INTER-AMERICAN DEVELOPMENT BANK

INTEGRATION AND REGIONAL PROGRAMS DEPARTMENT

Intal

Institute for the Integration of Latin America and the Caribbean

ITD

Integration, Trade and Hemispheric Issues Division

STA

Statistics and Quantitative Analysis Unit

Regional Integration and Productivity: The Experiences of Brazil and Mexico

Ernesto López-Córdova
Mauricio Mesquita Moreira

INTAL - ITD - STA
Working Paper 14

Regional Integration and Productivity: The Experiences of Brazil and Mexico

Ernesto López-Córdova
Mauricio Mesquita Moreira

INTAL ITD-STA

July, 2003
Working Paper 14

The Institute for the Integration of Latin America and the Caribbean (INTAL), the Integration, Trade and Hemispheric Issues Division (ITD) and the Statistics and Quantitative Analysis Unit (STA) of the Integration and Regional Programs Department of the IDB have organized a joint publication series:

WORKING PAPERS

Refereed technical studies providing a significant contribution to existing research in the area of trade and integration.

OCCASIONAL PAPERS

Articles, speeches, authorized journal reprints and other documents that should be of interest to a broader public.

Inter-American Development Bank
Integration and Regional Programs Department

Institute for the Integration of Latin America and the Caribbean IDB - INTAL
Esmeralda 130, 16th and 17th Floors (C1035ABD) Buenos Aires, Argentina - http://www.iadb.org/intal

Integration, Trade and Hemispheric Issues Division
Statistics and Quantitative Analysis Unit
1300 New York Avenue, NW. Washington, D.C. 20577 United States - http://www.iadb.org/int

Printed in Argentina

INTAL-ITD-STA
Regional Integration and Productivity:
The Experiences of Brazil and Mexico
Buenos Aires, 2003. 60 pages.
Working Paper 14
Available in pdf format at:
http://www.iadb.org/intal and/or *http://www.iadb.org/int/itd*

I.S.B.N. 950-738-159-6

US$ 5.00

Editing:
Mariela Marchisio

C O N T E N T S

REGIONAL INTEGRATION AND PRODUCTIVITY: THE EXPERIENCES OF BRAZIL AND MEXICO

Ernesto López-Córdova *
Mauricio Mesquita Moreira *

What is the impact of integration on productivity? What are the main channels? Is there anything specific about productivity effects in regional agreements? This paper tries to answer these questions by looking at the experience of Brazil and Mexico. We estimate firm-level productivity and test its causal links with trade and foreign direct investment (FDI) variables. The results suggest strong trade related gains, with import discipline emerging as the dominant effect. The results on learning-by-exporting were mixed, with gains restricted to Brazil's regional and worldwide exports. On FDI, foreign firms appear to have had a positive impact on their buyers and suppliers in Mexico, but in Brazil, the overall impact was statistically insignificant on productivity levels and negative on productivity growth.

Contents

I. INTRODUCTION

One of the key motivations behind agreements such as the Free Trade Area of the Americas (FTAA) -a major endeavor of the so-called new regionalism- is the hope to increase productivity. Productivity growth, as known to economists ever since Adam Smith's pin factory, is not an end in itself. It is arguably the main source of economic growth and rising standards of living and, accordingly, of crucial importance to regions such as Latin America and the Caribbean, where long-term sustainable growth has been an elusive goal. Since the 1960s, growth in the region has been trailing behind East Asia's and in the last two decades it has fallen below the developing countries' average (IDB [2001]).

Growth accounting exercises suggest that Latin America has been not only slow in accumulating inputs, but also particularly bad in raising productivity. For instance, the World Bank [1991] estimates that the region's average productivity growth in the period 1967-1987 was zero, whereas the averages for East Asia and the developing countries as a whole were, respectively, 1.9 and 0.6 percent. The IDB [2001], in turn, estimates that productivity in Latin America has declined in the 1980s and 1990s, despite the gains obtained elsewhere, particularly in the developed world.

* Economists in the Integration, Trade and Hemispheric Issues Division of the Integration and Regional Programs Department of the Inter-American Development Bank (e-mail: López-Córdova: *joselc@iadb.org*; Mesquita Moreira: *mauriciomm@iadb.org*).

We are grateful to Robert Devlin, Antoni Estevadeordal, Ernesto Stein, Renato Flores and to other participants of the IDB/Intal-Harvard University *Regional Conference On Free Trade in The Americas*, Punta del Este, December 15-16, 2002, for comments on an earlier version of this paper. We also benefited from discussions with Marc Muendler, Alejandro Micco, Armando Castelar and Regis Bonelli. Fernando Puga and Ricardo Vera played a vital role in putting together the firm-level databases and we are especially grateful to INEGI and IBGE staffs, which were very helpful during the process of data construction.

Against this dismal background, it seems clear that by promising productivity gains the move to regional integration has touched a raw nerve in the region. Why and how these gains are supposed to be delivered and what is the empirical evidence available is the focus of this paper. It concentrates its attention on the two largest economies in the region, Brazil and Mexico, and on the performance of their manufacturing sectors. While these two, given the size, geography and relative sophistication of their economies, might not serve as good points of comparison for all Latin American countries, their experiences with, respectively, MERCOSUR and NAFTA provide a valuable "policy experiment" to assess the implications of regional integration for productivity.

The paper is divided into four sections including this introduction. Section II reviews very briefly what is the theory behind the links between integration and productivity and what are the hard facts coming out of the region. Section III takes up the case of Brazil and Mexico, presenting, first, a few stylized facts about these countries' integration strategies and ensuing manufacturing performance; and, second, an econometric exercise which tries to pin down what exactly was the impact of integration (i.e. trade and foreign direct investment) on productivity. Section IV draws all the relevant conclusions.

II. WHY REGIONAL INTEGRATION MATTERS FOR PRODUCTIVITY?

Regional integration is, perhaps more than anything, about promoting trade and investment among countries. One can argue, then, that the nature of the costs and benefits involved is, to a great extent, the same as that of a process of unilateral, non-preferential integration to the world economy. This is particularly true for the "channels" that might impact productivity. Yet, there are some important specificities, related to the preferential nature of the integration, which cannot be overlooked. For analytical purposes, though, it is worth looking first at the more general (non-preferential) case of integration and then move on to the specifics of the regional schemes.[1] The literature usually refers to two main channels through which integration might affect productivity: trade and foreign direct investment.

The Trade Channel

The linkages between trade and productivity are seen to operate in at least three dimensions: the economy as whole, the sector, and the firm. The first dimension is the best known and the arguments can be divided into two groups according to the dynamics of their productivity effects. The comparative advantage gains -i.e. resource reallocation towards the country's comparative advantages- immortalized by Ricardo and the scale gains -i.e. advantages of large scale production (see e.g. Helpman and Krugman [1985])- fall into the group of the "level effects". They tend to produce a once and for all jump in the level of productivity, but they do not provide fuel for constant improvements. The long-term impacts on productivity or "growth effects" would come from learning-by-doing (e.g. Young [1991]) and innovation gains (e.g. Grossman and Helpman [1991]). Either by moving resources towards sectors where the potential for learning is higher or by improving the country accesses to foreign knowledge, trade would have a permanent impact on the countries' ability to learn and produce knowledge, and, therefore, increase productivity.

On the lesser-known sectoral and firm dimensions of the trade-productivity nexus, four effects stand out in the literature:[2]

- Greater availability of world class inputs.
- Technology acquisition via import or exports.
- Import discipline.
- Higher turnover.

The *rationale* of the first effects is that trade would boost productivity by expanding the range of intermediate inputs available, and, therefore, allowing producer more flexibility in matching their input mix to the technology available (Ethier [1982]). The second link is about trade increasing producers' access to foreign knowledge via, e.g., imported intermediate inputs, imitation of import

---

[1] Hereafter, the term integration is used in the sense of the general process of economic (trade and investment) integration, be it preferential or otherwise.

[2] For a review of this literature see Tybout [2000] and [2001].

varieties (see e.g. Keller [2001]) and access to knowledgeable buyers (learning-by-exporting; see e.g. Westphal [2001]). The third effect would come through import discipline which would affect productivity in at least three ways: by reducing the slack in firm management (so-called X-efficiency); by forcing firms to increase their output and therefore improve their 'scale efficiency' and by increasing the firms' incentive to innovate. Finally, the high-turnover argument suggests "trade can promote industry productivity growth without necessarily affecting intra-firm efficiency" (Melitz [2002]). This is because the simultaneous expansion of imports and exports would force the least efficient firm to contract or exit and the most efficient to expand.

Among these four effects, those related to technology acquisitions and import discipline, for acting on the firms' acquisition of knowledge and incentive to innovate, would be more likely to boost productivity growth.

The Foreign Direct Investment Channel

On the FDI channel, the literature (see e.g. Blomström and Kokko [1998], and Markunsen and Maskus [2001]) points to four main effects:

- An entry effect.
- Competition.
- Knowledge spillovers.
- Linkage effects.

All these conduits are close cousins of the trade-related channels. The first is the FDI counterpart of the turnover argument. The idea is that the entry of "world class" competitors would raise the industry average productivity. One can also draw a parallel between the pro-competitive effect and the import discipline hypotheses. As in the case of trade, FDI is expected to improve firm management, raise scale efficiency and provide more incentives to innovation. Knowledge spillovers and linkage effects are the channels more likely to have long-term implications for productivity growth, since they might improve the firms' ability to innovate. FDI knowledge spillovers are said to take place when local firms increase their productivity by copying the technology of affiliates of foreign firms. Given the foreign firms' strong interest in protecting their competitive edge and, therefore, minimize technology transfer, spillovers would more likely be "vertical" (among their clients and suppliers) than "horizontal" (among their competitors) (Kugler [2000]). Finally, FDI is believed to generate positive pecuniary externalities (linkages effects) to local firms by improving the local supply (quality and variety) of intermediate goods (see e.g. Markusen and Venables [1999]).

What Does Regional Integration Specifically Bring to Productivity?

The preferential character of regional integration adds some specificity to the way trade and FDI channels operate. This is particularly important for the trade-related linkages, since the implications for FDI are mainly related to the level and type of flows and the impact on productivity is at best indirect (see e.g. IDB [2002], Chapter 10). On the trade side, there are two major issues worth considering: comparative advantage and the scale effects.

When integration is regional, the traditional, comparative advantage gains from trade are no longer assured given the possibility of trade diversion. Trade diversion reduces productivity because the importer country is not buying from the most efficient suppliers and the exporter country is moving away from its comparative advantage. The overall comparative advantage gain of regional integration, then, is ambiguous, depending upon the balance between trade creation and diversion.

When the issue is scale, the specificities of regional integration are not so clear-cut. What is readily evident is that the potential gains from scale are much higher in the context of a non-preferential, worldwide integration, than in a regional setting. The former offers the world, the latter only a region of this world. This, though, is just one part of the story. The other part lies on the uncertainty of these scale gains. There is always the threat of increasing returns industries being dislocated by imports. These scale losses might also have long-term negative implications for productivity growth, compromising the financial viability of R&D activities and the potential for learning. One can argue, then, that regional integration for involving a smaller number of partners lowers the risk of damaging dislocations, whereas, at the same time, boosts the scale advantages of the member-countries *vis-à-vis* the rest of the world.[3]

What Does the Evidence in the Region Show?

Looking first at the macro, economy-wide level, the results for the 1990s -the decade when virtually all of Latin America embraced integration- are mixed. Most studies suggest that the regional average total factor productivity growth (hereafter TFP) was negative or low, even by the region's standards (see e.g. IDB [2001]; Baier, Dwyer Jr. and Tamura [2002]; and Loyaza, Fajnzylber and Calderón [2002]). True, one can argue that these studies also show a considerable heterogeneity in the countries' TFP performances and that, despite this heterogeneity, most countries improved their performance *vis-à-vis* the 1980s. Yet, they, at the very least, indicate that for the majority of the countries in the region, the integration-related gains, if they existed, were not strong enough to offset other negative influences on productivity such as macroeconomic volatility.

If one tries to look at the sectoral level -more specifically at manufacturing, the most protected sector during the imports substitution years- the picture is not so gloomy. For instance, Figure 1 shows that labor productivity in the region's largest countries has grown substantially during the nineties, particularly in Argentina, Brazil and Mexico. These three countries outperformed the U.S. (though not Korea) by a large margin, probably reducing the productivity gap *vis-à-vis* the best practice. Although impressive, this evidence has some important pitfalls. First, since labor productivity does not take into account all the inputs used in production, it gives only a partial view of what actually has happened to technology. Second, this data only covers a handful of countries in the region, and third, as with the macro-evidence, it does not tell much about the causal relationship between integration, regional or otherwise, and productivity.

---

[3] One could also argue that regionalism by formally guaranteeing market access among member countries, reduces the uncertainty which might restrict the scale (or enlarged market) gains.

Studies based on firm-level data have made progress in addressing the first and the last of these problems, although the number of countries studied is still limited and some important methodological hurdles have yet to be overcome.[4] One could argue, though, that they are the "best information available". For instance, studies on Mexico, Brazil, Chile and Colombia report positive rates of TFP growth in manufacturing during the trade liberalization period (see, respectively, Tybout and Westbrook [1995]; Muendler [2002]; Pavcnik [2000] and Fernandes [2001]). They also find evidence of trade-productivity links, mainly through import discipline effects. There is little evidence, though, supporting the other trade effects. The exceptions are Pavcnik [2000] on Chile whose estimates suggest that import discipline would have been dwarfed by the turnover effect and Muendler [2002] on Brazil, which finds evidence of relatively unimportant turnover and imported inputs effects. It is also worth mentioning a few studies which have focus exports externalities but with mixed results. Clerides, Lach and Tybout [1998] found no evidence of learning-by-exporting on plant level data for Colombia (1981-1991) and Mexico (1984-1990), but World Bank [2000], based on plant-level data for Mexico 1990-1998, find suggestive signs of learning-by-exporting.

Finally, the (scarce) evidence on the FDI channel tends to support the prevalence of vertical (inter-industry) over horizontal (intra-industry) spillovers and to highlight the importance of the countries' absorptive capacity.[5] For instance, Aitken and Harrison [1999] find that horizontal spillovers are negative in Venezuela (1976-1989). Likewise, Kugler [2000] reports limited horizontal spillovers for Colombian manufacturing plants over 1974-1998, but finds evidence of "widespread inter-industry spillovers from FDI". Kugler's [op. cit] and Kokko, Tansini and Zejan's [1996] results support the relevance of the absorptive capacity, the latter focusing on Uruguayan plants (1988).

---

[4] For a general review see Tybout [2001]. The main hurdle is related to the lack of firm level price deflators. See Katayama, Lu and Tybout [2003].

[5] For a general review that includes studies from other regions see Blomström, Kokko and Zejan [2000].

Contents

III. INTEGRATION AND PRODUCTIVITY IN BRAZIL AND MEXICO

Both Brazil and Mexico moved towards integration after at least half a century of import-substitution policies. For some time these policies were effective in promoting growth and in pushing their economies through a substantial structural change. Yet, by the late seventies there were clear signs that this "model" was not sustainable. For instance, productivity after an initial period of high growth, set into a downward trend and by the early 1980s was clearly stagnated (see Bacha and Bonelli [2001]; and Pinheiro, Gill, Servén and Thomas [2001] on Brazil and World Bank [1998] on Mexico). This slowdown, compounded by macroeconomic mismanagement, eventually led to the collapse of the "old regime" amid the debt crisis of the 1980s. The countries' response to that technological and economic stagnation was integration into the world markets.

Mexico moved first and faster and by the early 1990s had already made substantial progress. Tariffs on a MFN basis fell from 28.5 percent in 1985 (the first year of trade liberalization) to 11.4 percent in 1993, while only 192 tariff lines were subject to import licenses -in contrast to all imports being subject to them in 1982- (Ten Kate [1992]; and López Córdova [2001]). In manufacturing, tariffs fell from around 30 percent in 1985 to 15.5 percent in 1993, although in general it was less subject to import licensing requirements. From 1994, and as a result of NAFTA, these tariffs experienced a rapid and further decline (see figure 2). Trade liberalization was accompanied by FDI deregulation, also deepened by NAFTA, which led to the removal of most sectoral restrictions and approval and performance requirements.[6]

Brazil, by contrast, took longer to open up. The removal of non-tariff barriers and a drastic drop in tariffs had to wait until 1990. The average MFN tariffs fell from 52 percent in 1987 to 9.9 percent in 1994 and edged up to 12.9 percent by 2000, reflecting Brazil's response to the 1995 Mexican crisis.[7] Tariffs on manufacturing followed a similar trend (see figure 3). As in Mexico, trade liberalization was deepened by a regional trade agreement, Mercosur, and was associated with a broad FDI deregulation. The former brought the intra-regional average tariff from 59.5 in 1987 (one year after the first Brazil-Argentina agreement) to close to zero in 2000 and the latter extended national treatment to foreign firms except for a few sectors.[8]

These policy changes had a profound impact on trade and investment flows in both countries. In Mexico, both imports and exports boomed. Total imports grew on average by 16.3 percent a year during 1985-2000, followed closely by exports, which reached an average growth of 14.2 percent year. Manufacturing exports and intraregional (NAFTA) trade were the key factors behind the export take-off. The share of manufactured goods in total exports rose from 27 in 1985 to 83 percent in 2000, whereas NAFTA's share of total Mexican trade went from 78 to 83 percent (and the share of total exports from 80 to 91 percent) during the same period.[9] FDI also experienced a rapid growth with average flows increasing from US$2.6 billion in 1980-1988 to US$5.7 billion

---

6 See Dussel Peters, Paliza and Diaz [2002] for details.

7 See Kume, Piani and Bráz de Souza [2000] for details.

8 E.g. investment in communication services.

9 Mexico trade data is from Banco of Mexico, *Http://www.banxico.org.mx*. Unless otherwise stated, figure includes "maquiladora" (i.e., in-bond assembly) trade.

in 1989-1993. During the initial NAFTA period (1994-2000), FDI flows seems to have received another boost, reaching an average of US$ 14.5 billion.[10]

In Brazil, the trade boom was mainly restricted to imports, which increased on average by 13.8 percent a year in the post-liberalization, 1990-2000, period. Exports also grew but at the much more modest rate of 5.8 percent. The changes in the export composition were also modest, with manufacturing exports increasing its share of total exports from 54 to 58 percent over the same period. Exports to Mercosur, though, proved to be more dynamic increasing at 16.8% percent a year, which increased the regional agreement's share of total exports from 5.6 percent in 1990 to 14 percent in 2000 (from 6 to 20 percent in the case of manufacturing exports). The share of Mercosur in Brazil's total trade followed a similar trend jumping from 7 to 14 percent over the same period.[11] FDI flows also responded to the new regime, but only after inflation was controlled in the second half of the nineties.[12] Average flows, which were close to US$1.3 billion in 1980-1994, climbed to US$19.3 billion in 1995-2000.

