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INTERNATIONAL SPECIALIZATION MODELS IN LATIN AMERICA: THE CASE OF ARGENTINA

by Paola Caselli* and Andrea Zaghini**

Abstract

In this paper we compare the Argentine specialization model with that of the other major Latin American countries. Given the lack of production data at disaggregate level, we rely on trade flow information from the WTA Statistics Canada database (3-digit SITC classification), available for most Latin American countries for a rather long time span (1980-2000). Our analysis, based on the Lafay Index of international specialization, shows that Argentina concentrates its comparative advantages in raw materials, agricultural and food products and exhibits, at the same time, serious deficiencies in the production of manufactures. This specialization pattern has remained remarkably stable over the last two decades, in spite of the major reforms implemented in many different fields. These features are shared with the other major Latin American countries, with the notable exception of Mexico, whose comparative advantages have changed dramatically in the same period, from raw materials (essentially oil) towards manufactures. Moreover, the products in which Argentina is specialized are among those for which world demand growth is structurally lower; this could eventually lead to a decreasing weight of Argentina in international markets.

JEL classification: F14, F15, E23

Keywords: International trade, specialization model, revealed comparative advantages

Contents

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1. Introduction[1]

The severe economic and financial crisis that hit Argentina at the end of 2001 has been interpreted either as a consequence of increasing fiscal imbalances (current and expected) or as a result of the loss of international competitiveness. While the former would largely be the result of the Government's difficulties in effectively imposing limits on expenditure by provincial government, the latter is commonly associated with the appreciation of the dollar in the second half of the 1990s and with the devaluation of the Brazilian real in 1999.[2]

Although it cannot be denied that both factors have played a role in aggravating the economic situation, the ultimate causes of the Argentine crisis are very deeply rooted and they involve institutional, legal, political, as well as economic aspects. A thorough analysis goes beyond the scope of this study, whose aim is, instead, to focus on the relative underdevelopment of the Argentine productive structure, a factor that, in our opinion, has significantly contributed to the economic vulnerability of the country. As far as we know, this issue has not been explicitly addressed in the literature, the great bulk of the efforts being devoted to monetary and financial questions as well as fiscal policy issues.[3]

A 'weak' productive structure constitutes, in fact, a particularly serious problem for a country whose external debt increased considerably in the 1990s in the wake of the rapid international liberalization of capital flows. In 1999 the ratio between gross foreign liabilities and exports of goods and services, a measure of the capability of a country to repay its debt, reached a value of 4, the highest among the Latin American countries (IMF, 2002). It might well be that this indicator, more than the fiscal position itself, induced international investors

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[2] Among the many contributions and the lively literature that sprang up after the eruption of the crisis, see Hausmann (2001), Krugman (2001), Bordo and Chang (2002), Becker (2002) and Mussa (2002).

[3] For instance, Caballero (2000) stresses the underdevelopment of domestic financial markets and emphasizes the crowding-out effect on private borrowing arising from public borrowing as structural sources of the volatility of the Argentine economy.

to question the sustainability of the exchange rate regime, thus triggering the currency and financial crisis.

Having this in mind, in this paper we analyze the Argentine specialization model both from an historical perspective and in relation to the models of the other major Latin American countries. Given the lack of data on production at disaggregate level and covering a relatively long time span, we have chosen to rely on trade data information, which are available, on a comparable basis, at a fairly disaggregate level (the 3-digit SITC classification) over the last two decades.

In particular, we were able to compute the Lafay Index of international specialization for 200 items. This indicator has several advantages with respect to others measures (such as the Balassa Index of Revealed Comparative Advantages), above all that of taking into account both export and import flows, which is quite important due the existence of intra-industry trade, a phenomenon largely associated with increasing international production delocalization. We have also been able to compare Argentine trade advantages with those of the other major Latin American countries and to verify whether they have changed over time, shifting towards more dynamic manufactured goods, as has happened, for instance, in emerging Asian economies (Frankel et al., 1996).

