 4-Digit Mex. Ind. With MNCs Included		
Industries[b]	1970	1975	Ratio	1970	1975	Ratio
20-Food	0.43	0.44	1.01	0.52	0.52	0.99
21-Tobacco	0.39	0.45	1.15	0.39	0.45	1.15
22-Textile Mill	0.76	0.79	1.04	0.85	0.87	1.02
23-Apparel	0.67	0.51	0.76	0.68	0.52	0.76
24-Lumber & Wood	0.29	0.27	0.94	0.29	0.27	0.94
25-Furniture	0.73	0.59	0.81	0.73	0.59	0.81
26-Paper	0.63	0.57	0.90	0.63	0.57	0.90
27-Printing & Publishing	0.41	0.44	1.06	0.41	0.44	1.06
28-Chemicals	0.66	0.60	0.90	0.68	0.61	0.89
29-Petroleum & Coal	0.24	0.21	0.87	0.29	0.22	0.75
30-Rubber & Plastics	0.67	0.64	0.96	0.67	0.64	0.96
31-Leather	0.52	0.43	0.82	0.53	0.43	0.82
32-Stone, Clay & Glass	0.46	0.50	1.10	0.49	0.54	1.10
33-Primary Metals	0.67	0.66	0.98	0.67	0.66	0.98
34-Fabricated Metals	0.37	0.46	1.24	0.37	0.46	1.24
35-Non-Elec. Equip.	0.45	0.51	1.14	0.45	0.52	1.15
36-Electric Equip.	0.73	0.55	0.75	0.73	0.55	0.75
37-Transport Equip.	0.53	0.38	0.72	0.53	0.38	0.72
38-Instruments	0.56	0.46	0.81	0.64	0.48	0.75
39-Miscel. Manuf.	0.35	0.35	0.99	0.36	0.36	1.00
Total Manuf.	0.49	0.48	0.98	0.53	0.51	0.96

a. Basic data are from worksheets provided by la Direccion de Estadistica de la Secretaria de Industria y Commercio in Mexico. The U.S. data for GDP by Industry in current dollars and full-time and part-time employees are from NIPA tables. 1970 Mexican value added was converted to 1975 pesos on the basis of the Mexican GDP deflator; 1975 pesos were then converted to 1975 US dollars on the basis of the 1975 exchange rate. The 1970 U.S. value added was converted from 1982$ to 1975$ using the U.S. GDP deflator.

b. Industries are classified by U.S. SIC code. The results in the three five columns are based on all four-digit SICs in each industry. The results in the last two columns are based on only the four-digit SICS in which MNCs are present in either 1970 or 1975. See the Appendix for detailed Mexican industry codes included in each U.S. SIC code.

Table 8

Convergence of labor Productivity between Mexico and the U.S.:
Ratio of Mexico to U.S. Value added per employee, 1965-85[a]

Industry	1965	1967	1970	1975	1977	1979	1982	1984
20-Food	0.42	0.50	0.51	0.52	0.62	0.56	0.47	0.51
21-Tobacco	0.35	0.54	0.55	0.92	1.00	1.04	0.87	0.75
22-Textile Mill	NA	NA	0.54	0.55	0.51	0.61	0.60	0.66
23-Apparel	NA	NA	NA	NA	NA	NA	NA	NA
24-Lumber & Wood	0.47	0.54	0.55	0.51	0.64	0.91	1.10	1.11
25-Furniture	NA	NA	NA	NA	NA	NA	NA	NA
26-Paper	NA	0.56	0.67	0.68	0.60	0.61	0.61	0.68
27-Printing & Publishing	NA	NA	NA	NA	NA	NA	NA	NA
28-Chemicals	0.43	0.55	0.69	0.52	0.51	0.51	0.50	0.60
29-Petroleum & Coal	0.22	0.51	0.25	0.34	0.25	0.26	0.15	0.37
30-Rubber & Plastics	1.10	1.40	1.71	1.34	1.14	1.32	1.32	1.85
31-Leather	NA	NA	NA	NA	NA	NA	NA	NA
32-Stone, Clay & Glass	0.56	0.64	0.68	0.78	0.73	0.75	0.91	0.79
33-Primary Metals	0.55	0.58	0.68	0.64	0.58	0.62	0.64	0.83
34-Fabricated Metals	NA	NA	0.51	0.45	0.45	0.51	0.53	0.61
35-Machinery, exc. Electrical	NA	0.38	0.69	0.69	0.72	0.88	0.86	0.84
36-Electric Equip.	NA	NA	0.70	0.63	0.63	0.74	0.66	0.83
37-Transport Equip.	NA	NA	NA	0.53	0.43	0.61	0.59	0.57
38-Instruments	NA	NA	NA	NA	NA	NA	NA	NA
39-Miscel. Manuf.	NA	NA	NA	NA	NA	NA	NA	NA