Figure 4 presents a good picture of what all these changes in trade flows meant for manufacturing in the two economies. There are three issues worth noting. First, the two countries were in distinctly different positions when they moved into trade liberalization. In the first year of Mexico's trade reforms, 1985, the import penetration ratio in manufacturing was 9.3 percent (Weiss [1999], not shown in the figure), whereas in Brazil, in an equivalent year (1989), the same figure was 4.9 percent. In other words, Brazil went much further down the import substitution road. Second, import penetration increased substantially in both countries, but the "openness gap" remained considerable and in favor of Mexico. And third, export ratios (excluding Mexico's "maquiladora" exports) also showed an upward, if more volatile, trend in both countries, but the gap between them was and remained much smaller than that of import penetration, despite the differences in export performance.[13]

Productivity Performance

In light of this substantial opening of the Brazilian and Mexican economies one should expect to find a measurable impact on economic efficiency in the two countries. The importance of this impact, though, should vary on a country-by-country basis given the differences, *inter alia*, in macroeconomic environment, initial "openness", depth and scope of the reforms and in the strategy of regional integration. Some of these issues are particularly relevant. For instance, as mentioned before, Mexico was considerably more open than Brazil when the new trade policy was put in place. One could argue, therefore, that Brazil stood to gain relatively more from opening up than Mexico, with productivity, at least in the first years of reform growing faster in the former than in the latter.

---

[10] Due to methodological changes, pre- and post-NAFTA figures are not strictly comparable. See Dussel Peters, Paliza and Diaz [2002].

[11] Brazi's trade data is from Secex, *Http://www.mdic.gov.br*.

[12] For details see Pinheiro, Giambiagi and Moreira [2001].

[13] Manufacturing exports (defined as SITC 5 to 8, except for 68) grew at an average rate of 22 percent a year in Mexico and of 5.4 percent a year in Brazil over 1990-2000.

On the other hand, on the issue of the depth and scope of reforms, there is little doubt, judging by the level of tariffs and trade indicators, that Mexico was much more aggressive in pursuing trade-related gains than Brazil. The option for a North-South regional integration agreement can be seen as part of this aggressiveness. By linking-up with the United States and Canada, given the differences in size and resources involved, Mexico got much closer to reproduce free trade at a multilateral level than Brazil with Mercosur. The latter, for involving countries of limited size and similar resources, was bound to offer more limited trade-related productivity gains (or costs), at least when seen as an end in itself. So, if one believes that integration gains tend to outweigh its costs, a reasonable premise would be that Mexico would present a better productivity performance, or at least would reap more trade-related gains, than Brazil.

In order to ascertain such possibilities, one first needs to gauge the behavior of productivity in the two economies. To this end, the following discussion relies on micro-data for the Brazilian and Mexican manufacturing sectors; the Appendix provides a description of the methodology used herein.[14]

Figure 5 presents aggregate indices of total factor productivity (TFP) for Brazilian and Mexican manufacturing during their periods of trade liberalization. Two estimates with similar firm-level methodologies covering different periods are included for each of the two countries: for Brazil, Muendler [2002], which covers most of the liberalization period (1986-1998) and this paper's estimates, which refers to the second half of the 1990s (1996-2000). For Mexico, Tybout and Westbrook's [1995], which cover Mexico's non-preferential liberalization (1986-1990) and this paper's estimates, which focus on the NAFTA period (1993-2000). Keeping in mind that this comparison should be taken with a pinch of salt, given that the methodologies are similar but not exactly the same, the results suggest that productivity growth in Mexico was higher during the first, non-preferential than in the "regional" period. One possible explanation would be that the policy changes were more radical in the fist period and, therefore, most of the "level effects" occurred during this period. A second possibility would be that there were factors other than trade policy, such as the 1994-1995 peso crisis, that might have affected the periods differently.

In the case of Brazil, the 1986-1998 estimate suggests that productivity growth was positive but significantly lower than that of Mexico in both periods, which might be seen as supporting the aggressiveness argument raised above. Yet, the estimates for the second half of the decade support the initial conditions argument, showing an impressive productivity growth, which outstrips that of Mexico's NAFTA period and it is close to East Asian standards of 3 percent or more of TFP growth. Given that the most radical changes in trade policy, including Mercosur, took place in the first half of the decade, this might imply that stagflation, which prevailed for most of the first half of the decade, would have been a major drag on Brazil's productivity, particularly on trade-related productivity gains. This also underlines the difficulty in looking at the impact of integration without "controlling for" other relevant factors at play.

---

[14] For the case of Brazil we use firm-level data, whereas for Mexico we rely on plant-level data. The text employs the term "firm" indistinctly. The sample of Mexican plants used in this estimation does not include *maquiladora* (in-bond assembly) plants. Productivity figures for Mexico from López-Córdova [2002].

Before moving into a more careful attempt to uncover the integration-productivity links in these two countries, it is worth looking behind these aggregate figures to get a sense of, first, how trade orientation correlates with productivity growth among manufacturing industries and, second, what was the relative importance of intra-firm *vis-à-vis* intra and inter-industry gains.

TFP by Trade Orientation

Figures 6a and b, relying now just on this paper's estimates, show that there were wide differences in productivity performance among manufacturing industries. Trade policy, to the extent that it treats industries differently, might be one of the key factors behind this variation. As a first approximation to evaluating such possibility, Figures 7a and b distinguish TFP performance according to industry or plant characteristics. Leaving, for the moment, plant characteristics aside, one would expect to find that, in the context of a more liberal trade regime, those industries that are more exposed to competition from imported goods or that participate more actively in foreign markets would perform better than industries were little trade takes place.

Figures 7a and b offers some support to the view that trade is an important force behind productivity improvements.[15] Productivity growth among Brazilian tradable industries was clearly higher than in those little exposed to trade. The performance of industries that trade with Mercosur was also impressive although not as strong as that of tradable industries as a whole. In Mexico, tradable industries were also the top performers, but with an even more clear lead over non-tradable industries than in the case of Brazil.

Intra-Firm versus Reallocation Gains

Another way of looking behind the aggregate figures is to decompose annual change in TFP into three effects: intra-firm gains, i.e., variations in productivity which occurred inside the firms resulting from technological and managerial innovations; intra-industry reallocation or turnover, reflecting changes in market share between low and high productivity firms within the same industry; and inter-industry reallocation, measuring changes in TFP brought about by shifts in the composition of manufacturing output (e.g. the share of the car industry rises whereas that of textile falls). The details of this decomposition are in the Appendix and Figure 8 presents the results.

What seems immediately evident in Figures 8a and b is that in both countries the reallocation effects, particularly across industries, were a major force behind productivity growth. Reallocation accounted for more than 70 percent of the total productivity growth in both cases, with firm-level efficiency gains accounting for the remaining 30 percent. In Brazil, reallocation from less to more productive industries "explains" around half of all reallocation gains; the remaining half is explained by intra-industry reallocations from less to more productive firms. In Mexico, output share increases in the more productive industries account for the bulk of all reallocation gains.

[15] In what follows, import-competing and exporting industries are defined as those in which import penetration or the ratio exports to output, respectively, are in the upper quartile of the manufacturing distribution. Non-traded industries are those that are neither import-competing nor exporting.

When industries are grouped by trade orientation, what stands out is that in both countries traded industries accounted for almost all TFP growth and intra-firm gains. Industries with strong global trade links increased their share of manufacturing output relative to those industries with little links and thus were responsible for all reallocation productivity gains. Moreover, firms in traded industries accounted for almost 70 percent of all firm-level efficiency gains in Brazil; remarkably, in Mexico, all firm-level gains occurred in traded industries, as productivity among firms in non-traded industries actually declined. The previous exercise also hints at the relative importance of regional integration for both countries. Although it is difficult to disentangle regional from extra-regional effects, economic integration with North America seems to have played a major role for Mexico, explaining virtually all TFP and intra-firm improvements. For Brazil, trade with other Mercosur partners seems to have had a positive role in reallocating resources to more efficient industries and in raising firm-level productivity performance.[16]

The previous findings are in line with those of other studies that show that turnover is an important driver of productivity performance. Moreover, even though, on the basis of this evidence alone, one cannot attribute these changes directly to trade, they clearly suggest, first, that trade might have played a role in the replacement of low by high productivity firms. Last, our findings indicate that the dislocation of high-productivity industries -such as those that exhibit increasing returns or that are knowledge-producing- might not have been significant, or, at least, not significant enough to offset comparative advantage and scale gains.

Integration and Productivity Links

While Figures 7 and 8 are highly suggestive of positive links between trade liberalization and productivity growth, one cannot yet conclude that trade policy, or trade itself, was behind the contrasting industry performance or the intra-firm or intra- and inter-industry gains. Indeed, establishing such link proves rather challenging since a number of events affected the economies of the two countries during the same period, from the devaluation of the Mexican peso in December 1994 and the Brazilian real in 1999, to rapid U.S. productivity growth and the Asian financial crisis in the second half of the decade. In order to provide more conclusive indication on whether trade liberalization, either regionally or otherwise, has had a positive impact on productivity, the following discussion relies on econometric evidence. This evidence seeks to isolate trade and FDI from the other forces that influence manufacturing efficiency. Some of these forces are specific to a firm, such as its age and its size, whereas others reflect industry-wide characteristics and macroeconomic conditions that are external to the firm. The latter include, *inter alia*, industrial output concentration -either across firms or regions- exchange rate fluctuations that affect external supply and demand, and changes in domestic consumption over the business cycle. The Appendix describes the econometric approach.

---

[16] Industries traded in Mercosur and NAFTA were defined as those whose import-penetration and export ratio were in the fourth quartile of their distribution. Although this definition makes sure that the regional markets are important for those industries, it does not eliminates the overlapping with industries traded in extra-regional markets. In the case of firm characteristics there is also overlapping among the regional trade categories, since Mercosur exporters might also be world exporters. In fact, 76 percent of Mercosur exporters are also World Exporters.

Import Discipline

Tables 1 and 2 summarize the main results of the econometric exercise used for analyzing trade liberalization in Brazil and Mexico. A first finding is that heightened competition from foreign goods resulting from the elimination of import duties has had a substantial and positive impact on productive efficiency. For the case of Brazil, the results suggest that a 1 percent increase in the import ratio (the industry's imports divided by shipments) would raise the firms' level of TFP by 0.1 percent (columns 1 to 4) and its growth by 1.3 percentage points (columns 5 to 19). They also suggest that a 1 percent point reduction in tariffs would boost productivity levels by another 0.1 percent. The impact of tariffs on growth, though, was not statistically significant, suggesting only level effects. Muendler [2002], also working on firm level data but covering a longer and earlier period (1986-1998), reaches similar qualitatively conclusions. He argues that import penetration and tariff reduction explained a good deal of the increase in TFP in Brazil. A 10-point reduction in tariffs, for instance, would have increased (log) TFP by 2.8 percent.

Similarly, the experience of Mexico from 1993 to 2000 confirms that tariffs negatively impact both the level and the growth rate of productivity. Since tariffs on the rest of the world also affect productivity, one should consider total Mexican duties and not simply those applied on North American goods.[17] Nonetheless, the previous discussion suggests that NAFTA has been, by far, the main factor behind tariff changes in Mexico during the 1990s. Quantitatively, as the estimates in Table 2 suggest, the 10-point reduction in import duties from 1993 to 2000 would account for an increase of around 3 percent in firm-level total factor productivity (columns 1 to 4). Since firm productivity grew by around 9 percent during the period, the estimates suggest that tariff cuts during NAFTA's first 7 years contributed significantly to the sector's average growth, possibly offsetting other forces that affected productivity negatively during the 1990s. In addition, the elimination of Mexican tariffs also had a positive impact on productivity growth, with a 10-point reduction in import duties increasing the growth rate by roughly 4 percentage points (columns 5 to 15). Moreover, a one-percent increase in the import-output ratio results in a 0.5-percent rise in productivity and a quarter of a percentage point increase in its growth rate.

Scale and Learning by Exports

As argued earlier, global and regional integration may also be conducive to enhanced efficiency through economies of scale and learning associated with improved export opportunities in the expanded market. Both Brazil and Mexico saw the proportion of manufacturing firms that participate in world markets increase during the 1990s, from 41 in 1996 to 47 percent in 2000 in Brazil, and from 30.4 to 45.7 percent in Mexico during the 1993-2000 period.[18] At the same time, the proportion of exports as a fraction of firm output in the two countries rose from 12.0 to 18.6 percent in Brazil in 1996-2000 and, in Mexico, from 16.2 in 1993 to 31.2 percent in 2000. In

---

[17] Total Mexican duties are calculated as the trade weighted averaged of preferential and non-preferential rates.

[18] We look at a balanced panel of firms in order to focus on the likelihood that a given firm becomes an exporter, or on a firm's share of output being exported. Using an unbalanced panel fails to correct for sample compositional changes that might reflect a greater likelihood among exporters to remain in operation. These percentages refer to the proportion of exporters in a sample of manufacturing firms in Brazil and Mexico which are biased toward medium to large firms. The corresponding figures for all manufacturing firms would be smaller.

Brazil, the fraction of firms exporting to other Mercosur countries increased in tandem, from 29 to 35 percent. Although the data available for Mexico does not contain information on where exports went, there is some indication that the preferential margin on Mexican products entering the U.S. market that resulted from NAFTA's tariff phase-out has increased the probability that a manufacturing plant becomes an exporter.[19]

Has export activity induced higher productivity among Brazilian and Mexican manufacturers? As Figure 7 illustrates, exporters, regional or otherwise, in both countries seem to have experienced more rapid productivity growth than non-exporters. The following discussion considers whether such result holds under the more rigorous econometric analysis described in the Appendix. Consider first the case of NAFTA and Mexico. An increase in the preferential margin enjoyed by Mexican exporters in the U.S. market over their competitors from the rest of the world suggests that NAFTA would have created export opportunities for Mexican producers that, in turn, would have translated into more rapid productivity growth. Another possibility, though, is that the preferential access to the U.S. market would have lessened the incentives for Mexican manufacturers to improve their efficiency. The econometric results show, however, that an increase in the tariff margin in favor of Mexican goods in the U.S. market is positively associated with an increase in productivity. A one-point increase in the tariff preference granted to Mexican producers yields a 3 percent increase in productivity (see Table 2, columns 1 to 4).

The previous finding, though, is not confirmed by estimates of the correlation between TFP growth and export activity, measured either by export status or export propensity -export to sales ratio- (see Table 2, columns 9 and 10).[20] This result is in line with the work by other authors that fails to find a causal link between exporting and productivity growth and that argues that, instead, it is high productivity plants that make inroads in foreign markets. Recall, however, that the previous discussion regarding Figure 8 argued that reallocation of resources toward exporting firms is an important channel for industry-wide productivity gains. Thus, even though exporting might not have an impact on the productivity of Mexican producers, it might result in aggregate productivity gains as more efficient firms and industries expand relative to less efficient ones.

In contrast to Mexico, TFP growth among Brazilian manufacturers seems to be positively correlated to export propensity (the ratio of exports to sales), with one-percent point increase in the ratio of exports to sales increasing annual productivity growth by 0.4 percentage points (see Table 1, column 8). Exports to Mercosur seem to provide a similar "kick" to productivity (column 9). [21] These results are qualified when an ownership dummy is interacted with export propensity. For both world and Mercosur exporters, the evidence suggests that it is only local firms (defined as having the majority of the voting rights being owned by residents) who "learn by exporting", which seems consistent with the fact that foreign affiliates, by definition, have other more direct means of tapping into the stock of international knowledge (columns 13 and 15). To check if

---

[19] The latter stems from an econometric exercise that estimates the probability that a plant is an exporter. The preferential margin in the U.S. market on Mexican goods is positively correlated with the probability of exporting.

[20] Bernard and Jensen [2001] perform such an exercise on U.S. data.

[21] When export activity is measured by exporter status, rather than by export propensity, the coefficients were not significant (columns 10 and 11). This might have been related to the fact that there might be a threshold in the terms of volume and year of experience, below which there might not be any significant productivity gains.

these results were hiding sectoral specificities, a sectoral dummy (ISIC 2 digits) was interacted with the export propensity variable for both Mercosur and World exports. The results, though, did not show any sector specific behavior worth mentioning.[22]

Imported Inputs

Another channel through which integration by Brazil and Mexico might have enhanced manufacturing efficiency is the improved availability of world-class intermediate inputs. From 1996 to 2000, the fraction of Brazilian firms using imported inputs remain fairly constant, from 36.9 to 35.9 percent, and imported inputs went from 8.5 percent of material costs to 8.9 percent. The use of imported inputs in Mexico seems to have risen more rapidly, as they went from 28.5 percent to 34.1 percent of all non-wage costs of production from 1993 to 1999, with the fraction of all plants using imported inputs rising from 50.9 to 55.4 percent during the 8-year span.

Is there evidence suggesting that the expanded use of imported inputs favored productivity improvements? The evidence in Figures 7a and b is mixed. In Brazil, users of foreign inputs saw productivity rise faster but in Mexico the opposite happened. However, a more careful look at the data using econometric techniques does not to lend any support to the argument. The use of imported inputs, measured as the ratio of imported-inputs to material costs, seems to have a limited and negative impact on TFP level and growth among Brazil's foreign affiliates. The impact on local firms, in turn, is not statistically significant (Table 1, column 4 for level and columns 13-19 for growth). These results are consistent with Muendler's [2002], who argues that foreign inputs contributed minimally to Brazilian manufacturing TFP growth during the 1986-1998 period.

For Mexico, imported inputs seem to have an adverse impact on productivity growth (columns 11-13). However, when we interact imported input use (as a fraction of total costs) with a domestic-firm dummy, we see that the previous result is due solely to foreign firms (columns 14 and 15). Among domestic firms, using imported inputs does not affect firm efficiency. The latter finding, which may seem paradoxical at first sight, might reflect differences between foreign producers that use Mexico as a base for simple assembly operations of imported materials, with little productivity dynamism, and foreign firms that are not attracted to Mexico solely due to its relatively low wages. Unfortunately, the dataset does not allow us to delve further into this topic, since, for example, *maquiladora* plants are not in the original survey.

The FDI Channel

Beyond the trade effects analyzed so far, there is the issue of whether higher FDI inflows have had an impact on productivity in Brazil and Mexico. Figures 7a and b compares TFP growth differentials between domestic and foreign producers. Whereas in Mexico productivity growth among foreign firms outpaced that among domestic producers, in Brazil domestic manufacturers' TFP grew faster. The latter result, however, is reversed once one takes into account industry and firm size productivity differences. After controlling for these characteristics, foreign firms are

[22] Results not show in the Table 1. Available upon request.

suggested to be 14 percent more productive than its local counterparts in Mexico, and 17 percent in Brazil (see Tables A3a and A3b). Furthermore, in Mexico, productivity among U.S.- and Canadian-owned plants grew faster than among other foreign plants. The results shown in Figures 8a and b tell a similar story.