Of course, a close relationship between productive structure and trade flows can be inferred, strictly speaking, only when the latter are sufficiently 'free'. In this case, in fact, ex-post trade data can give reliable information on the true pattern of comparative advantages: this is at the core of the 'Revealed Comparative Advantage' approach pioneered by Balassa (1965). We are conscious of the fact that in the period under consideration most Latin American countries experienced major economic structural changes linked also (but not only) to trade liberalization. The most obvious case is Mexico, which became a member of the North American Free Trade Agreement (NAFTA) in the early 1990s. For this reason, the term 'specialization models', at least at the beginning of the period, has to be interpreted with some caution.

However, with this caveat in mind, we claim that our analysis is nonetheless informative since it gives an idea of how Latin American economies have been able to

integrate in the world trade pattern in the last two decades, taking advantage also of trade liberalization policies implemented in the period.

The paper is organized as follows: in Section 2 we analyze the international specialization patterns of Latin American countries by identifying their comparative advantages and by comparing them with the world demand structure in the 1990s; in Section 3 we assess whether these patterns have changed over time and whether Latin American countries were able to adapt their productive structures in favour of the most dynamic items. Section 4 concludes.

2. International specialization patterns in Latin America

The specialization pattern of the major Latin American countries is analyzed carried out using trade flow data from the World Trade Analyzer by Statistics Canada, which are available for several countries over a rather long time span (1980-2000).[4] It is worth noting that the last two decades have been characterized by deep structural changes in the region and one would suspect that this process has also affected the productive structure.[5] In particular, as regards Argentina, it is relevant to assess whether the 1990s - the decade of disinflation and monetary stabilization, of the 'currency board', of financial as well as trade liberalizations - have also favoured a modernization of the productive structure of the country with respect to the 1980s, the decade of hyperinflation, stagnation and, ultimately, inward-looking policies.

The use of trade data has, of course, some drawbacks. First of all, these data are usually quite erratic; more importantly they are expressed, in our data-base, only in nominal terms (current dollars), so that we cannot distinguish between ‘quantity’ and ‘price’ effects, which would have been particularly useful in our analysis since the terms of trade of some Latin American countries have changed quite dramatically in the period under consideration,

[4] A similar analysis has been developed by Bender and Li (2002). However, they look only at the exports of the manufacturing sector, and they compare the performance of the RCA Balassa Index of Latin America as a whole with that of East and Southeast Asia.

[5] An empirical analysis of the relationship between trade openness and productivity growth in developing countries is provided by Weinhold and Rauch (1999) and by Alcalà and Ciccone (2001), while for a recent analysis of the degree of integration among Latin American countries see Dorrucci et al. (2002).

especially reflecting the large swing of oil prices. To limit the first problem we have computed all indicators on 3-year average data.

A first glance at the broad composition of Argentine exports shows that, at the end of the 1990s, they are highly concentrated in agricultural and food products (35 per cent) and non-agricultural raw materials (16 per cent), while the share of manufactures is only 36 per cent (Table 1). The same ratios are 19, 8 and 59 for the average of Latin American countries and 5, 1 and 85 for Mexico. This export composition sharply contrasts with that of Asian emerging economies, where manufactures represent the great bulk of exports (Bentivogli and Monti, 2001).

However, in a context of increasing intra-industry trade, a careful assessment of international comparative advantages requires that we take into consideration not only exports but also imports.[6] To this end we rely on the index of international specialization proposed by Lafay (1992); this index has been applied, for instance, to the analysis of specialization patterns of the main euro-area countries (Bugamelli, 2001). For a given country, *i*, and for any given group of products, *j*, the Lafay Index is defined as:

$$(1) \qquad LFI_j^i = 100\left(\frac{x_j^i - m_j^i}{x_j^i + m_j^i} - \frac{\sum_{j=1}^{N}(x_j^i - m_j^i)}{\sum_{j=1}^{N}(x_j^i + m_j^i)}\right)\frac{x_j^i + m_j^i}{\sum_{j=1}^{N}(x_j^i + m_j^i)}$$

where x_j^i and m_j^i are exports and imports of products of group *j* of country *i*, towards and from the rest of the world, respectively, and *N* is the number of traded groups. According to this index, the comparative advantage of country *i* in the production of group *j* items is measured by the deviation of the normalized trade balance of group *j* from the overall normalized trade balance, multiplied by the share of trade (imports plus exports) of

[6] As is well known, this also depends on the level of disaggregation of the analysis; for fairly aggregated groups of products the size of intra-industry trade flows becomes very relevant and the export performance a less reliable indicator of comparative advantages.

group j on total trade.[7] It is worth noting that $\sum_{j=1}^{N} LFI_j^i = 0$, since the index measures each group's contribution to the overall normalized trade balance.