a. Data for Mexican value added and average number of employees are from: United Nations, Industrial Statistics Yearbook, various years. The U.S. data for GDP by Industry in current dollars and full-time and part-time employees are from NIPA tables. Before 1977, Mexico value added is net of non-industrial services purchased from others. For Mexico, current pesos were first converted into 1975 pesos using the Mexican GDP deflator and then converted to 1975 dollars using the actual 1975 exchange rate. For U.S., GDP in current dollars was converted into 1975 dollars using the U.S. GDP deflator. Because of a discontinuity in the Mexican value added series between 1976 and 1976, Mexican value added after 1977 was adjusted as:

$$VA^*_t = VA_t(VA_{76} \cdot (GO_{77}/GO_{76})/VA_{77})$$

where VA is value added and GO is gross output. See Appendix for Mexican industries included in each U.S. SIC Gode.

Table 9

Regression Analysis of Productivity Catch-Up between Mexican and U.S. Industries[a]

Independent Variables	Dependent Variable				
	LPG7075	LPG6577	LPG6584	CONV6577	CONV6584
Constant	-0.069**	0.030*	0.257*	0.104**	0.106**
	(3.49)	(2.38)	(3.04)	(13.4)	(15.8)
FORSHARE	0.081*	0.078**	0.047**	0.039**	0.024*
	(2.22)	(4.21)	(3.79)	(3.43)	(2.44)
$MEXUSGAP_0$	-0.083*	-0.070**	-0.036*	-0.042**	-0.028*
	(2.65)	(3.49)	(2.42)	(3.14)	(2.38)
OUTPGRTH	-0.125				
	(1.48)				
KL1970	-0.234*				
	(2.46)				
R^2	0.46	0.72	0.63	0.64	0.49
$\bar{R}^2$	0.31	0.66	0.56	0.58	0.40
Std. Err σ	0.022	0.013	0.009	0.008	0.007
Sample Size[b]	20	20	20	20	20

[a] Estimated coefficients are shown together with the absolute value of the t-statistic in parentheses. Key:

LPG7075: annual rate of growth of value added per employee in Mexican industry, 1970-75.
FORSHARE: share of employment in foreign-owned firms in total industry employment, averaged between 1970 and 1975.
$MEXUSGAP_0$: ratio of value added per employee in Mexican industry to value added per employee in corresponding U.S. industry at the beginning of the period.
OUTPGRTH: average annual rate of growth of industry output, 1970-1975.
KL1970: industry capital-labor ratio in 1970.
CONV6577: ratio of $MEXUSGAP_1$ to $MEXUSGAP_0$, where subscript 1 designates the end of the period.

[b] The variables LPG6577, LPG6584, CONV6577, and CONV6584 are compute from data in United Nations, Industrial Statistics Yearbook, various years. All other Mexican data are from worksheets provided by la Direccion de Estadistica de la Secretaria de Industria y Commercio in Mexico. Industries are classified by 2-digit U.S. SIC code and include all four-digit SICs in each industry. The U.S. data are from NIPA tables. See the Appendix for details.

* Significant at the .05 level (two-tailed test).
** Significant at the .01 level (two-tailed test).

Appendix: Data Sources and Methods

I. Documentation for Mexican Data on Multinationals and Domestic Firms.

A. Sources: The data on foreign and Mexican firms were provided by la Direccion de Estadistica de la Secretaria de Industria y Commercio in Mexico, and are from the Mexican Census of Manufactures, 1970 and 1975. The data are gathered at the plant level and cover the entire manufacturing industry, which is divided into 230 4-digit manufacturing industries. Because of missing information, 15 industries had to be discarded. In the regression analysis of productivity growth, on the 4-digit level, another 70 industries had to be discarded because of a change in the classification system between 1970 and 1975. In particular, all 4-digit industries in 1970 that were divided into two or more industry classed in 1975 were excluded.

Ownership is divided into three categories in the 1970 data: foreign, state-owned, and privately-owned. In 1975, it is divided into two categories: foreign and Mexican. Companies whose share are at least 15 percent foreign owned are classified as "foreign." If the Mexican state owns more than 49 per cent of a plant, it is defined as state-owned, even if foreigners own 15 per cent or more of its outstanding shares.

There are no capital stock figures that are comparable between 1970 and 1975. For 1970, we use capital invertido, which is the book value of net property, plant and equipment plus intangible capital. For 1975, we use activos fijos brutos, which is the gross value of property, plant, and equipment. Mexican deflators for GDP and gross fixed capital formation were derived from tables in United Nations, National Accounts Statistics: Main Aggregates and Detailed Tables, 1983.