The better performance of foreign producers in Mexico and Brazil suggests that their increasing presence might have had a positive impact on productivity growth. The FDI impact might have reflected the combination of entry, competitive, knowledge and linkages effects discussed earlier. To disentangle the contribution of each one of these effects is a daunting, if not impossible, task. Yet, by using information on ownership and on the firms' cost and demand structure (see Appendix), it was possible to estimate at least part the overall impact of FDI on productivity, and to assess whether its effects were more important to the foreign firms' competitors (intra-industry effects) or to their buyers and suppliers (inter-industry effects).

The results for Mexico are more in line with those of the literature of FDI spillovers. Intra-industry FDI, perhaps reflecting the affiliates attempts to protect their technology and increase market share, appears as having a negative impact on TFP level (Table 2, columns 1, 3 and 4). It seems to be a level effect since there is no evidence that it affects TFP growth (columns 5, and 7 to 15). Backward and forward linkages, as expected, have a positive impact both in the TFP levels and growth and the net FDI effect is always positive, both for domestic and foreign firms.

In Brazil, the results are less intuitive and on the whole at odds with the theory. The evidence point to a positive impact of intra-industry FDI on TFP (Table 1, columns 1 to 4), suggesting that the competition effect might have prevailed. The interaction with the ownership dummy, though, indicates that this might be the case only to foreign affiliates established in the same industry but not to local firms. As in Mexico, the growth effect does not seem to be relevant (columns 5 to 19). Rather unexpectedly, backward and forward linkages came out with a negative sign for both level and growth effects. Only the results for the impact on growth were statistically significant, though. Overall, the net FDI impact on TFP levels was not different from zero, and negative on TFP growth. There are a number of hypotheses behind these results. First, this might have to do with the low absorptive capacity of Brazilians firms. Yet, preliminary tests, using the ratio of blue to white collars as a proxy to absorptive capacity, do not suggest that this is the case. And second, the fact that industry wide measures of demand and cost structures are being used (see Appendix) to calculate the FDI linkages might be biasing the results.

Contents

IV. CONCLUSIONS

Economic theory suggests that integration can be the handmaiden of productivity growth, either through trade or foreign investment. This potential is particularly important for a region such as Latin America, which, with a few exceptions, has a dismal record on productivity and has been struggling in the last decades to get back on a sustainable growth path. The theory also indicates that both global and regional integration can offer substantial productivity gains. The former, for involving larger markets and a larger spectrum of comparative advantages would involve larger potential gains. The latter, though, could be seen as a strategic stepping-stone to global integration for speeding up negotiations, mitigating adjustment costs and for offering safeguards against the downside risks of integration.

After more than a decade since pro-trade polices spread throughout the region, the empirical evidence on the relevance of these productivity-related gains is still rather sketchy. Economy-wide measures of productivity suggest, with a few exceptions, a rather gloomy scenario of low or even negative productivity growth. Yet, analysis of manufacturing, by far the sector most affected by integration in the region, suggests a different and more upbeat story, indicating, perhaps that the gains did not reach the economies' non-tradable side. In any case, this type of sectoral analysis, based on more reliable plant-level data, does not cover more than a handful of countries in the region, giving little ground for generalizations.

Against this background of scarce evidence, the case study of Brazil and Mexico throws some light in the more general links between productivity and integration and on the nuances of different strategies of regional integration. On the former, the results show that productivity growth in manufacturing was positive in both countries, reversing a downward trend that prevailed until the 1980s. The two countries also coincided in three other points. First, they did not show signs of a change in the composition of output that would indicate dislocation of high productivity sectors. Second, and as a consequence, they experienced reallocation effects, which accounted for most of the productivity growth. And third, when it comes to direct evidence on trade-productivity links, import-discipline emerged as the dominant effect.

The results on learning-by-exporting and FDI effects varied between countries. Brazil shows signs of learning-by-exporting, whereas in Mexico, despite its higher export orientation and the export boom experienced during the 90s, the only evidence comes from the positive impact of US preferential tariffs. On FDI, foreign firms appear to have had a positive impact on their buyers and suppliers in Mexico, despite the lower local content and greater export orientation of Mexico's industry. In Brazil, the overall impact was statically insignificant on TFP levels and negative on TFP growth raising questions about local firms' absorptive capacity and about the measurement of the FDI linkages.

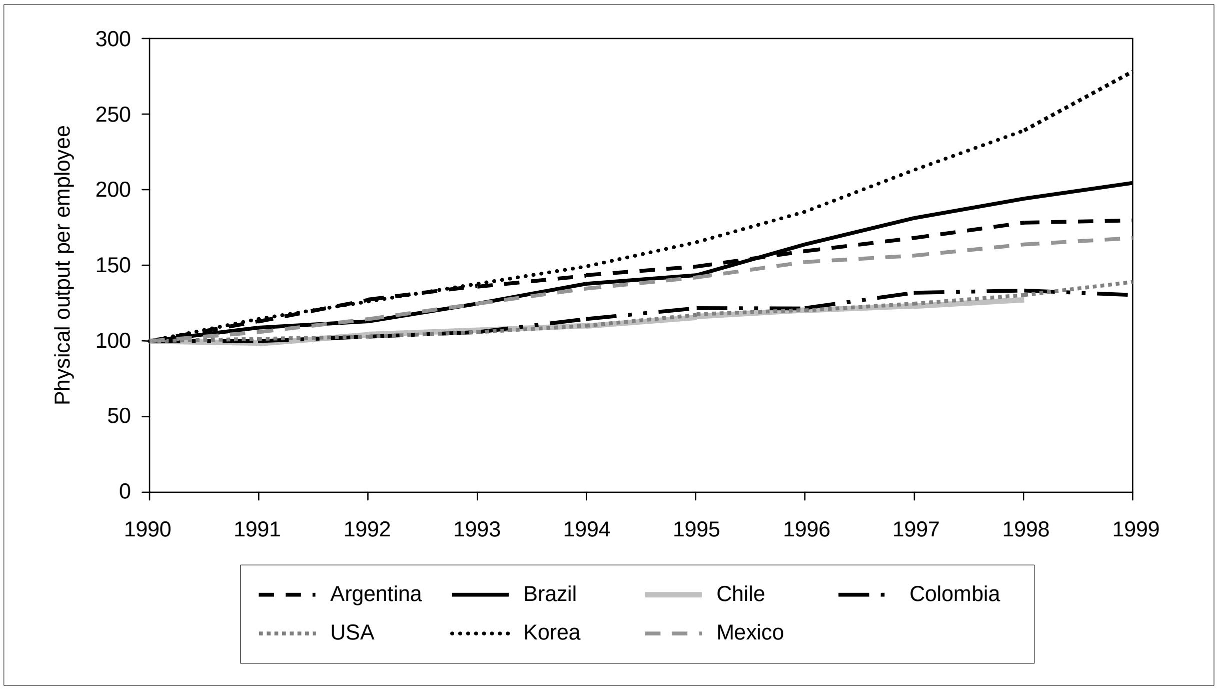
On the strategy of regional integration, Mexico's more aggressive stance with NAFTA seems to have paid off, at least as far as productivity is concerned. Tariff reductions undertaken during the agreement appear to have had a sizable positive impact on productivity growth, which added to the already substantial gains reaped during the period of non-preferential liberalization. As the theory suggests, the differences in labor costs between NAFTA partners appears to have kept the threat of damaging dislocations in increasing returns and knowledge-intensive sectors at bay. An encouraging outcome for countries in the region, which are negotiating the FTAA.

On the other hand, there is not enough evidence to argue that Brazil's more cautious approach to trade, which involved Mercosur, was misguided. The fact that the preferential and non-preferential liberalizations were carried out simultaneously makes it very difficult to disentangle regional and non-regional effects. What one can argue, though, without erring too much on the side of speculation, is that the lion's share of Brazil productivity gains during this period came from the non-preferential liberalization, given that Mercosur at its peak did not account for more than 17 percent of Brazil's total trade. And this comes at no surprise in view of the relative size and resources of Brazil's partners in the regional agreement. This limitation put a severe cap on the type of learning-by-exporting gains uncovered by the econometric exercise. The elasticity of the productivity gains by unit of product exported seems to be roughly the same for world and Mercosur (local firm) exporters, yet the latter are constrained by a very limited market.

Given the limits of Mercosur gains, the importance of the import-discipline effect and the fact that productivity growth only took off in the second half of the 1990s, one feels tempted to believe that Brazil would have had a better performance if it had pursued a more aggressive approach towards integration. One that would not have excluded Mercosur, but that would have gone beyond it, in search of more sizable trade gains. A broad agreement such as the FTAA, negotiated in a way that balance the interest of all parties, might just provide such opportunity.

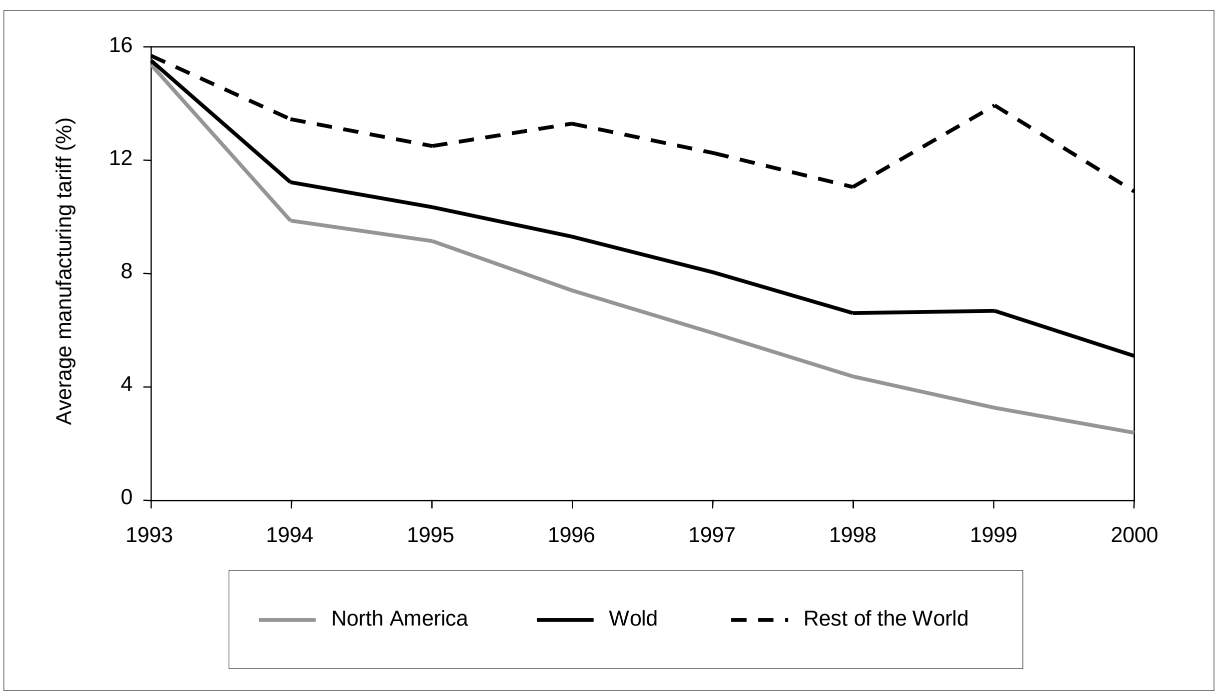
Leaving strategic and counterfactual considerations aside, the bottom line seems to be that both Brazil and Mexico reaped important productivity gains from integration. How much of these gains were "level or growth effects" or whether or not the "integration shock" will produce the same sort of rapid, sustainable and long-term productivity growth seen in East Asia is, perhaps, to early to tell. It will depend very much on the long-tem effects of import discipline on the countries' rate of innovation. In any case, one could not realistically expect that integration would do the entire job. When it comes to a stable macroeconomic environment and investment in education, technological capabilities and institutions, all key ingredients of productivity growth, both countries, not to mention the whole region, still have a considerable agenda ahead of them.

FIGURE 1
LABOUR PRODUCTIVITY IN MANUFACTURING IN SELECTED LATIN AMERICAN COUNTRIES, KOREA AND THE UNITED STATES



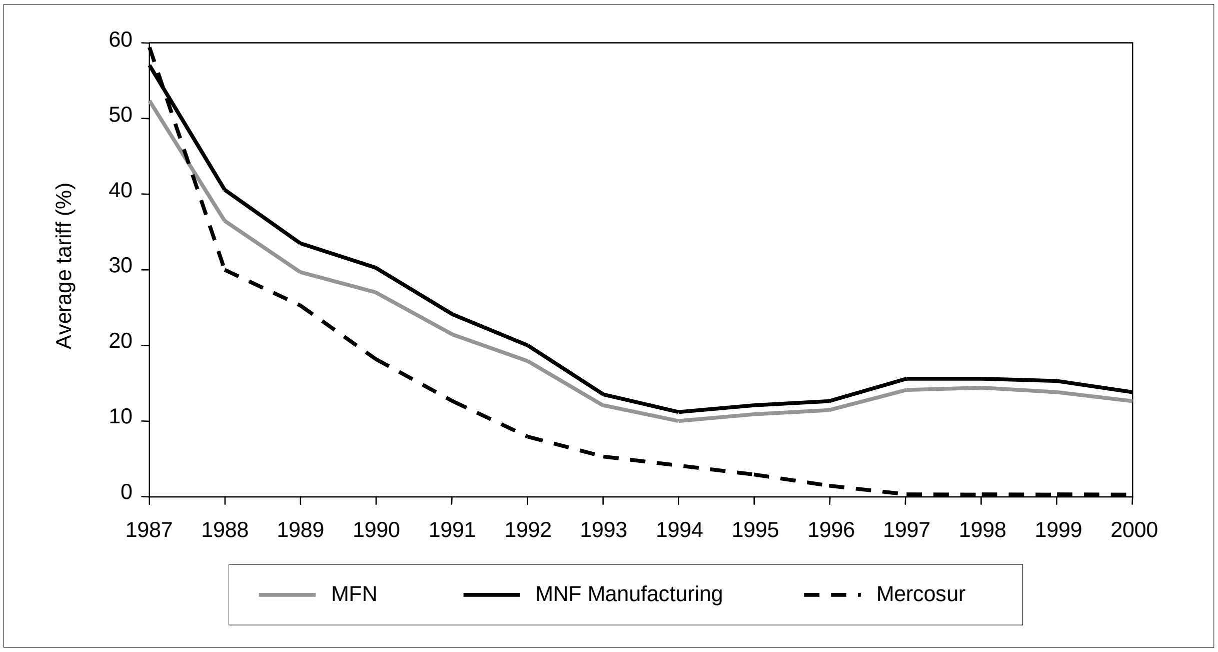
Source: Countries' Statistical Offices.

FIGURE 2
AVERAGE MANUFACTURING TARIFF: MEXICO, 1993-2000



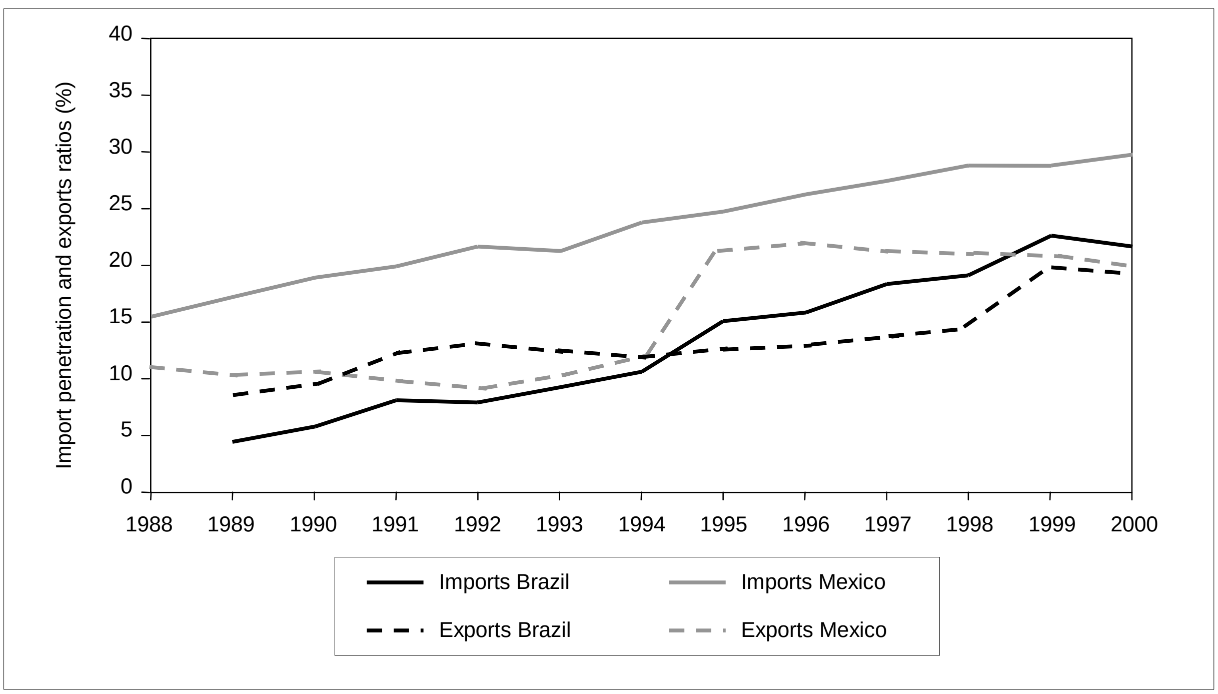
Source: López-Córdova [2002].

FIGURE 3
AVERAGE MFN AND MERCOSUR TARIFF: BRAZIL, 1987-2000



Source: For MFN Kume, *et al.* [2000] and *Receita Federal*. For Mercosur, Estevadeordal, *et al.* [2000] and *Receita Federal*.

FIGURE 4
IMPORT PENETRATION AND EXPORT RATIOS IN MANUFACTURING: BRAZIL AND MEXICO, 1988-2000



Note: Import penetration divided by domestic consumption. Export ratio is exports divided by output. Data for Mexico does not includes maquilas.

Source: Own calculations based on IBGE and INEGI Manufacturing Surveys.

FIGURE 5
TFP ANNUAL AVERAGE GROWTH IN MANUFACTURING POST-TRADE LIBERALIZATION: BRAZIL AND MEXICO

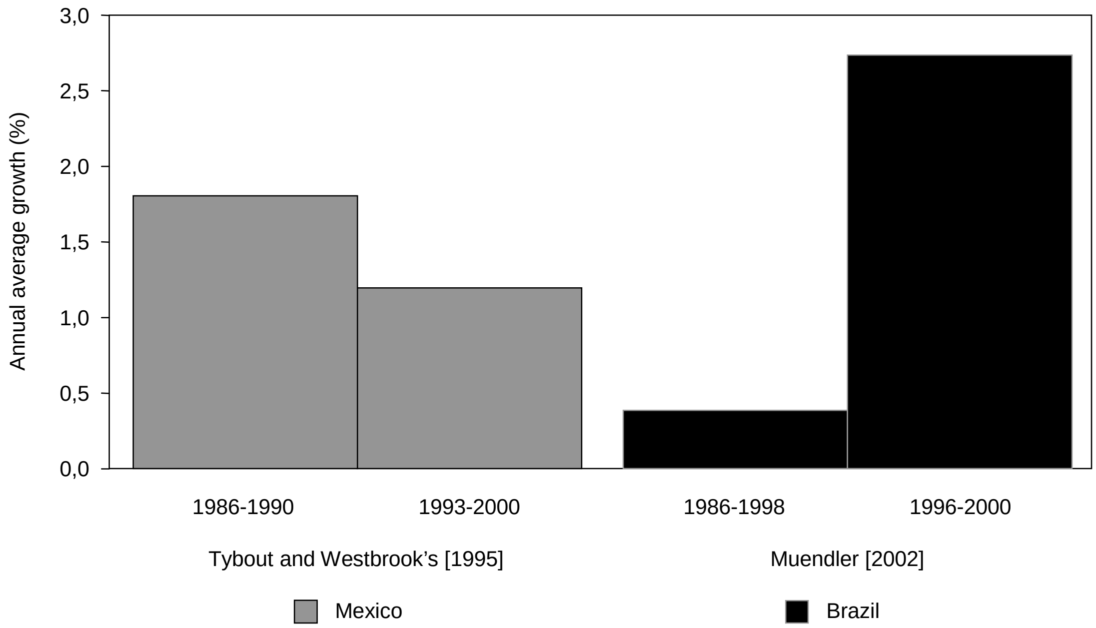


FIGURE 6A
AVERAGE FIRM TFP GROWTH: BRAZIL, 1996-2000

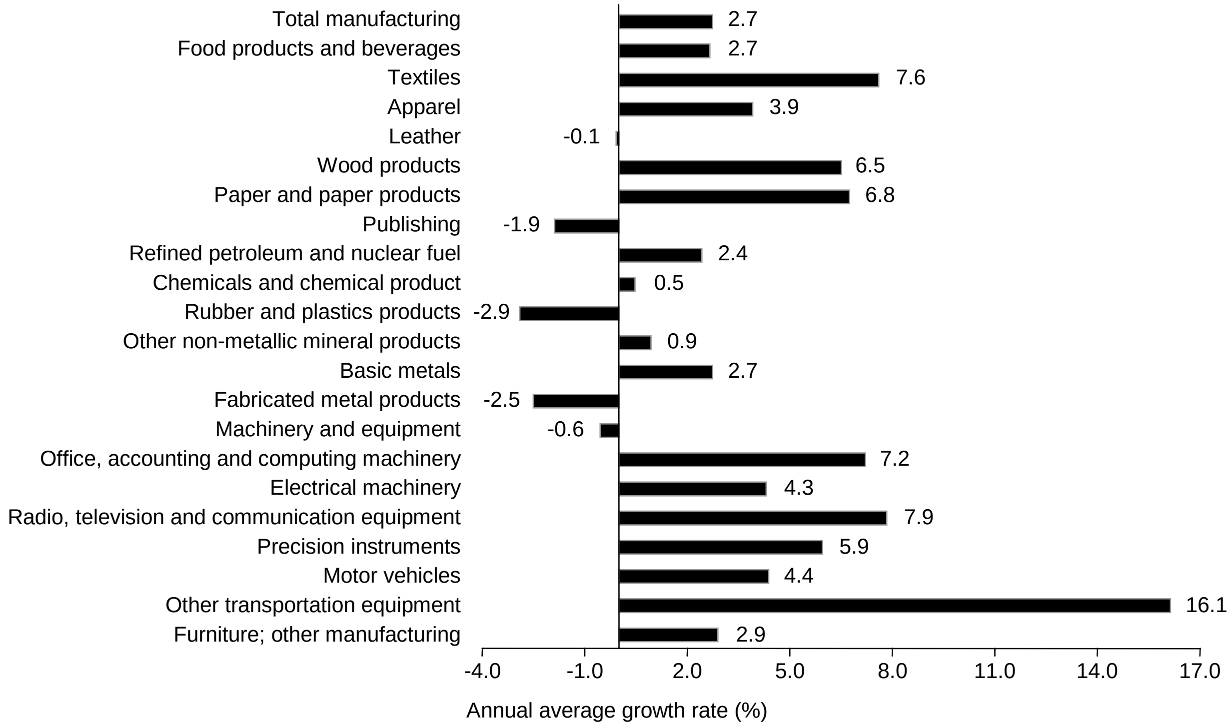


FIGURE 6B
AVERAGE FIRM TFP GROWTH: MEXICO, 1993-2000

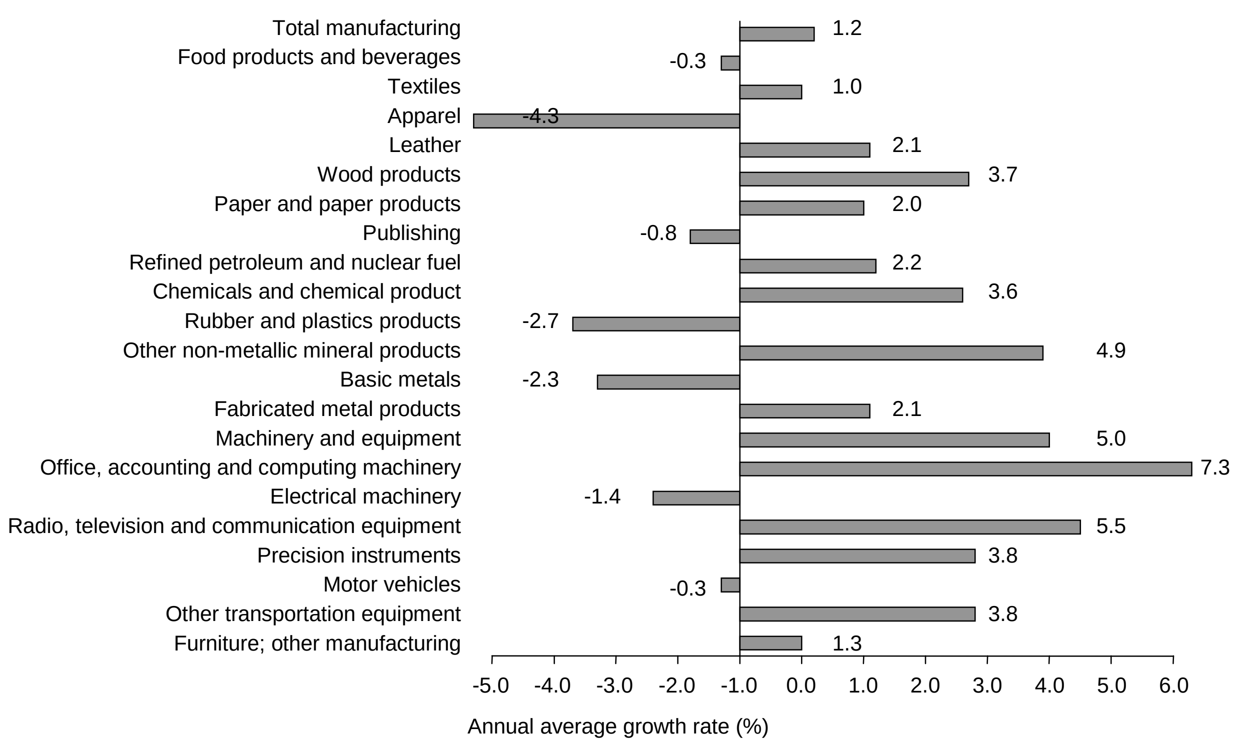


FIGURE 7A
AVERAGE FIRM TFP GROWTH, BY INDUSTRY OR FIRM CHARACTERISTICS: BRAZIL, 1996-2000

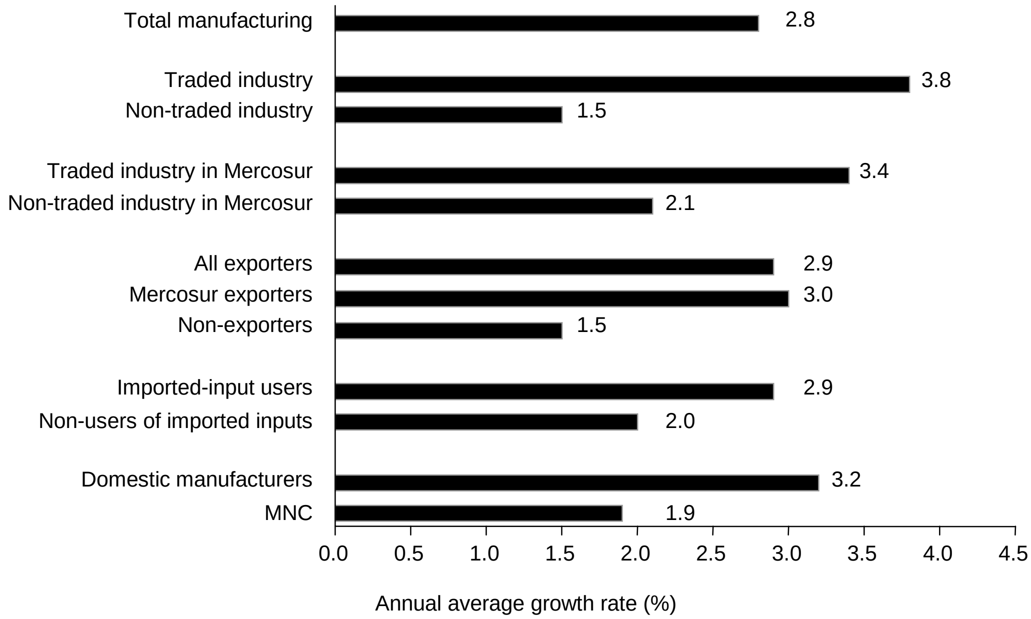


FIGURE 7B
AVERAGE FIRM TFP GROWTH, BY INDUSTRY OR FIRM CHARACTERISTICS: MEXICO,1996-2000

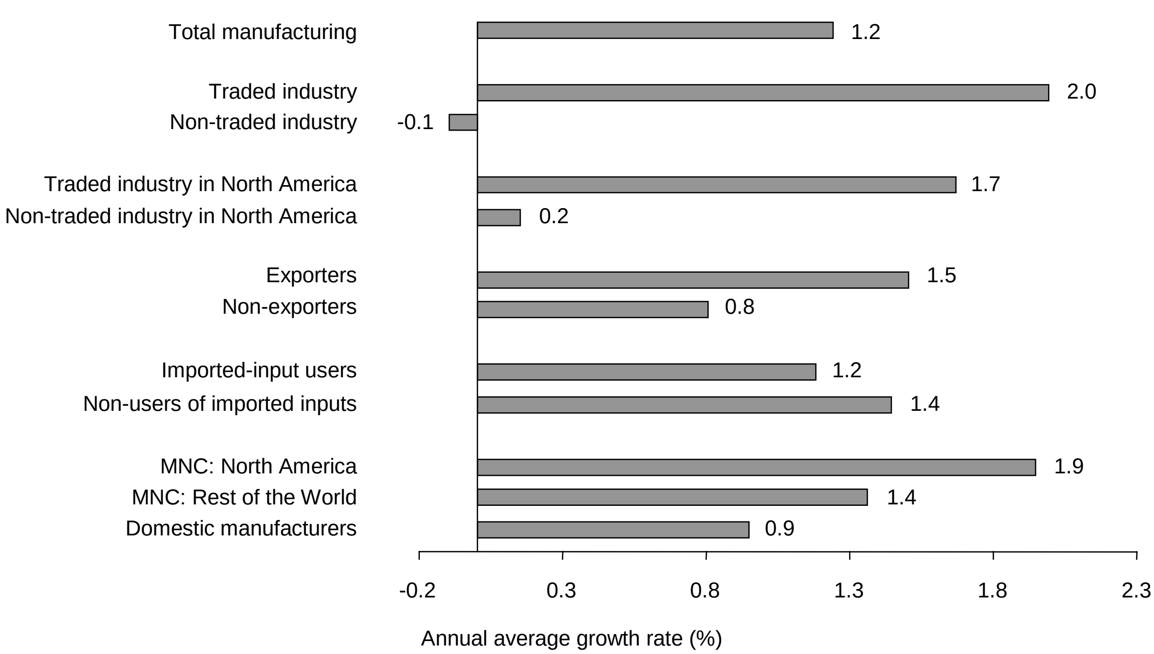
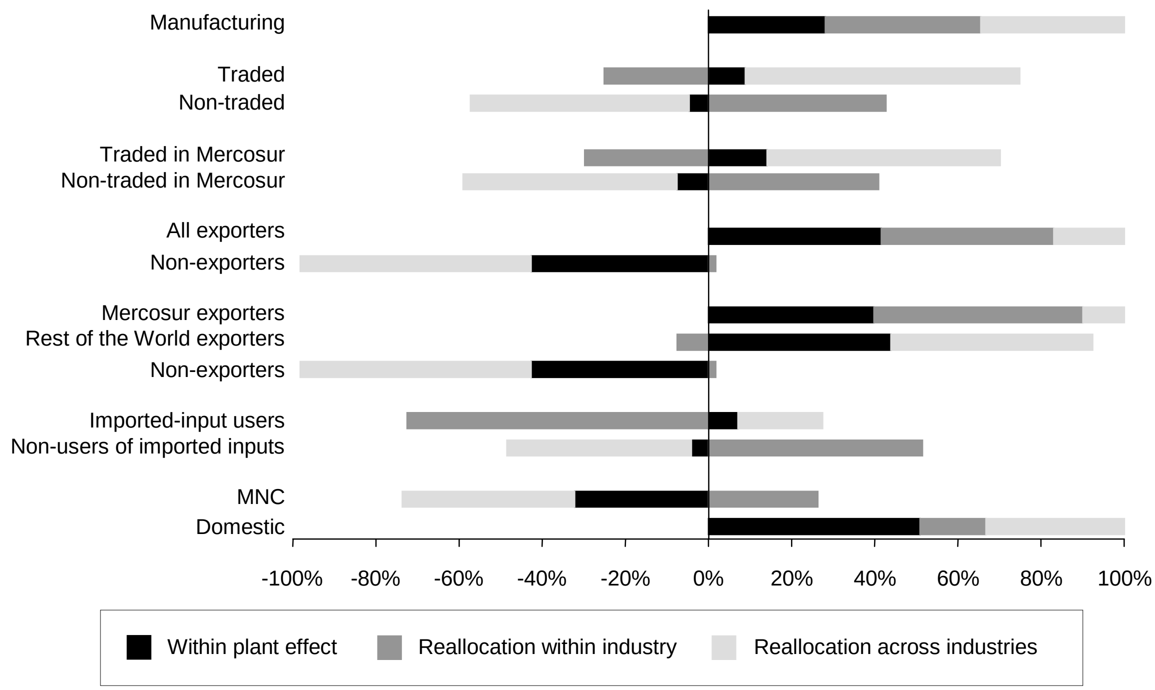
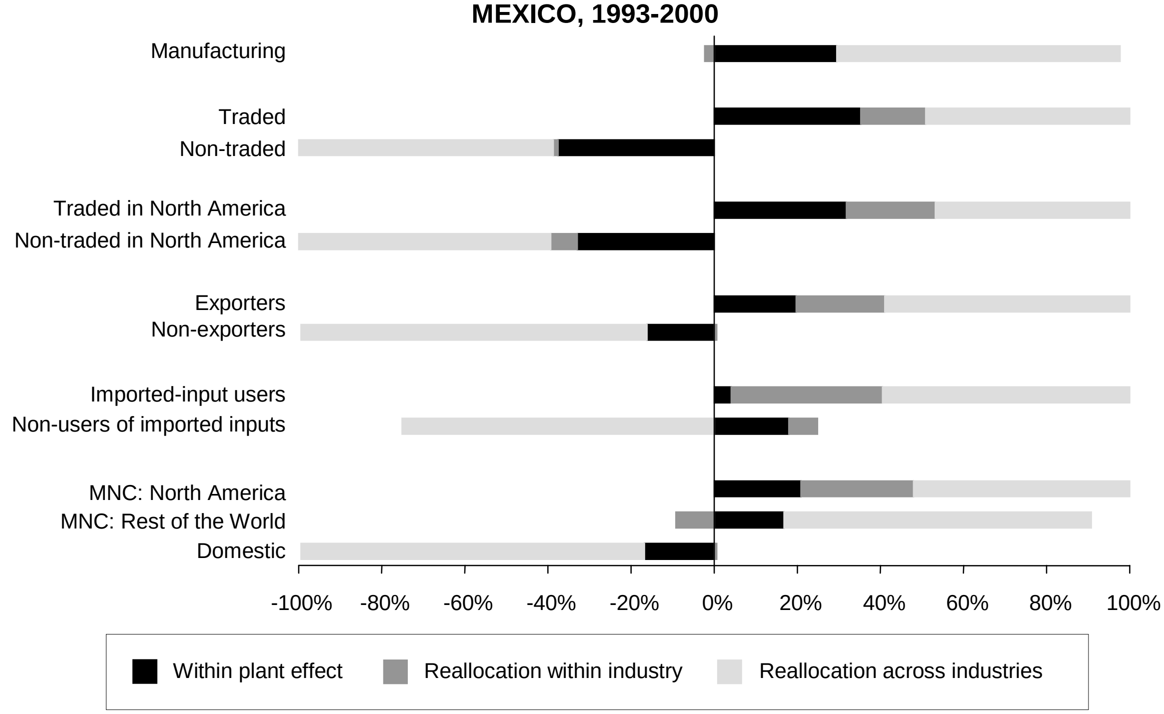


FIGURE 8A
PRODUCTIVITY DECOMPOSITION:
BRAZIL, 1996-2000



Note: See Appendix for methodology.

FIGURE 8B
PRODUCTIVITY DECOMPOSITION:
MEXICO, 1993-2000



Note: See Appendix for methodology.