B. Concordance Scheme between U.S. 2-Digit SIC codes and Mexican 4-Digit SIC Codes

2-Digit U.S. SIC Code	1970 Mexican 4-Digit Codes	
	All Ind.	Ind. with MNCs
20 - Food and Kindred Products		
	2011	2011
	2012	2012
	2021	2021
	2022	2022
	2023	2023
	2024	2024
	2025	2025
	2031	2032
	2032	2034
	2033	2041
	2034	2051
	2041	2055
	2051	2058
	2052	2059
	2053	2061
	2054	2062
	2055	2071

2056	2073
2057	2081
2058	2082
2059	2083
2061	2084
2062	2085
2071	2091
2072	2093
2073	2094
2081	2095
2082	2096
2083	2097
2084	2098
2085	2099
2091	2111
2092	2113
2093	2121
2094	2131
2095	2132
2096	2141
2097	
2098	
2099	
2111	
2112	
2113	
2121	
2123	
2131	
2132	
2141	

21 - Tobacco Manufactures

2211	2211
2212	2212
2213	2213

22 - Textile Mill Products

2311	2311
2312	2312
2313	2313
2315	2315
2316	2316
2319	2319
2321	2321
2322	2322
2323	2323
2331	2334
2333	2341
2334	2343
2341	2344
2342	2346
2343	

2344	
2345	
2346	

23 - Apparel and Other Textiles

2421	2421
2422	2422
2423	2424
2424	2434
2425	
2426	
2427	
2431	
2432	
2433	
2434	
2439	

24 - Lumber and Wood Products

2511	2511
2512	2512
2521	2521
2522	2533
2531	2534
2533	
2534	

25 - Furniture and Fixtures

2612	2621
2621	3521
3521	

26 - Paper and Allied Products

2711	2711
2712	2712
2721	2721
2722	2722
2723	2723

27 - Printing and Publishing

2811	2811
2812	2812
2813	2813
2814	2814

28 - Chemicals and Allied Products

3111	3111
3112	3112
3113	3113

3121	3121
3122	3122
3131	3131
3132	3132
3141	3141
3151	3151
3161	3161
3162	3162
3171	3171
3172	3191
3191	3194
3192	3195
3193	3196
3194	3199
3195	
3196	
3199	

29 - Petroleum and Coal Products

3213	3213
3221	3221
3222	

30 - Rubber and Misc. Plastics Products

3011	3011
3012	3012
3013	3013
3181	3181

31 - Leather and Leather Products

2411	2411
2412	2413
2413	2911
2911	2912
2912	

32 - Stone, Clay and Glass Products

3311	3311
3312	3312
3321	3321
3322	3323
3323	3324
3324	3329
3329	3341
3341	3342
3342	3351
3343	3352
3351	3354
3352	
3353	
3354	

33 - Primary Metal Industries

3411	3411
3412	3412
3413	3413
3421	3421
3422	3422
3423	3423
3424	3424

34 - Fabricated Metal Products

3511	3511
3512	3512
3513	3513
3514	3514
3517	3517
3531	3531
3541	3541
3542	3542
3543	3543
3544	3544
3545	3545
3546	3546
3547	3547
3549	3549
3987	3987

35 - Machinery, except Electrical

3611	3611
3621	3621
3631	3632
3632	3641
3641	3651
3651	3652
3652	3653
3653	3654
3654	3655
3655	3656
3656	3659
3659	

36 - Electric and Electronic Equipment

3711	3711
3721	3721
3722	3722
3723	3723
3724	3724
3731	3731
3741	3741
3742	3742
3743	3743

3749	3749

37 - Transportation Equipment

3811	3811
3821	3821
3831	3831
3832	3832
3834	3834
3841	3841
3842	3842
3843	

38 - Instruments and Related Products

3911	3911
3912	3912
3921	3921
3922	3922
3931	3931
3984	

39 - Miscellaneous Manufacturing Industries

3941	3942
3942	3951
3951	3961
3961	3971
3971	3981
3981	3982
3982	3983
3983	3986
3985	3988
3986	
3988	