TABLE 1
TOTAL FACTOR PRODUCTIVITY AND INTEGRATION IN BRAZIL: REGRESSION RESULTS

	Dependent Variable: Log TFP				Dependent Variable: Change in Log TFP														
Explanatory variables	**Reg 1**	**Reg 2**	**Reg 3**	**Reg 4**	**Reg 5**	**Reg 6**	**Reg 7**	**Reg 8**	**Reg 9**	**Reg 10**	**Reg 11**	**Reg 12**	**Reg 13**	**Reg 14**	**Reg 15**	**Reg 16**	**Reg 17**	**Reg 18**	**Reg 19**
Competition from imports																			
Log imports/industry output	0.1244	0.1242	0.1241	0.1243	1.2890	1.2191	1.2894	1.3521	1.2940	1.2913	1.2889	1.3524	1.3465	1.2943	1.2873	1.2918	1.2874	1.2894	1.2869
	(0.0285)***	(0.0287)***	(0.0285)***	(0.0285)***	(0.2433)***	(0.2333)***	(0.2432)***	(0.2614)***	(0.2437)***	(0.2443)***	(0.2433)***	(0.2613)***	(0.2605)***	(0.2436)***	(0.2422)***	(0.2442)***	(0.2436)***	(0.2432)***	(0.2431)***
Brazil MFN Tariffs	-0.1250	-0.1282	-0.1250	-0.1248	0.0507	0.0565	0.0507	0.0560	0.0504	0.0507	0.0507	0.0560	0.0584	0.0504	0.0515	0.0507	0.0517	0.0507	0.0514
	(0.0389)***	(0.0400)***	(0.0388)***	(0.0388)***	(0.0448)	(0.0440)	(0.0449)	(0.0464)	(0.0449)	(0.0449)	(0.0448)	(0.0464)	(0.0461)	(0.0449)	(0.0447)	(0.0449)	(0.0449)	(0.0449)	(0.0449)
FDI spillovers																			
Intra-industry FDI	0.3939	0.3962	0.3935	0.3918	-0.7933	0.5698	-0.7933	-0.8340	-0.7990	-0.7940	-0.7927	-0.8339	-0.8443	-0.7990	-0.8043	-0.7939	-0.7973	-0.7927	-0.7950
	(0.1487)***	(0.2080)*	(0.1485)***	(0.1483)***	(0.2003)***	(0.3411)*	(0.2004)***	(0.2112)***	(0.2014)***	(0.2006)***	(0.2003)***	(0.2112)***	(0.2116)***	(0.2015)***	(0.2011)***	(0.2006)***	(0.2005)***	(0.2003)***	(0.2003)***
FDI-Forward linkages	-0.0686	0.2783	-0.0679	-0.0682	-1.2510	-3.3103	-1.2522	-1.3035	-1.2629	-1.2555	-1.2509	-1.3045	-1.2644	-1.2639	-1.2293	-1.2568	-1.2422	-1.2521	-1.2439
	(0.2721)	(0.4828)	(0.2717)	(0.2715)	(0.5408)**	(1.0440)***	(0.5400)**	(0.5658)**	(0.5408)**	(0.5428)**	(0.5407)**	(0.5650)**	(0.5583)**	(0.5401)**	(0.5347)**	(0.5420)**	(0.5407)**	(0.5400)**	(0.5401)**
FDI-Backward linkages	-0.3345	-0.2521	-0.3332	-0.3322	-1.3815	-1.6298	-1.3821	-1.4342	-1.3844	-1.3820	-1.3813	-1.4347	-1.4341	-1.3850	-1.3851	-1.3827	-1.3751	-1.3819	-1.3744
	(0.2444)	(0.3777)	(0.2450)	(0.2448)	(0.3806)***	(0.7372)**	(0.3805)***	(0.4000)***	(0.3813)***	(0.3811)***	(0.3805)***	(0.3999)***	(0.4007)***	(0.3812)***	(0.3808)***	(0.3810)***	(0.3802)***	(0.3804)***	(0.3797)***
Intra-industry FDI * Local Firm Dummy		0.0104				-1.5700													
		(0.2653)				(0.4101)***													
FDI-Forward linkages * Local Firm Dummy		-0.3987				2.4556													
		(0.4976)				(0.9835)**													
FDI-Backward linkages * Local Firm Dummy		-0.0796				0.3977													
		(0.2851)				(0.7811)													
Exporting activity																			
Mercosur exporter											-0.0047							-0.0047	-0.0455
											(0.0137)							(0.0137)	(0.0557)
World exporter										0.0144						0.0144	-0.0101		
										(0.0145)						(0.0145)	(0.0690)		
Mercosur exporter * Local Firm Dummy																			0.0435
																			(0.0571)
World exporter * Local Firm Dummy																	0.0254		
																	(0.0705)		
Mercosur exports/sales									0.0039					0.0039	-0.0042				
									(0.0017)**					(0.0017)**	(0.0046)				
Exports/sales								0.0041				0.0041	0.0000						
								(0.0008)***				(0.0008)***	(0.0019)						
Mercosur export/sales * Local Firm Dummy															0.0093				
															(0.0048)**				
World export/sales * Local Firm Dummy													0.0046						

TABLE 1 (continued)

	Dependent Variable: Log TFP				Dependent Variable: Change in Log TFP														
Explanatory variables	**Reg 1**	**Reg 2**	**Reg 3**	**Reg 4**	**Reg 5**	**Reg 6**	**Reg 7**	**Reg 8**	**Reg 9**	**Reg 10**	**Reg 11**	**Reg 12**	**Reg 13**	**Reg 14**	**Reg 15**	**Reg 16**	**Reg 17**	**Reg 18**	**Reg 19**
Imported intermediate goods																			
Imported-input/material costs			-0.0002	-0.0009			0.0001					0.0001	-0.0016	0.0001	-0.0015	0.0001	-0.0016	0.0001	-0.0016
			(0.0002)	(0.0005)*			(0.0004)					(0.0004)	(0.0009)*	(0.0004)	(0.0009)*	(0.0004)	(0.0009)*	(0.0004)	(0.0009)*
Imported input * Local Firm Dummy				0.0009									0.0021		0.0020		0.0021		0.0021
				(0.0006)									(0.0010)**		(0.0010)**		(0.0010)**		(0.0010)**
Observations	47664	47664	47664	47664	36274	36274	36274	36274	36274	36274	36274	36274	36274	36274	36274	36274	36274	36274	36274
Number of id	11177	11177	11177	11177	10253	10253	10253	10253	10253	10253	10253	10253	10253	10253	10253	10253	10253	10253	10253
Ho: Sum FDI variables=0 (Chi^2)	0.0022	0.0504	0.0015	0.0057	20.6111	17.9101	20.6724	19.8252	20.8239	20.5319	20.6235	19.8804	19.77	20.8814	20.82	20.5929	20.492	20.6849	20.56
Prob > chi2	0.96	0.82	0.97	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ho: Sum input and ownership variables=0 (Chi^2)				0.01									1.3014		1.3141		1.387		1.3715
Prob > chi2				0.9396									0.25		0.25		0.24		0.24
Ho: Sum export and ownership variables=0 (Chi^2)													24.39		9.14		1.07		1.37
Prob > chi2													0		0.0025		0.3017		0.2415

Notes: (1) All regressions were estimated using fixed effects on a panel of firms. (2) All regressions include the following controls: Size, industry output (excluding the plant's own output), capacity utilization, industrial concentration indices, U.S. consumption, log of exchange rate times U.S. PPI in the industry, and year dummies. Regressions 4 to 10 also include log TFP in year *t*. (3) Bootstrapped standard errors in parentheses.

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

TABLE 2
TOTAL FACTOR PRODUCTIVITY AND INTEGRATION IN MEXICO: REGRESSION RESULTS

	Dependent Variable: Log TFP				Dependent Variable: Change in Log TFP										
Explanatory variables	**Reg 1**	**Reg 2**	**Reg 3**	**Reg 4**	**Reg 5**	**Reg 6**	**Reg 7**	**Reg 8**	**Reg 9**	**Reg 10**	**Reg 11**	**Reg 12**	**Reg 13**	**Reg 14**	**Reg 15**
Competition from imports															
Log imports/industry output	0.5148	0.3994		0.5159	0.2398	0.1223		0.2390	0.2399	0.2506	0.2386	0.2387	0.2496	0.2372	0.2498
	(0.0440)***	(0.0341)***		(0.0437)***	(0.0537)***	(0.0421)***		(0.0531)***	(0.0539)***	(0.0549)***	(0.0536)***	(0.0538)***	(0.0548)***	(0.0538)***	(0.0546)***
Mexican tariff on total imports	-0.0028	-0.0033		-0.0027	-0.0040	-0.0039		-0.0039	-0.0040	-0.0049	-0.0039	-0.0039	-0.0049	-0.0039	-0.0049
	(0.0010)***	(0.0009)***		(0.0010)***	(0.0014)***	(0.0014)***		(0.0014)***	(0.0014)***	(0.0013)***	(0.0014)***	(0.0014)***	(0.0013)***	(0.0014)***	(0.0013)***
FDI spillovers															
Intra-industry FDI	-0.2706		-0.1503	-0.0242	0.0209		0.0804	0.0733	0.0210	-0.0178	0.0210	0.0211	-0.0177	0.0226	-0.0188
	(0.0480)***		(0.0440)***	(0.1069)	(0.0489)		(0.0441)*	(0.1024)	(0.0488)	(0.0465)	(0.0488)	(0.0488)	(0.0465)	(0.0488)	(0.0464)
FDI-Forward linkages	0.9286		0.1429	1.2100	0.4698		0.0748	0.4448	0.4698	0.4761	0.4668	0.4667	0.4736	0.4631	0.4745
	(0.1052)***		(0.0530)***	(0.1912)***	(0.1190)***		(0.0510)	(0.1789)**	(0.1190)***	(0.1181)***	(0.1188)***	(0.1188)***	(0.1179)***	(0.1186)***	(0.1174)***
FDI-Backward linkages	0.9684		1.1038	0.5621	1.2233		1.2462	1.0181	1.2232	1.1870	1.2218	1.2216	1.1849	1.2265	1.1870
	(0.1187)***		(0.1032)***	(0.2917)*	(0.1166)***		(0.1063)***	(0.2846)***	(0.1166)***	(0.1114)***	(0.1166)***	(0.1166)***	(0.1113)***	(0.1165)***	(0.1114)***
Intra-industry FDI * Local Firm Dummy				-0.3051				-0.0621							
				(0.1178)***				(0.1132)							
FDI-Forward linkages * Local Firm Dummy				-0.3057				0.0234							
				(0.1835)*				(0.1722)							
FDI-Backward linkages * Local Firm Dummy				0.4483				0.2289							
				(0.3028)				(0.2931)							
Exporting activity															
U.S. Tariff (Mx - RofW)	-0.0351	-0.0288		-0.0351	-0.0164	-0.0069		-0.0163	-0.0164	-0.0158	-0.0162	-0.0162	-0.0156	-0.0161	-0.0156
	(0.0037)***	(0.0031)***		(0.0036)***	(0.0048)***	(0.0041)*		(0.0047)***	(0.0048)***	(0.0047)***	(0.0048)***	(0.0048)***	(0.0047)***	(0.0048)***	(0.0047)***
Exporter									0.0003			0.0007		-0.0079	
									(0.0047)			(0.0047)		(0.0147)	
Exports/Sales										0.0129			0.0145		0.0516
										(0.0139)			(0.0139)		(0.0371)
Exporter * Local Firm Dummy														0.0092	
														(0.0156)	
Exports/Sales * Local Firm Dummy															-0.0427
															(0.0403)
Imported intermediate goods															
Imported-input/material costs											-0.0338	-0.0339	-0.0320	-0.1014	-0.0908
											(0.0138)**	(0.0138)**	(0.0134)**	(0.0365)***	(0.0347)***
Imported input * Local Firm Dummy														0.0786	0.0686
														(0.0396)**	(0.0379)*
Observations	38024	38401	38527	38024	31940	32248	32365	31940	31940	30922	31940	31940	30922	31940	30922
Number of group (clase folio)	5935	5980	6012	5935	5779	5819	5854	5779	5779	5647	5779	5779	5647	5779	5647
Ho: Sum FDI variables=0 (Chi^2 of F-stat)	94.70		91.04	82.08	110.25		147.38	101.34	110.36	111.49	109.98	110.10	111.34	110.84	111.59
Prob > F or Chi^2	0.00		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ho: Exports*domestic=0 (Chi^2)														0.06	0.35
Prob > chi2														0.7991	0.559
Ho: Imported inputs*domestic=0 (Chi^2)														2.32	2.30
Prob > chi2														0.1277	0.1293

Notes: (1) All regressions were estimated using two-stage least squares on a panel with fixed effects. Endogenous variables: Mexican and U.S. tariffs, imports/output, industry real exchange rate. Instrumental variables: NAFTA-negotiated tariffs, predicted imports/output from gravity equation, and nominal exchange rate multiplied by U.S. industry producer price index. (2) All regressions include the following controls: size, industry output (exluding the plant's own output), capacity utilization, industrial and geographic concentration indices, U.S. consumption, log of exchange rate times U.S. PPI in the industry, and year dummies. Regressions 4 to 9 also include log TFP in year t. (3) "Mexican tariff" is the ISIC (rev 3) 4-digit industry tariff on world imports, weighted by trade. "U.S. tariff" is the difference between effective tariffs on Mexican imports and on imports from the rest of the world in the industry. FDI variables refer to the fraction of output produced by foreign plants; linkages were calculated using Mexican input-output data as weights. (4) Standard errors in parentheses.

* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Contents

APPENDIX
EMPIRICAL METHODOLOGY

(a) Productivity Estimates

The analysis applies an algorithm proposed by Olley and Pakes [1996] to account for simultaneity and sample selection issues in estimating the parameters of a Cobb-Douglas production function with skilled (L^s) and unskilled (L^u) labor, materials (M), and capital (K) inputs as regressors, and output (Y) as the dependent variable:

$$\ln Y_{ijt} = \beta_o + \beta_u \ln L^u_{ijt} + \beta_s \ln L^s_{ijt} + \beta_m \ln M_{ijt} + \beta_k \ln K_{ijt} + p_{ijt} + \varepsilon_{ijt}, \qquad (1)$$

where $p_{ijt} \equiv \ln P_{ijt}$ represents total factor productivity (in logs) for firm i in industry j during year t. Different production functions were estimated for eight manufacturing industries (industries 31 to 38 in the International Standard Industrial Classification- ISIC, revision 2, see Tables A1a and A1b). In the case of Brazil, where a more disaggregated classification was available (see below), production functions were also estimated for the 21 sectors of the ISIC, revision 3 (see table A1c). Productivity was then defined as the unexplained residual

$$\hat{p}_{ijt} = \ln Y_{ijt} - \hat{\beta}_u \ln L^u_{ijt} - \hat{\beta}_s \ln L^s_{ijt} - \hat{\beta}_m \ln M_{ijt} - \hat{\beta}_k \ln K_{ijt} \qquad (2)$$

Figures 6 and 7 reflect the output-weighted average firm-level productivity growth using ISIC revision 2 production functions, excluding the lower and upper 1-percent tails of the distribution of TFP to remove outlying observations.[23] The analysis underlying Figure 8 extends the productivity decomposition proposed by Griliches and Regev [1995] by further distinguishing between intra- and inter-industry reallocation of resources. Specifically, letting $P_{jt} = \Sigma_{i\in j} s^j_{it} P_{ijt}$ represent industry j's aggregate TFP (in levels) in year t, manufacturing sector-wide productivity is $P_t = \Sigma_j s^t_j P_{jt}$, where s^j_{it} represents firm i's share of industry j's output and s^j_t represents industry j's share of total manufacturing output. Then, productivity growth in the manufacturing sector is given by the expression

$$\Delta P_t = \underbrace{\Sigma_j \Sigma_{i\in j} \overline{s}_j \overline{s}^{\,j}_{it} \Delta P_{ijt}}_{\text{Within-firm TFains}} + \underbrace{\Sigma_j \Sigma_{i\in j} \overline{s}_j P_{ijt} \Delta s^j_{it}}_{\text{Within-industry reallocation}} + \underbrace{\Sigma_j \overline{P}_j \Delta s^j_t}_{\text{Reallocation across industries}} \qquad (3)$$

The first right-hand side term reflects the contribution to TFP growth of within-firm efficiency improvements, whereas the second and third term reflect the contribution of resource reallocation

---

[23] The use of productions functions based on either ISIC revision 2 or revision 3 classifications produced similar TFP growth results for Brazil. We opted for the revision 2 results in the econometric exercises for Brazil to have the same breakdown as Mexico.

from less to more productive firms within or across industries, respectively. A bar over a variable indicates the average over t and $t+1$ for a given variable. Since performing such decomposition requires aggregating across firms in industries with different production functions, TFP estimates were normalized as in Pavcnik [2000] by subtracting the productivity level of a so-called "reference firm" in the initial year (1996 for Brazil and 1993 for Mexico). Thus, the implicit TFP growth rates in Figure 8 are not readily comparable to those in Figures 6 and 7. In the decomposition exercise, we follow Bernard and Jensen [2001] in classifying firms according to alternative industry typologies.

(b) Impacts of Trade and FDI

With the productivity estimates in hand, we explain a firm's efficiency as a function of trade policy variables (e.g., tariffs), foreign capital participation and FDI, exports, imported-input use, as well as other controls needed to prevent omitted variable biases. Thus, one may estimate equations of the form:

$$Productivity_{\mathrm{ijt}} = \mathrm{Trade}_{\mathrm{ijt}}\beta_1 + \mathrm{FDI}_{\mathrm{ijt}}\beta_2 + controls + \varepsilon_{\mathrm{it}} \qquad (4)$$

where $\mathrm{Trade}_{\mathrm{ijt}}$ and $\mathrm{FDI}_{\mathrm{ijt}}$ are matrices of trade- and FDI-related variables. The dependent variable, productivity, is either log TFP or the change in log TFP from t to $t+1$; in the latter case, all right-hand side variables are measured at year t. The availability of panel data allows tracking each plant over time and controlling for unobserved plant characteristics via fixed-effect panel techniques. Tables A2a and A2b present the descriptive statistics for the relevant variables.

Since trade policy is potentially endogenous -for example, less productive industries may receive more protection from policymakers- one needs to find appropriate instrumental variables to obtain consistent estimates of the coefficients in vector β_1. In the Mexican case the analysis uses the NAFTA-agreed tariffs as instruments for the actual Mexican tariffs on world trade, as well as for U.S. tariffs on Mexican goods. NAFTA tariff phase-out negotiations finished in August 1992. Moreover, according to NAFTA Annex 302.2, paragraph 2, the base rate for determining import duties after applying the staging category agreed upon "generally reflect the rate of duty in effect on July 1, 1991." Thus, we can safely consider that they are exogenous (that is, they are not influence by plant-level TFP levels during the 1993-2000 period). Moreover, they are highly correlated with actual tariffs. For Brazilian tariffs, we use Mexican most-favored nation tariffs as instruments; the two variables have a 0.5 correlation coefficient and it seems unlikely that Brazilian producers adjust their efficiency levels to Mexican protection, as the two countries engage in little bilateral trade.

For both countries, we instrumented import penetration (more specifically, imports divided by shipments measured in PPP terms) using a gravity equation approach as in Frankel and Romer [1999]. Using industry-level bilateral import figures for Mexico and Brazil with every other country in the world, we fit the following gravity equation:

$$\ln\left(IMP_{ijt}\right) = \ln\left(GDP_{it}\right) + \ln\left(\frac{GDP_{it}}{POP_{it}}\right) + FTA_{it} + \ln\left(distance_i\right)$$
$$+ \ln\left(area_i\right) + border_i + language_i + island_i + landlocked_i \qquad (5)$$
$$+ \text{year dummies} + \text{industry dummies} + \varepsilon_{ijt}$$

where IMP_{ijt} are imports from country *i* in industry *j* during year *t*; GDP_{it} and POP_{it} are, respectively, gross domestic product and population in country *i* at time *t*; FTA_{it} is a dummy equal to one if Mexico (Brazil) and country *i* are members of a common free trade agreement in year *t*; $distance_i$ is the great circle distance between Mexico (Brazil) and country *i* in kilometers; $area_i$ is country *i*'s land area in squared kilometers; the indicator variables $border_i$, $language_i$, $island_i$, and $landlocked_i$ are each equal to one if, respectively, Mexico (Brazil) and country *i* share a common border, a common language, country *i* is an island or it is landlocked. The period of analysis is 1993-2000 for Mexico and 1996-2000 for Brazil and year dummies were used accordingly. Industry dummies for all four-digit ISIC revision 3 manufacturing industries were included. We estimated equation (5) pooling the data for all countries, industries and years and applying ordinary least squares. We also estimated equation (5) one industry at a time, pooling all countries and years, but the correlation of the fitted values with actual imports, as well as the productivity results, did not differ. GDP and trade data are expressed in 1995 U.S. dollars.[24]

According to the gravity equation literature and to trade theory, one expects Mexican and Brazilian imports to be positively correlated to its partners' GDP, GDP per capita, having common border or speaking a common language, and sharing an FTA. In contrast, imports are expected to be negatively affected by distance and geographic isolation (being landlocked or an island), and the partner's land area (which proxies for the size of the domestic market in the partner country). As Table A3 illustrates, all variables in the gravity equation are significant, except for landlocked in the case of Mexico, and have the expected sign. After transforming to levels, we aggregate bilateral fitted import values across countries in order to get a measure of total Mexican and Brazilian imports at the industry level explained solely by the gravity equation variables and that, therefore, is uncorrelated with the error term in equation (4). In order to control for changes in the import ratio, which reflects only the impact of exchange rate movements on the dollar denominated value of output, we used purchasing power parity exchange rates to covert output denominated in local currency to dollars. The correlation between the ratio of this measure of imports to industry output and the actual ratio is above 0.97 for Mexico and 0.74 for Brazil.

Tables A4a and b present the first-stage results for the baseline regressions under the two-stage least square approach, using the instruments described above.

Last, since exporting activities and the use of imported inputs are potentially endogenous, with more productive plants engaging in exports or establishing links with world-class input suppliers,

---

[24] Import figures come from Mexico's *Secretaría de Economía* and from Brazil's Secex. All other data were kindly provided by Ernesto Stein (IDB) and come from Stein and Daude [2001], the World Bank's *World Development Indicators* and from the CIA's *World Factbook*.

we only include this kind of variables in regressions where the dependent variable is the change in log TFP. We believe this decision ameliorates our concern of biased estimates since what we capture is the impact that, say, exporting today has on productivity growth over the coming year.

(c) Data Construction

MEXICO

Plant-level data: The paper uses a panel of manufacturing plants from the annual industrial survey (EIA, *Encuesta Industrial Anual*) collected by Mexico's INEGI (*Instituto Nacional de Estadística Geografía e Informática*). EIA includes approximately 6,800 plants, although missing data reduced the number of plants used in this study to around 5,800. The original sample was designed so as to account for at least 80 percent of the value of output in each of 205 industries in the CMAP (*Clasificación Mexicana de Actividades y Productos*), out of 306 industries in the manufacturing sector. All plants with more than 100 employees were included in the initial sample. In addition, a random sample of smaller plants was added to the sample and in some cases all plants in an industry were included. Still, the sample is biased toward medium and large plants.

Although good information exists to explain attrition, the sample was not updated, except rarely, to account for plant entry in an industry. Thus, our analysis includes only plants that existed in 1993 and that either were in operation throughout the period of analysis or that exit the sample because they went out of business; plants that stopped reporting information to INEGI or that shutdown for reasons other than a decision to exit the industry (e.g., a strike) were dropped from the sample.

EIA contains information on the book value of fixed assets, investment, domestic and imported material inputs, hours worked and number of employees, the value of domestic and foreign sales, and the total value of output, among other. Additional plant level information, such as working hours by skill level, was obtained from INEGI's monthly industrial survey (*Encuesta Industrial Mensual*) or from unpublished INEGI information. Access to the data was granted by INEGI upon condition of confidentiality.

Industry-level producer and input price indices were obtained from *Banco de México*'s webpage. Such indices are classified according to the national accounts classifier and were transformed to the CMAP classification using a correspondence table provided by INEGI. An implicit price index for gross fixed asset formation was obtained from INEGI's *Banco de Información Económica* database.

Capital stock: In order to obtain a series for the stock of capital at the plant level, the analysis uses the perpetual inventory method, $K_{it+1} = (1 - \delta_{it}) K_{it} + I_{it}$, where K_{it+1} is the stock of capital at the beginning of year t+1 in plant i, I_{it} is investment in fixed assets during year t and δ_{it} is the depreciation rate of capital during the year. First, using the implicit price index for fixed asset formation, we transformed investment figures into 1993 prices. Then, for every year, we calculated the depreciation rate using the reported amount of depreciated assets during the year, reported at book value, and the book-value of assets at the beginning of the year. Last, we defined the initial value of the capital stock as the book-value of fixed assets at the beginning of 1993, the first year in our sample, and updated the capital stock series with the investment and depreciation rates found earlier.

Trade and tariff data: Detailed trade and import duties data for Mexico and the United States were obtained at the Harmonized System 8- or 10-digit tariff line level, respectively. Mexican data come from INEGI and *Secretaría de Economía* and, for the United States, from the U.S. Department of Commerce. Mexican tariff information include preferential tariffs applied on specific countries according to the several free trade agreements negotiated by Mexico. Data were aggregated to the four-digit industry level, according to the International Standard Industrial Classification (ISIC), revision 3, using a correspondence table provided by the United Nation's Economic Commission for Latin America and the Caribbean (CEPAL [1998]). U.S. tariffs on imports from Mexico and the rest of the world were calculated dividing collected duties by the customs value of imports. In order to obtain Mexican tariff figures at the industry level, 8-digit HS tariffs were aggregated to the 6-digit level using the value of Mexican imports as weights. We then aggregated to the ISIC industry level using U.S. exports to the world, excluding Mexico, as weights.

Foreign capital participation: INEGI provided information on the percent of equity owned by foreigners, with some detail on the country of ownership, for the year 1994. Information for other years was unavailable. We assumed the structure of ownership remained unchanged throughout the period of analysis. We defined a plant to be "foreign" if foreigners owned more than 50 percent of equity. With this information at hand, we calculated the fraction of industry output produced by foreign plants in each industry to account for the possibility of spillovers from foreign direct investment. In the econometric exercises, we excluded a foreign plant's own output when measuring foreign capital participation in the industry to which the plant belongs. In order to account for the possibility of spillovers from industries upstream or downstream in the production process, we calculate average foreign capital participation in industries with backward or forward linkages. To this effect, we use intermediate good purchases from and sales to other industries as weights in calculating such averages, relying on an input-ouput matrix for Mexico provided by the Inforum Project at the University of Maryland.

BRAZIL

Firm level data: The productivity analysis for Brazil is based on an unbalanced panel dataset of firms drawn from the Annual Industrial Survey (*Pesquisa Industrial Anual* - PIA) conducted by IBGE, Brazil's statistical office. The choice of period was 1996-2000 for two reasons: first, in 1996 PIA went through a major methodological overhaul, which led, *inter alia*, to a larger and more representative sample (an average sample of 110,000 firms in 1996-2000), but which compromised the comparability of the pre- and post-1996 series; and second, the quality of the data collected until 1995 suffered with the extremely high inflation of the pre-1994 period and with the frequent changes in accountancy methods. The "new" PIA, though, has a major drawback, which is the lack of information on capital stock. To obtain this information, three other databases were used: the 1995 PIA (approximately 4,597 firms), a corporate income tax database from Receita Federal for 1996-1998 (approximately 20,000 firms) and a balance sheet database built by Fundação Getulio Vargas (approximately 4,000 firms). The crossing of firm-level information among these databases led to a panel dataset of approximately 11,900 firms. This dataset accounted in average for 83 percent of the manufacturing industry value-added and for 62 percent of manufacturing employment over the period. All the relevant variables were deflated to 1995 prices, with the use of general (for non-sector specific variables such as investment) and sectoral price indices (sector specific variables such as output and inputs). The latter were based on national account implicit deflators available at the *setor matriz* level (81 sectors) and converted to ISIC four digits (output) and on technical coefficients of the input-output matrix (cost indices). Since there was no information available on 1999 and 2000 technical coefficients, the information for 1998 was used for those two years. To check the sensitivity of the productivity results to different deflators, another series of output and inputs at 1995 prices was constructed taking as a the sector specific deflator the wholesale price index (Indice de Preço de Atacado Fundação Getúlio Vargas). The results, though, were similar to those using the national account implicit deflator. Data on industry capacity utilization, used as a control in the trade related regressions is from Fundação Getulio Vargas.

Capital stock: The variable capital stock was constructed using information on fixed assets for 1995 taken from the three alternative databases mentioned above and updating this information for the other years using the perpetual inventory method. The information on fixed assets was limited to roughly 5,000 firms. For the rest of the firms, there was information on total assets. To obtain the missing information on fixed assets, fixed assets/total assets (K_f / K_t) ratios were estimated based on the data of those firms that had information on these two variables. The K_f / K_t ratio was regressed on non-labor inputs, depreciation and sectoral dummies. The depreciation variable was based on PIA information except for those firms whose depreciation ratios were well beyond the industry norm. For those firms, the depreciation ratio used was inputted through linear regression and prediction. Following Muendler [2002] capital stock equivalents to leasing and renting expenditures were built, adjusted by depreciation and real interest rates, and added to the firms proprietary stock. The capital stock variable was constructed so capital stock at time t does not contain investment at time t. Investment flows were deflated with a price index based on the economy's capital formation vector.

Trade and tariff data: Detailed trade and import duties data for Brazil s were obtained at the Harmonized System 8- or 10-digit tariff line level, respectively. Trade data come from SECEX and Tariff data from Unctad Trains. Data were aggregated to the four-digit industry level, according to CNAE (*Classificação Nacional de Atividades Economicas*) and then to International Standard Industrial Classification (ISIC), revision 3, using a correspondence table provided by IBGE. In order to obtain tariff figures at the industry level, 8-digit HS tariffs were aggregated using the value of Brazil total trade as weights.

Foreign capital participation: The data on FDI exposure was constructed based, respectively, on BACEN 1995 and 2000 Foreign Capital Census' firm level information. In order to measure intra- and inter-industry spillovers from FDI, the analysis uses information on the percent of equity owned by foreigners in 1995. To avoid endogeneity problems, the analysis assumes that the structure of ownership remained unchanged through 2000. A firm is considered to be "foreign" if foreigners owned more than 50 percent of equity. With this information at hand, the fraction of industry output produced by foreign plants in each industry was taken as the measure for foreign capital participation. In order to account for the possibility of spillovers from industries upstream or downstream in the production process, the analysis considers the average foreign capital participation among the firm's buyers and suppliers, using the coefficients of the input-output matrix as weights. The firms' cost (backward linkages) and demand structures (forward linkages) were assumed to be the same in each industry.

TABLE A1A
MEXICO'S PRODUCTION FUNCTION ESTIMATION RESULTS

Manufacturing division	31	32	33	34	35	36	37	38	39
Unskilled labor	0.093	0.246	0.060	0.140	0.054	0.102	0.126	0.101	0.090
	(0.008)***	(0.009)***	(0.033)*	(0.016)***	(0.010)***	(0.018)***	(0.040)***	(0.009)***	(0.032)***
Skilled labor	0.061	0.094	0.162	0.088	0.151	0.136	0.066	0.123	0.159
	(0.007)***	(0.008)***	(0.022)***	(0.010)***	(0.010)***	(0.015)***	(0.014)***	(0.007)***	(0.028)***
Materials	0.826	0.652	0.747	0.732	0.763	0.781	0.809	0.777	0.724
	(0.008)***	(0.010)***	(0.024)***	(0.014)***	(0.011)***	(0.015)***	(0.035)***	(0.007)***	(0.024)***
Capital	0.049	0.077	0.059	0.072	0.084	0.013	0.027	0.041	0.007
	(0.004)***	(0.006)***	(0.005)***	(0.006)***	(0.004)***	(0.005)***	(0.008)***	(0.005)***	(0.003)**
Observations	4639	4052	780	1362	4720	1325	497	5603	57

Notes: Bootstrapped standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

TABLE A1B
BRAZIL'S PRODUCTION FUNCTION ESTIMATION RESULTS (ISIC REV. 2, 2 DIGITS)

Sectors	31	32	33	34	35	36	37	38	39
Unskilled labor	0.131	0.243	0.237	0.266	0.108	0.225	0.170	0.226	0.219
	(0.009)***	(0.011)***	(0.021)***	(0.036)***	(0.009)***	(0.016)***	(0.019)***	(0.009)***	(0.029)***
Skilled labor	0.108	0.096	0.105	0.197	0.177	0.102	0.129	0.175	0.144
	(0.006)***	(0.007)***	(0.013)***	(0.018)***	(0.008)***	(0.013)***	(0.023)***	(0.007)***	(0.025)***
Materials	0.761	0.666	0.711	0.594	0.718	0.712	0.715	0.632	0.636
	(0.010)***	(0.012)***	(0.024)***	(0.052)***	(0.009)***	(0.012)***	(0.027)***	(0.009)***	(0.029)***
Capital	0.070	0.111	0.046	0.086	0.075	0.102	0.132	0.056	0.071
	(0.003)***	(0.009)***	(0.006)***	(0.008)***	(0.004)***	(0.011)***	(0.019)***	(0.007)***	(0.009)***
Observations	3449	2551	1500	1452	3437	939	584	4317	154

Notes: Bootstrapped standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table A1c
BRAZIL'S PRODUCTION FUNCTION ESTIMATION RESULTS (ISIC REV. 3, 2 DIGITS)

Sectors	15	17	18	19	20	21	22	24	25	26	27	28	29	31	32	33	34	36
Unskilled labor	0.131	0.187	0.272	0.26	0.271	0.218	0.267	0.068	0.174	0.225	0.17	0.245	0.156	0.201	0.185	0.267	0.321	0.213
	(0.009)***	(0.012)***	(0.020)***	(0.021)***	(0.029)***	(0.019)***	(0.039)***	(0.011)***	(0.013)***	(0.016)***	(0.019)***	(0.019)***	(0.012)***	(0.025)***	(0.022)***	(0.033)***	(0.031)***	(0.021)***
Skilled labor	0.108	0.093	0.136	0.044	0.124	0.116	0.235	0.188	0.136	0.102	0.129	0.14	0.173	0.211	0.14	0.135	0.148	0.104
	(0.006)***	(0.012)***	(0.014)***	(0.011)***	(0.021)***	(0.015)***	(0.022)***	(0.011)***	(0.011)***	(0.013)***	(0.023)***	(0.012)***	(0.011)***	(0.020)***	(0.023)***	(0.038)***	(0.018)***	(0.013)***
Materials	0.761	0.68	0.624	0.678	0.659	0.715	0.506	0.729	0.681	0.712	0.715	0.611	0.67	0.586	0.65	0.526	0.573	0.714
	(0.010)***	(0.014)***	(0.024)***	(0.019)***	(0.039)***	(0.017)***	(0.076)***	(0.013)***	(0.013)***	(0.012)***	(0.027)***	(0.020)***	(0.012)***	(0.024)***	(0.023)***	(0.043)***	(0.030)***	(0.024)***
Capital	0.070	0.017	0.057	0.052	0.055	0.073	0.075	0.074	0.065	0.09	0.098	0.077	0.054	0.086	0.057	0.113	0.069	0.07
	(0.003)***	(0.009)*	(0.010)***	(0.004)***	(0.017)***	(0.009)***	(0.006)***	(0.003)***	(0.008)***	(0.006)***	(0.012)***	(0.005)***	(0.005)***	(0.016)***	(0.009)***	(0.004)***	(0.009)***	(0.006)***
Observations	3449	901	633	873	497	550	704	1922	1228	939	584	1304	951	407	290	191	841	1076

Notes: Bootstrapped standard errors in parentheses; Sectors 16, 23, 30 and 35 were agregated into sectors 15, 24, 32 and 34, respectively, due to the small number observations.
* significant at 10%; **significant at 5%; ***significant at 1%.

TABLE A2A
DESCRIPTIVE STATISTICS FOR BRAZIL

Variable		Total 1996-2000 Mean [Std Dev]	Year				
			1996	1997	1998	1999	2000
Change in log TFP from t to t+1	Mean	-0.012	-0.005	-0.016	-0.010	-0.020	---
	Std. Dev.	0.365	0.362	0.362	0.373	0.362	---
Log TFP	Mean	2.929	2.933	2.941	2.932	2.927	2.907
	Std. Dev.	0.824	0.818	0.826	0.836	0.823	0.813
MFN tariffs	Mean	16.841	15.861	15.546	18.105	17.578	17.130
	Std. Dev.	5.855	7.134	5.896	5.545	5.171	4.810
Log Imports/Output	Mean	-2.758	-2.785	-2.665	-2.725	-2.761	-2.853
	Std. Dev.	1.511	1.403	1.402	1.555	1.617	1.559
Intra-Industry FDI	Mean	0.230	0.220	0.226	0.232	0.237	0.236
	Std. Dev.	0.230	0.223	0.226	0.230	0.237	0.235
FDI in backward linked industries	Mean	0.255	0.245	0.249	0.255	0.259	0.266
	Std. Dev.	0.207	0.199	0.201	0.205	0.209	0.220
FDI in forward linked industries	Mean	0.248	0.238	0.244	0.250	0.254	0.256
	Std. Dev.	0.188	0.180	0.186	0.190	0.193	0.188
Exports/Sales	Mean	0.067	0.067	0.063	0.061	0.065	0.085
	Std. Dev.	0.182	0.182	0.176	0.171	0.180	0.204
Exports/Sales Mercosur	Mean	0.011	0.009	0.010	0.011	0.011	0.014
	Std. Dev.	0.041	0.040	0.041	0.043	0.039	0.044
Exporter dummy	Mean	0.404	0.416	0.399	0.383	0.364	0.475
	Std. Dev.	0.491	0.493	0.490	0.486	0.481	0.499
Exporter dummy Mercosur	Mean	0.293	0.295	0.288	0.279	0.266	0.354
	Std. Dev.	0.455	0.456	0.453	0.448	0.442	0.478
Imported inputs/Total non-labor costs	Mean	0.078	0.079	0.078	0.075	0.070	0.089
	Std. Dev.	0.183	0.183	0.181	0.179	0.177	0.196

TABLE A2B
DESCRIPTIVE STATISTICS FOR MEXICO

Variable		Total 1993-2000 Mean [Std Dev]	Year							
			1993	1994	1995	1996	1997	1998	1999	2000
Change in log TFP from t to t+1	Mean	-0.019	-0.093	0.017	0.011	-0.016	-0.036	-0.014	0.013	---
	Std. Dev.	0.257	0.355	0.295	0.249	0.217	0.177	0.185	0.177	---
Log TFP	Mean	1.146	1.227	1.139	1.150	1.161	1.141	1.106	1.091	1.109
	Std. Dev.	0.451	0.354	0.427	0.474	0.471	0.460	0.450	0.484	0.497
Mexican tariff on all imports	Mean	11.866	16.863	12.578	12.964	11.649	10.613	9.564	9.729	7.844
	Std. Dev.	13.001	14.587	12.107	14.207	13.727	13.252	11.878	10.950	7.677
Log Imports/Output	Mean	-0.628	-1.157	-0.954	-0.892	-0.656	-0.468	-0.253	-0.124	0.009
	Std. Dev.	1.242	1.145	1.122	1.204	1.137	1.229	1.229	1.239	1.172
Intra-Industry FDI	Mean	0.151	0.142	0.146	0.153	0.153	0.152	0.156	0.157	0.153
	Std. Dev.	0.214	0.203	0.209	0.219	0.218	0.217	0.217	0.219	0.214
FDI in backward linked industries	Mean	0.192	0.175	0.186	0.195	0.195	0.194	0.199	0.204	0.202
	Std. Dev.	0.067	0.065	0.064	0.065	0.069	0.068	0.069	0.067	0.066
FDI in forward linked industries	Mean	0.351	0.326	0.334	0.367	0.353	0.354	0.357	0.362	0.368
	Std. Dev.	0.207	0.189	0.195	0.227	0.211	0.211	0.206	0.208	0.209
U.S. preferential tariff	Mean	-2.932	-2.427	-3.011	-3.206	-3.182	-3.039	-3.015	-2.831	-2.697
	Std. Dev.	3.499	2.839	3.127	3.587	3.577	3.563	3.697	3.908	3.872
Exports/Sales	Mean	0.094	0.064	0.068	0.098	0.105	0.110	0.111	0.109	0.105
	Std. Dev.	0.212	0.183	0.188	0.220	0.222	0.222	0.223	0.223	0.220
Exporter dummy	Mean	0.368	0.273	0.279	0.352	0.395	0.428	0.422	0.437	0.437
	Std. Dev.	0.482	0.446	0.448	0.478	0.489	0.495	0.494	0.496	0.496
Imported inputs/Total non-labor costs	Mean	0.130	0.123	0.127	0.126	0.128	0.136	0.133	0.135	0.136
	Std. Dev.	0.208	0.201	0.204	0.207	0.209	0.212	0.209	0.211	0.211

TABLE A3
INSTRUMENTING FOR IMPORTS
GRAVITY EQUATION ESTIMATION RESULTS

Pooled OLS estimates.