II. Documentation for Mexican industries included in U.N. data.

ISIC	Industry Name	Beginning of Series
311/2	preparation and preserving of meat	1965
	condensed and evaporated milk and milk powder	1965
	canning of fruits and vegetables	1965
	canning of fish and shellfish	1965
	wheat mills	1965
	corn flour	1969?
	tea and instant coffee	1969?
	chewing gum	1965
	biscuits and pastries	1965
	yeast, baking powder, starch and similar products	1965
	vegetable oils and margarine	1965
	prepared foods for animals and fowls	1965
313	malt	1969?
	beer	1965

	soft drinks	1975
	carbonated water	1975
314	cigarettes	1965
321	spinning, weaving and finishing of cotton, artificial fibres and henequen	1967?
	manufacture of yarns	1969?
	manufacture of cashmere textiles, shawls and similar products	1969?
	manufacture of wool	1973?
331	manufacture of plywood, veneer and lamina	1965
341	manufacture of pulp from fibre, paper and paperboard	1965
	manufacture of articles of paperboard, including oil impregnated board	1965
351	manufacture of cellulosic fibres and other artificial fibres	1965?
	manufacture of fertilizers	1965?
352	manufacture of matches and candles	1965?
	soap, detergents and other cleaning compounds	1967
	paints, varnishes and lacquers	1965
	drugs and medicines	1975?
354	manufacture of coke and other coal products	1965
	regeneration of lubricating oils including additives	1973
355	manufacture of tires and tubes	1965
362	manufacture of sheet glass, glass fibres,safety glass, and glass containers	1965?
369	manufacture of hydraulic cement, brick, fire-proof partitions, refractory mortar	1965?
	manufacture of asbestos products	1973
371	manufacture of iron and steel tubes and rods	1967
	founding, casting and rolling of iron and steel	1965
372	founding, refining, casting, extruding and drawing of copper and its alloys	1967
	casting, extruding and drawing of aluminum and manufacture of aluminum solders	1965?
381	manufacture of furniture and fixtures primarily of metal	1967?
	manufacture of crown caps and other cast and enamelled metal products	1967?
	manufacture of containers and other products from tin-plate	1973
382	manufacture and assembly of agricultural machinery and equipment	1965
	manufacture and assembly of typing, computing and accounting machinery	1973
383	manufacture of record-players and receiving sets of radio	1969

	and television	
	manufacture of condensers and batteries	1967
	manufacture and assembly of electrical apparatus and parts	1967
	manufacture of other electronic equipment and apparatus	1975
384	manufacture and assembly of motor vehicles, including tractors for trailers	1965
	manufacture of bodies for motor vehicles	1965
	manufacture of railroad equipment	1975

? indicates exact year of inclusion cannot be determined from UN Yearbook From 1975 to 1984, only 58 out of the 225 4-digit Mexican manufacturing industries are included in the U.N. tabulations.

Concordance scheme between U.S. 2-Digit SIC Codes and UN 3-Digit ISIC Codes.

U.S. SIC	UN ISIC
20 - Food and kindred products	311/2 - Food products
	313 - Beverages
21 - Tobacco manufactures	314 - Tobacco
22 - Textile mill products	321 - Textiles
23 - Apparel and other textiles	322 - Wearing apparel
24 - Lumber and wood products	331 - Wood products
25 - Furniture and fixtures	332 - Furniture, fixtures
26 - Paper and allied products	341 - Paper and products
27 - Printing and publishing	342 - Printing, publishing
28 - Chemicals and allied products	351 - Industrial chemicals
	352 - Other chemical products
29 - Petroleum and coal products	353 - Petroleum refineries
	354 - Petroleum, coal products
30 - Rubber and misc. plastics products	355 - Rubber products
	356 - Plastic products, n.e.c.
31 - Leather and leather products	323 - Leather and leather products
	324 - Footwear
32 - Stone, clay and glass products	361 - Pottery, china etc.
	362 - Glass and products
	369 - Non-metal products n.e.c.
33 - Primary metal industries	371 - Iron and steel
	372 - Non-ferrous metals
34 - Fabricated metal products	381 - Metal products
35 - Machinery, except electrical	382 - Machinery, n.e.c.
36 - Electric and electronic equipment	383 - Electrical machinery
37 - Transportation equipment	384 - Transport equipment
38 - Instruments and related products	385 - Professional goods
39 - Miscellaneous manufacturing	390 - Other industries

III. U.S. Data.

U.S. data are as follows: (i) GDP is from GDP by Industry in constant dollars, Table 6.02 of the National Income and Product Accounts; (ii) employment is from Full-time and part-time employees, Table 6.06 of the National Income and Product Accounts; (iii) capital stock figures are from: Musgrave, John C., "Fixed Reproducible Tangible Wealth in the United States:

Revised Estimates," Survey of Current Business, Vol. 66, No. 1, January, 1986, 51-75 ; and (iv) U.S. deflators for GDP and gross fixed capital formation were derived from tables in National Accounts, Main Aggregates, Volume I, 1960-84, OECD, Department of Economics and Statistics.