Dependent variable: Log of bilateral imports by industry.

	Mexico	**Brazil**
GDP	1.4156	1.1975
	(0.0187)***	(0.0174)***
GDP/POP	0.3247	0.2624
	(0.0535)***	(0.0431)***
FTA	0.7771	0.9834
	(0.1312)***	(0.1524)***
Distance	-0.9247	-0.7564
	(0.0890)***	(0.0982)***
Landlocked	-0.0428	-0.3732
	(0.0662)	(0.0579)***
Island	-1.0770	-1.0945
	(0.0802)***	(0.0971)***
Land area	-0.1167	-0.1104
	(0.0176)***	(0.0127)***
Border	0.1883	1.3205
	(0.0866)**	(0.1202)***
Common Language	1.9305	0.4879
	(0.0667)***	(0.0963)***
Observations	16888	16146
R-squared	0.6430	0.5435

Notes: - Robust standard errors in parentheses.
- Significant at: * 10%; ** 5%; *** 1%.
- Constant's coefficient, as well as year and industry dummies, are not reported.

TABLE A4A
TWO-STAGE LEAST SQUARE FIXED EFFECT REGRESSION: BRAZIL'S TFP LEVEL AND CHANGE

	Reg 1 (Table 1)	First stage regressions			Reg 5 (Table 1)	First stage regressions		
	Dependent variable: Log TFP	Industry real exchange rate	Log Import/industry output	Tariffs	Dependent variable: Change in Log TFP	Industry real exchange rate	Log Import/industry output	Tariffs
Explanatory variables								
Log import ratio	0.1244				1.2889			
	(0.0285)***				(0.2433)***			
MNF tariffs	-0.1250				-0.0507			
	(0.0389)***				(0.0448)*			
Sectoral real exchange rate	0.0879				-1.1268			
	(0.0958)				(0.2064)***			
Intra-industry FDI	0.3939	0.1722	0.7128	3.6188	-0.7933	0.1524	0.6969	3.5866
	(0.1487)***	(0.0090)***	(0.6276)***	(0.4271)***	(0.2003)***	(0.0007)***	(0.0813)***	(0.5536)***
FDI-Forward linkages	-0.0686	0.2908	0.6572	-4.3414	-1.2510	-0.1366	0.9035	-3.8070
	(0.2721)	(0.0195)***	(0.1357)***	(0.9235)***	(0.5408)**	(0.0210)***	(0.2052)***	(1.3957)***
FDI-Backward linkages	-0.3345	-0.6657	1.4201	4.0408	-1.3815	-0.0518	1.0282	-0.3189
	(0.2444)	(0.0126)***	(0.0871)***	(0.5978)***	(0.3806)***	(0.0168)***	(0.1645)***	(1.1189)***
Capacity utlization	0.0073	0.0016	-0.0236	0.0061	0.02570	-0.0001	-0.0181	-0.013
	(0.0011)***	(0.0001)***	(0.0007)***	(0.0050)	(0.0044)***	(0.0000)**	(0.0009)***	(0.0062)***
Size (30-299 workers)	-0.0540	-0.0038	-0.0172	0.0639	0.049	0.0001	-0.0379	0.1157
	(0.0012)***	(0.0014)***	(0.0099)*	(0.0685)	(0.0289)**	(0.0016)	(0.0155)***	(0.1058)
Size (>299 workers)	-0.1029	-0.0058	0.0250	0.1274	-0.0474	-0.0041	0.0308	0.1849
	(0.0185)***	(0.002)***	(0.0142)*	(0.0979)	(0.0349)	(0.0020)**	(0.0201)***	(0.1368)
Herfindal	-0.1321	-0.3758	0.6482	2.2222	-0.5049	-0.1821	-0.0986	3.8093
	(0.1919)	(0.0162)***	(0.1126)***	(0.7665)***	(0.3272)	(0.0154)***	(0.1502)	(1.0220)***
Instruments								
Industry nominal ex. rate adj. U.S. PPI		0.9448	0.2689	2.0864		0.9239	0.6827	1.2468
		(0.0049)***	(0.0334)***	(0.2327)***		(0.0047)***	(0.0464)***	(0.3158)***
Predicted import ratio		0.1516	0.6877	0.2075		0.1423	0.2538	1.044
		(0.0019)***	(0.0137)***	(0.0932)***		(0.0023)***	(0.0231)***	(0.1546)***
Mexico's NFM tariffs		-0.0018	0.0027	0.0117		-0.0011	-0.0031	0.0146
		(0.0000)***	(0.0005)	(0.0033)***		(0.0000)***	(0.0006)***	(0.0044)***
Observations	47664	47664	47664	47664	36274	36274	36274	36274
Number of id	11177	11177	11177	11177	10253	10253	10253	10253
Within R-squared	-	0.9502	0.4945	0.2367	-	0.9706	0.4166	0.2805
Sum FDI variables=0	0.0022				20.6111			
Prob > chi2	0.96				0			

Notes: (1) other controls included: industry output (exluding the plant's own output), U.S. consumption and year dummies. (2) Standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

TABLE A4B
TWO-STAGE LEAST SQUARE FIXED EFFECT REGRESSION: MEXICO'S TFP LEVEL AND CHANGE

	Reg 1 (Table 2)	First stage regressions				Reg 5 (Table 2)	First stage regressions			
	Dependent variable: Log TFP	Mexican tariff	Log Imports / industry output	U.S. Tariff	Industry real exchange rate	Dependent variable: Change in Log TFP	Mexican tariff	Log Imports / industry output	U.S. Tariff	Industry real exchange rate
Explanatory variables										
Mexican tariff on total imports	-0.0028					-0.0040				
	(0.0010)***					(0.0014)***				
Log imports/industry output	0.5148					0.2398				
	(0.0440)***					(0.0537)***				
U.S. Tariff (Mx - RofW)	-0.0351					-0.0164				
	(0.0037)***					(0.0048)***				
Industry real exchange rate	0.1540					-0.0728				
	(0.0465)***					(0.0607)				
Intra-industry FDI	-0.2706	-11.2965	0.1311	-1.2372	0.1470	0.0209	-10.1706	0.0936	-1.4936	0.0570
	(0.0480)***	(0.8205)***	(0.0325)***	(0.1769)***	(0.0197)***	(0.0489)	(0.8815)***	(0.0375)**	(0.2054)***	(0.0207)***
FDI-Backward linkages	0.9684	-11.5456	1.6515	18.0969	0.7496	1.2233	-2.2520	1.8923	18.9591	0.3211
	(0.1187)***	(1.9209)***	(0.0762)***	(0.4141)***	(0.0462)***	(0.1166)***	(2.1195)	(0.0901)***	(0.4938)***	(0.0498)***
FDI-Forward linkages	0.9286	11.7301	-1.3912	4.2309	0.0739	0.4698	6.7849	-1.3595	4.2109	0.1028
	(0.1052)***	(0.9971)***	(0.0395)***	(0.2150)***	(0.0240)***	(0.1190)***	(1.0275)***	(0.0437)***	(0.2394)***	(0.0241)***
Industry capacity utilization	-0.4403	0.4976	0.2462	0.0025	-0.3211	-0.0002	0.9398	0.2504	0.5056	-0.2376
	(0.0379)***	(0.4960)	(0.0197)***	(0.1069)	(0.0119)***	(0.0368)	(0.5268)*	(0.0224)***	(0.1227)***	(0.0124)***
Industrial concentration (Herfindhal Index)	-0.4530	7.0754	-0.4782	-1.9437	-0.4615	-0.0323	6.4194	-0.5127	-2.0822	-0.2639
	(0.0564)***	(0.9496)***	(0.0376)***	(0.2047)***	(0.0228)***	(0.0557)	(1.0350)***	(0.0440)***	(0.2411)***	(0.0243)***
Geographic concentration (Herfindhal Index)	0.0056	0.1428	-0.0032	0.0051	-0.0032	-0.0017	0.0996	0.0005	0.0002	-0.0024
	(0.0016)***	(0.0277)***	(0.0011)***	(0.0060)	(0.0007)***	(0.0016)	(0.0307)***	(0.0013)	(0.0071)	(0.0007)***
U.S. consumption	0.0639	-9.6670	0.4088	2.6874	-0.0657	0.0615	-12.5007	0.5012	3.1538	-0.0686
	(0.0313)**	(0.3405)***	(0.0135)***	(0.0734)***	(0.0082)***	(0.0407)	(0.3786)***	(0.0161)***	(0.0882)***	(0.0089)***
Size (101-500 workers)	0.0473	-0.0233	-0.0062	-0.0282	0.0206	0.0051	-0.0738	-0.0125	-0.0621	0.0093
	(0.0097)***	(0.1672)	(0.0066)	(0.0360)	(0.0040)***	(0.0094)	(0.1786)	(0.0076)*	(0.0416)	(0.0042)**
Size (31-100 workers)	0.0787	0.2428	-0.0115	-0.0532	0.0281	0.0084	0.0576	-0.0194	-0.1064	0.0118
	(0.0116)***	(0.1990)	(0.0079)	(0.0429)	(0.0048)***	(0.0111)	(0.2121)	(0.0090)**	(0.0494)**	(0.0050)**
Size (1-30 workers)	0.1014	0.1981	-0.0191	-0.0329	0.0471	0.0066	-0.0496	-0.0229	-0.0721	0.0250
	(0.0141)***	(0.2399)	(0.0095)**	(0.0517)	(0.0058)***	(0.0137)	(0.2585)	(0.0110)**	(0.0602)	(0.0061)***

Table A4b (continued)

	Reg 1 (Table 2)	First stage regressions				Reg 5 (Table 2)	First stage regressions			
	Dependent variable: Log TFP	Mexican tariff	Log Imports / industry output	U.S. Tariff	Industry real exchange rate	Dependent variable: Change in Log TFP	Mexican tariff	Log Imports / industry output	U.S. Tariff	Industry real exchange rate
Instruments										
NAFTA Mexican tariff		0.9252	0.0008	0.0069	-0.0064		0.7342	0.0002	0.0105	-0.0080
		(0.0138)***	(0.0005)	(0.0030)**	(0.0003)***		(0.0152)***	(0.0006)	(0.0035)***	(0.0004)***
NAFTA U.S. tariff		-0.4380	0.0225	0.4295	-0.0095		-0.3027	0.0242	0.4069	-0.0081
		(0.0154)***	(0.0006)***	(0.0033)***	(0.0004)***		(0.0155)***	(0.0007)***	(0.0036)***	(0.0004)***
Predicted import ratio		-3.9543	0.6629	0.9975	0.4781		-3.5999	0.6224	0.8810	0.4299
		(0.2319)***	(0.0092)***	(0.0500)***	(0.0056)***		(0.2548)***	(0.0108)***	(0.0594)***	(0.0060)***
Industry nominal ex. rate adj. U.S. PPI		-7.9193	0.3464	2.9014	0.7237		-10.7813	0.5187	3.4784	0.7387
		(0.4469)***	(0.0177)***	(0.0964)***	(0.0108)***		(0.5093)***	(0.0217)***	(0.1187)***	(0.0120)***
Observations	38024	38024	38024	38024	38024	31940	31940	31940	31940	31940
Number of group (clase folio)	5935	5935	5935	5935	5935	5779	5779	5779	5779	5779
Within R-squared	0.0561	0.3797	0.8661	0.5122	0.6880	0.4272	0.3660	0.8435	0.4986	0.7374
Sum FDI variables=0	94.70					110.25				
Prob > chi2	0.00					0.00				

Notes: (1) Year dummies and a constant were also included but are not reported. (2) Standard errors in parentheses.
* significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Table A5a
TOTAL FACTOR PRODUCTIVITY AND OWNERSHIP: REGRESSION RESULTS BRAZIL

Explanatory variables	Dependent Variable: TFP Level
Foreign Firm Dummy	0.1601
	(0.0067)***
Size (30-299 workers)	-0.0186
	(0.0113)
Size (>299 workers)	-0.1287
	(0.0117)***
Observations	51077
R-squared	0.7549

Notes:
- All regressions includes year and industry dummies (ISIC, Rev3, 2 digits).
- Robust standard errors in parentheses.
- * significant at 10%; ** significant at 5%; *** significant at 1%.

Table A5b
TOTAL FACTOR PRODUCTIVITY AND OWNERSHIP: REGRESSION RESULTS MEXICO

Explanatory variables	Dependent Variable: TFP Level
Foreign Firm Dummy	0.1295
	(0.0064)***
Size (101-500 workers)	0.0072
	(0053)
Size (31-100 workers)	0.290
	(0.0062)***
Size (1-30 workers)	0.0557
	(0.0088)***
Observations	39060
R-squared	0.4956

Note:
- All regressions includes year and industry dummies (cemat 6 digits).
- Robust standard errors in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Contents

BIBLIOGRAPHY

AITKEN, BRIAN AND ANN E. HARRISON. "Do Domestic Firms benefit from Foreign Direct Investment? Evidence from Venezuela", *American Economic Review*, 89 (3), pp. 605-18. 1999.

BACHA, E. AND REGIS BONELLI. "Crescimento e Produtividade no Brasil: o que nos diz o Registro de Longo Prazo", *Seminários Dimac* N° 52. IPEA, Rio de Janeiro. 2001.

BAIER, SCOTT L.; GERALD P. DWYER JR. AND ROBERT TAMURA. "How Important are Capital and Total Factor Productivity for Economic Growth", *Working Paper Series 2002-2*. Federal Reserve Bank of Atlanta, Atlanta, Georgia. 2002.

BERNARD, ANDREW AND J. BRADFORD JENSEN. "Exporting and Productivity", *NBER Working Paper* 7135. April, 2001.

BLOMSTRÖM, MAGNUS AND ARI KOKKO. "Multinational Corporations and Spillovers", *Journal of Economic Surveys* 12:247-277. 1998.

BLOMSTRÖM, MAGNUS; ARI KOKKO AND MARIO ZEJAN. *Foreign Direct Investment. Firm and Host Country Strategies*. London: Macmillan. 2000.

CLERIDES, SOFRONIS; SAUL LACH AND JAMES TYBOUT. "Is Learning By Exporting Important? Micro Dynamics Evidence from Colombia, Mexico and Marocco", *Quarterly Journal of Economics* 113(3), pp. 903-947. 1998.

DUSSEL PETERS, ENRIQUE; LUIS M. GALINDO PALIZA AND EDUARDO LORÍA DÍAZ. "Condiciones y efectos de la IED y del proceso de integración regional en México durante los años noventa: Una perspectiva microeconómica". *Serie RedINT* (segunda convocatoria). Buenos Aires: BID-INTAL. 2003.

ESTEVADEORDAL, ANTONI; JUCHINI GOTO AND RAUL SAEZ. *The New Regionalism in the Americas: The case of MERCOSUR*, Intal-ITD Series, Working Paper N° 5. Buenos Aires: IDB-INTAL. 2000.

ETHIER, WILFRED. "National and International Returns to Scale in the Modern Theory of International Trade", *American Economic Review*, 72, pp. 950-59. 1982.

FERNANDES, ANA. *Trade Policy, Trade Volumes and Plant Level Productivity in Colombian Manufacturing Industries*. Department of Economics, Yale University. 2001.

FRANKEL, JEFFREY A., AND DAVID ROMER. "Does trade cause growth?", *American Economic Review*, 89(3), pp. 379-399. 1999.

GRILICHES, ZVI AND HAIM REGEV. "Firm Productivity in Israeli Industry 1979-1988", *Journal of Econometrics*, Vol. 65, pp. 175-203. 1995.

GROSSMAN, GENE AND ELHANAN HELPMAN. *Innovation and Growth in the Global Economy*. Mit Press: Cambridge, Massachusetts. 1991.

GROSSMAN, GENE AND ELHANAN HELPMAN. "Technology and Trade", *NBER Working Paper* 4926. November, 1994.

HELPMAN, ELHANAN AND PAUL KRUGMAN. Market Structure and Foreign Trade. Cambridge, M.A.: MIT Press. 1985.

INTER-AMERICAN DEVELOPMENT BANK - IDB. "Beyond Borders. The New Regionalism in Latin America", *Economic and Social Progress in Latin America*. Washington, D.C.: IDB. 2002.

INTER-AMERICAN DEVELOPMENT BANK - IDB. "Competitiveness: The Business of Growth", *Economic and Social Progress in Latin America*. Washington, D.C.: IDB. 2001.

KATAYAMA, HAJIME; LU SHIHUA AND JAMES TYBOUT. "Why Plant-Level Productivity Studies are Often Misleading, and an Alternative Approach to Inference" (processed). Pennsylvania State University. 2003.

KELLER, WOLFANG. "International Technology of Diffusion", Discussion Paper N° 3.133. Center for Economic Policy Research. 2001.

KOKKO, ARI; RUBEN TANSINI AND MARIO C. ZEJAN. "Local Technological Capability and Productivity Spillovers from FDI in the Uruguayan Manufacturing Sector", *Journal of Development Studies*, Vol. 32, N° 4, pp. 602-611. April, 1996.

KUGLER, MAURICE. "The Diffusion of Externalities from Foreign Direct Investment: Theory ahead of Measurement", University of Southampton Discussion Papers. 2000.

KUME, HONORIO; GUIDA PIANI AND CARLOS F. BRÁZ DE SOUZA. "A Política Brasileira de Importação no Período 1987-98: descrição e avaliação", (mimeo). IPEA, Rio de Janeiro. 2000.

LÓPEZ CÓRDOVA, ERNESTO. "Las Negociaciones de Acceso a los Mercados en los Tratados de Libre Comercio de México con Bolivia y Costa Rica", in Antoni Estevadeordal and Carolyn Robert (Eds.), *Las Américas Sin Barreras: Negociaciones Comerciales de Acceso a Mercados*, Chapter X, pp. 213-247. Washington, D.C.: BID. 2001.

LÓPEZ CÓRDOVA, ERNESTO. "NAFTA and Mexico's Manufacturing Productivity: An Empirical Investigation using Micro-level Data", (processed). IDB, Washington, D.C. 2002.

LOAYZA, NORMAN; PABLO FAJNZYLBER AND CÉSAR CALDERÓN. "Economic Growth in Latin America and The Caribbean. Stylized Facts, Explanations and Forecasts", (processed). World Bank, Washington, D.C. 2002.

MARKUSEN, JAMES AND ANTHONY VENABLES. "Foreign Direct Investment as a Catalyst for Industrial Development", *European Economic Review*, 43 (2), pp. 355-56. 1999.

MARKUSEN, JAMES AND KEITH MASKUS. "General Equilibrium Approaches to the Multinational Firm: A review of theory and evidence", in James Harrigan (Ed.), *Handbook of International Economics*, Vol. 38. Basil-Blackwell. 2001.

MELITZ, MARC J. "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity", Department of Economics, Harvard University. March, 2002.

MUENDLER, MARC-ANDREAS. "Trade, Technology and Productivity: A Study of Brazilian Manufacturers, 1986-1998", (mimeo). University of California, Berkley. 2002.

OLLEY, GEORGE S. AND ARIEL PAKES. "The Dynamics of Productivity in the Telecommunications Equipment Industry", *Econometrica*, 64, pp. 1263-1297. 1996.

PAVCNIK, NINA. *Trade Liberalization, Exit and Productivity Improvements: Evidence from Chileans Plants*. Department of Economics, Dartmouth College. 2000.

PINHEIRO, ARMANDO, FABIO GIAMBIAGI AND MAURICIO MESQUITA MOREIRA. "Brazil in the 1990s: A Successful Transition?", BNDES Discussion Paper 91. Rio de Janeiro. 2001

PINHEIRO, ARMANDO C.; INDERMIT S. GILL; LUIS SERVÉN AND MARK ROLAND THOMAS. "Brazilian Economic Growth, 1900-2000. Lessons and Policy Implications", Third Annual Conference on Global Development Network. Rio de Janeiro, Brazil. 2001.

ROBERTS, MARK J. AND JAMES TYBOUT (EDS.). *Industrial Evolution in Developing Countries*. New York: Oxford University Press. 1996.

STEIN, ERNESTO AND CHRISTIAN DAUDE. "Institutions, Integration, and the Location of Foreign Direct Investment", document prepared for the *Annual Meeting of the Board of Governors*, Inter-American Development Bank and Inter-American Investment Corporation. 2001.

TEN KATE, ADRIAAN. "Trade Liberalization and Economic Stabilization in Mexico: Lessons of Experience", *World Development*, 20(5), pp. 659-672. 1992.

TYBOUT, JAMES. "Manufacturing Firms in Developing Countries: How Well Do they Do and Why?", *Journal of Economic Literature* 38 (1), pp. 11-44. 2000.

__________ . "Plant and Firm-Level Evidence on New Trade Theories", in James Harrigan (Ed.), *Handbook of International Economics*, Vol. 38. Basil-Blackwell. 2001.

__________ AND M. DANIEL WESTBROOK. "Trade Liberalization and The Dimensions of Efficiency Change in Mexican Manufacturing Industries", *Journal of International Economics* 39, pp. 53-78. 1995.

WEISS, JOHN. "Trade Reform and Manufacturing Performance in Mexico: from import substitution to dramatic export growth", *Journal of Latin American Studies*, 31, pp. 151-166. 1999.

WESTPHAL, LARRY. *Tehcnologies Strategies For Economic Development in a Fast Changing Global Economy*. Departments of Economics, Swarthmore College. 2001.

WORLD BANK. *World Development Report*. Washington, D.C.: World Bank. 1991.

__________ . "Mexico. Enhancing Factor Productivity Growth", Country Economic Memorandum, Report 17392-ME. Washington, D.C. 1998.

__________ . "Mexico. Export Dynamics and Productivity. Analysis of Mexican Manufacturing in the 1990s", Report 19864-ME. Washington, D.C. 2000.

YOUNG, ALVIN. "Learning by Doing and the Dynamic Effects of International Trade", *Quarterly Journal of Economics*, 106(2), pp. 396-406. 1991.

Contents

INTAL PUBLICATIONS

REGULAR PUBLICATIONS

Integration & Trade. Two journal issues (English and Spanish) by subscription or individual issue purchase.

INTAL Monthly Newsletter (English, Portuguese and Spanish - Internet).

SUB-REGIONAL INTEGRATION REPORTS

ANDEAN Report. Annual publication (Spanish). English version: Internet.

CARICOM Report. Annual publication (English).

CENTRAL AMERICAN Report. Annual publication (Spanish). English version: Internet.

MERCOSUR Report. Annual publication (English, Portuguese and Spanish).

SPECIAL REPORTS

Perspectivas y Desafíos del Proceso de Integración Argentino-Chileno a Diez Años del ACE 16 (Spanish). 2002.

América Latina a principios del Siglo XXI: Integración, Identidad y Globalización. Actitudes y expectativas de las elites latinoamericanas. Spanish (Internet).

INTAL: 35 años de Compromiso con la Integración Regional. Spanish.

Impacto del TLCAN en las exportaciones de prendas de vestir de los países de América Central y República Dominicana. Spanish (Internet).

El impacto sectorial de la integración en el MERCOSUR (Spanish and Portuguese). Juan José Taccone and Luis Jorge Garay (Eds.) 1999.

Integración en el Sector Transporte en el Cono Sur (Spanish):

- *Transporte Terrestre.* José Alex Sant'Anna. 1997.
- *Puertos y vías navegables.* Martín Sgut. 1997.
- *Los ferrocarriles y su contribución al comercio internacional.* Ian Thomson. 1997.

Integración energética en el Cono Sur (Spanish). Mario A. Wiegers. 1996.

WORKING PAPERS

Las relaciones de comercio e inversión entre Colombia y Venezuela (Spanish). Eglé Iturbe de Blanco. INTAL DT-03. 1997.

MERCOSUL e Comércio Agropecuario (Portuguese). Ives Chaloult and Guillermo Hillcoat. INTAL DT-02. 1997.

The Integration Movement in the Caribbean at Crossroads: Towards a New Approach of Integration (English). Uziel Nogueira. INTAL WP-01. 1997.

DISSEMINATION PAPERS

El Tratado de Libre Comercio entre el Istmo Centroamericano y los Estados Unidos de América. Oportunidades, desafíos y riesgos (Spanish). Eduardo Lizano and Anabel González. INTAL DD-09. 2003.

Los países pequeños: Su rol en los procesos de integración (Spanish). Lincoln Bizzozero - Sergio Abreu. INTAL DD-08. 2000.

Capital social y cultura. Claves olvidadas del desarrollo (Spanish). Bernardo Kliksberg. INTAL DD-07. 2000.

La dimensión cultural: base para el desarrollo de América Latina y el Caribe: desde la solidaridad hacia la integración. (Spanish) Alejandra Radl. INTAL DD-06. 2000.

Cómo expandir las exportaciones de los países dentro de una economía globalizada (Spanish).
Rubens Lopes Braga. INTAL DD-05. 1999.

Comercio Electrónico: conceptos y reflexiones básicas (Spanish). Gerardo Gariboldi. INTAL DD-04. 1999.

Evolución institucional y jurídica del MERCOSUR (Spanish). Vicente Garnelo. INTAL DD-03. 1998.

Estado de evolución en la elaboración e implementación de las Normas ISO 14.000 y CODEX Alimentarius (Spanish). Laura Berón. INTAL DD-02. 1997.

Integración y democracia en América Latina y el Caribe (Spanish). Alvaro Tirado Mejía. INTAL DD-01. 1997.

DATABASES - SOFTWARE

DATAINTAL (CD-ROM) Sistema de estadísticas de comercio de América

Base INTAL MERCOSUR (BIM)

Base de datos bibliográficos (INTEG)

Directorio de las Relaciones Económicas de América Latina y el Caribe con Asia-Pacífico (CD-ROM)

Instrumentos básicos de integración económica en América Latina y el Caribe. Updated to March, 2003.

Rueda de Negocios

Contents

INTAL/ITD/STA PUBLICATIONS

WORKING PAPERS - SPECIAL INITIATIVE ON TRADE AND INTEGRATION (SITI)

Free Trade Area of the Americas: The Scope of the Negotiations (English and Spanish).
Herminio Blanco M. and Jaime Zabludovsky K. INTAL-ITD-STA WP-SITI-01. 2003.

WORKING PAPERS

Regional Integration and Productivity: The Experiences of Brazil and Mexico (English).
Ernesto López-Córdova and Mauricio Mesquita Moreira. INTAL-ITD-STA WP-14. 2003.

Regional Banks and Regionalism: A New Frontier for Development Financing (English).
Robert Devlin and Lucio Castro. INTAL-ITD-STA WP-13. 2002.

Métodos casuísticos de evaluación de impacto para negociaciones comerciales internacionales (Spanish).
Antonio Bonet Madurga. INTAL-ITD-STA DT-12. 2002.

Las trabas no arancelarias en el comercio bilateral agroalimentario entre Venezuela y Colombia (Spanish).
Alejandro Gutiérrez S. INTAL-ITD-STA DT-11. 2002.

The Outlier Sectors: Areas of Non-Free Trade in the North American Free Trade Agreement (English).
Eric Miller. INTAL-ITD-STA WP-10. 2002.

A ALCA no limiar do século XXI: Brasil e EUA na negociação comercial hemisférica (Portuguese).
Antonio José Ferreira Simões. INTAL-ITD-STA DT-09. 2002.

Metodología para el análisis de regímenes de origen. Aplicación en el caso de las Américas (Spanish).
Luis J. Garay S. y Rafael Cornejo. INTAL-ITD-STA DT-08. 2001.

Qué hay de Nuevo en el Nuevo Regionalismo de las Américas? (Spanish).
Robert Devlin and Antoni Estevadeordal. INTAL-ITD-STA DT-07. 2001.

What's New in the New Regionalism in the Americas? (English and Spanish).
Robert Devlin and Antoni Estevadeordal. INTAL-ITD-STA WP-06. 2001.

The New Regionalism in the Americas: The Case of MERCOSUR. (English).
Antoni Estevadeordal, Junichi Goto and Raúl Saez. INTAL-ITD WP-05. 2000.

El ALCA y la OMC: Especulaciones en torno a su interacción (Spanish).
Jaime Granados. INTAL-ITD DT-04. 1999.

Negotiating Preferential Market Access: The Case of NAFTA (English).
Antoni Estevadeordal. INTAL-ITD WP-03. 1999.

Towards an Evaluation of Regional Integration in Latin America in the 1990s (English). Robert Devlin and Ricardo Ffrench-Davis. INTAL-ITD WP-02. 1998.

Una evaluación de la homogeneidad macroeconómica y del desarrollo de la región centroamericana (Spanish).
Florencio Ballestero. INTAL-ITD DT-01. 1998.

OCCASIONAL PAPERS

The Trade and Cooperation Nexus: How Does Mercosur-EU Process Measure Up? (English). Robert Devlin, Antoni Estevadeordal and Ekaterina Krivonos. INTAL-ITD-STA OP-22. 2003.

Desigualdad regional y gasto público en México (Spanish). Rafael Gamboa and Miguel Messmacher.
INTAL-ITD-STA DD-21. 2003.

Zonas Francas y otros regímenes especiales en un contexto de negociaciones comerciales multilaterales y regionales (Spanish). Jaime Granados. INTAL-ITD-STA DD-20. 2003.

The External Dimension of MERCOSUR: Prospects for North-South Integration with the European Union (English).
Paolo Giordano. INTAL-ITD-STA OP-19. 2003.

Regional Aspects of Brazil's Trade Policy (English). Eduardo A. Haddad (coord.), Edson P. Domínguez and Fernando S. Perobelli. INTAL-ITD-STA OP-18. 2002.

El proceso de integración Argentina-Brasil en perspectiva: El ciclo cambiario y la relación público-privada en Argentina (Spanish). Ricardo Rozemberg and Gustavo Svarzman. INTAL-ITD-STA DD-17. 2002.

A Study on the Activities of IFIs in the Area of Export Credit Insurance and Export Finance (English).
Malcom Stephens and Diana Smallridge. INTAL-ITD-STA OP-16. 2002.

Diseños institucionales y gestión de la política comercial exterior en América Latina (Spanish).
Jacint Jordana and Carles Ramió. INTAL-ITD-STA DD-15. 2002.

Mercosul em sua primeira década (1991-2001): Uma avaliação política a partir do Brasil (Portuguese).
Paulo Roberto de Almeida. INTAL-ITD-STA DD-14. 2002.

The Trade Policy-Making Process Level One of the Two Level Game: Country Studies in the Western Hemisphere (English and Spanish). INTAL-ITD-STA OP-13. 2002.

Search for a New Partnership in Trade and Investment between Latin America and Asia-Pacific (English).
Mikio Kuwayama. INTAL-ITD-STA OP-12. 2001. Spanish version: Internet.

Regional Public Goods in Official Development Assistance (English). Marco Ferroni. INTAL-ITD-STA OP-11. 2001.

Breaking from Isolation: Suriname's Participation in Regional Integration Initiatives (English). Anneke Jessen and Andrew Katona. INTAL-ITD-STA OP-10. 2001.

NAFTA and the Mexican Economy: Analytical Issues and Lessons for the FTAA (English). J. Ernesto López-Córdova. INTAL-ITD-STA OP-09. 2001.

La integración comercial centroamericana: Un marco interpretativo y cursos de acción plausible (Spanish). Jaime Granados. INTAL-ITD DD-08. 2001.

Negotiating Market Access between the European Union and MERCOSUR: Issues and Prospects (English). Antoni Estevadeordal and Ekaterina Krivonos. INTAL-ITD OP-07. 2000.

The Free Trade Area of the Americas and MERCOSUR-European Union Free Trade Processes: Can they Learn from Each Other? (English). Robert Devlin. INTAL-ITD OP-06. 2000.

The FTAA: Some Longer Term Issues (English). Robert Devlin, Antoni Estevadeordal and Luis Jorge Garay. INTAL-ITD OP-05. 1999.

Financial Services in the Trading System: Progress and Prospects (English). Eric Miller. INTAL-ITD OP-04. 1999.

Government Procurement and Free Trade in the Americas (English). Jorge Claro de la Maza and Roberto Camblor. INTAL-ITD OP-03. 1999.

The Caribbean Community: Facing the Challenges of Regional and Global Integration (English). Anneke Jessen and Ennio Rodríguez. INTAL-ITD OP-02. 1999.

ALCA: Un proceso en marcha (Spanish). Nohra Rey de Marulanda. INTAL-ITD DD-01. 1998.

Contents

INT/ITD PUBLICATIONS

WORKING PAPERS

MERCOSUR: Achievements and Challenges. Carlos Sepúlveda and Arturo Vera Aguirre. Working Paper # 222. September 1997 (also available in Spanish).

Transport Infrastructure in Latin America. Arturo Vera Aguirre. Working Paper # 221. July 1997 (also available in Spanish).

Convergence and Divergence Between NAFTA, Chile, and MERCOSUR: Overcoming Dilemmas of North and South American Economic Integration. Raúl A. Hinojosa-Ojeda, Jeffrey D. Lewis and Sherman Robinson. Working Paper # 219. May 1997.

Towards Free Trade in the Western Hemisphere: The FTAA Process and the Technical Support of the Inter-American Development Bank. Enrique V. Iglesias. Working Paper # 217. July 1997 (also available in Spanish)

Economic Integration and Equal Distribution. Willem Molle. Working Paper # 216. May 1997.

What can European Experience Teach Latin America About Integration. L. Alan Winters. Working Paper # 215. May 1997.

Facts, Fallacies and Free Trade: A Note on Linking Trade Integration to Labor Standards. Donald J. Robbins. Working Paper # 214. May 1997.

From Miami to Cartagena: Nine Lessons and Nine Challenges of the FTAA. Robert Devlin and Luis Jorge Garay. Working Paper # 211. July 1996 (also available in Spanish).

Common Market of the Southern Cone: MERCOSUR. Martin Arocena. Working Paper # 204. September 1995 (also available in Spanish).

SPECIAL PUBLICATIONS

Periodic Note on Integration and Trade in the Americas, July 1995; February, August and December 1996; July and December 1997; August and December 1998; February and October 1999; October and December 2000; May 2002; December 2002. (also available in Spanish and 1997 versions are available in Portuguese).

The Euro and its Effect on the Economy and the Integration of Latin America and the Caribbean. Roberto Zahler. Paper presented at the Seminar "Euro and its International Impact" on occasion of the Annual Meetings of the Boards of Governors. France, March 16, 1999 (also available in Spanish).

Extract from the Bank's 1996 Report on Economic and Social Progress in Latin America, Part II, Chapter 2: Trade Liberalization, 1996 (also available in Spanish).

European Economic and Monetary Union: Recent Progress and Possible Implications for Latin America and the Caribbean. March 1997 (also available in Spanish).

Globalization and Regional Integration: Consequences for Latin America. Speech delivered by Enrique V. Iglesias at the Seminar on "A Critical View of Globality". Mexico City, November 1997 (also available in Spanish).

Protection, Preferential Tariff Elimination and Rules of Origin in the Americas - An Overview. Luis Jorge Garay and Antoni Estevadeordal. June 1995 (also available in Spanish).

The New Face of Regional Integration in Latin America and the Caribbean. Speech delivered by Enrique V. Iglesias at The Annual World Bank Conference on Development in Latin America and the Caribbean. Montevideo, July 1997 (also available in Spanish).

Free Trade Area of the Americas: From Miami to Belo Horizonte. Speech delivered by Enrique V. Iglesias at the III Business Forum of the Americas. Belo Horizonte, May 1997 (English, Portuguese and Spanish).

Transpacific Partnership: Latin America's Role. Speech delivered by Enrique V. Iglesias at the XII International General Meeting of the Pacific Economic Cooperation Council (PECC XII). Santiago, September, 1997 (also available in Spanish).