The LFI index has several appealing features over alternative measures of specialization. As mentioned before, by taking into account also imports, it allows us to control for intra-industry trade and re-export flows; in this sense it is superior to the traditional RCA Balassa Index and to the Beneficial Structural Change Index. Moreover, unlike the Michaely Index and the Trade Specialization Index, it also controls for distortions induced by macroeconomic fluctuations.[8] Since comparative advantages are structural by definition, it is crucial to eliminate the influence of cyclical factors, which can affect the size of trade flows in the short run. The Lafay Index controls for these effects by considering the difference between each group's normalized trade balance and the overall normalized trade balance. The implicit assumption is, of course, that cyclical factors influence aggregate and disaggregate trade flows in the same way. Finally, it weights each group's contribution according to the respective importance in trade. Positive values of the Lafay Index indicate the existence of comparative advantages; the larger the value, the higher is the degree of specialization in a given production. On the contrary, negative values points to de-specialization.

First, we have computed the Lafay Index at a fairly aggregate level, the 1-digit SITC classification for five countries: Argentina, Brazil, Chile, Mexico and Venezuela.[9] The calculations have been made on average annual data for the period 1998-2000. As clearly shows Figure 1, the specialization patterns of Latin American countries are indeed similar, with the remarkable exception of Mexico. In all countries but Mexico, comparative advantages are concentrated in raw materials, oil and food products, while disadvantages can

[7] The index we use in the paper differs slightly from the original one, since the weights proposed by Lafay (1992) are the shares of trade in each group relative to overall GDP.

[8] See the Appendix for a formal description of the indexes.

[9] The 9 broad groups of items considered here are: food and live animals chiefly for food (0), Beverages and tobacco (1), Crude materials, inedible, except fuels (2), Mineral fuels, lubricants and related materials (3), Animal and vegetable oils, fats and waxes (4), Chemicals and related products (5), Manufactured goods classified chiefly (6), Machinery and transport equipment (7), Miscellaneous manufactured articles (8). Note that we did not consider the residual group, Commodities not classified elsewhere (9).

be found in all manufactured goods. In Argentina, comparative advantages are massed in food and agricultural products (group 0), whereas manufacturing sectors (5-8) show deep de-specialization. Mexico's productive structure is strikingly different: first, it is much more balanced than that of the other countries; second, it is relatively strong in manufactures (group 7, in particular).

The level of aggregation provided by the 1-digit SICT classification is obviously quite unsatisfactory, since we know that each group contains extremely heterogeneous products; to overcome this problem we now turn to a more disaggregate analysis based on 200 items from the 3-digit SITC classification.[10] First of all, we have ordered these items according to the value of the Lafay Index computed on average trade flows in the period 1998-2000. Tables 2A-2E show the ten items in which each country is more (top) and less (bottom) specialized, together with their export shares on international markets and their weights in total trade (exports plus imports).

As regards Argentina, 4 out of the 10 top items belong to food products (over 10 per cent of total trade), only one ('Leather') is a manufactured good (although lightly processed), and the remaining five are raw materials. At the same time, eight out of the ten bottom items (those of deepest de-specialization) belong to Machinery and transportation equipment (group 7) and the remaining two to other sectors of manufacture. It is worth noting that the world export shares of Argentina in the ten top items are quite significant, in some cases above 10 per cent.[11] Argentina does not differ a great deal from Brazil, Chile and Venezuela, all countries specialized in the production and/or first transformation of agricultural and raw materials (oil, copper, coffee, etc.). On the other hand, Mexico is quite different; although it maintains a fairly strong specialization in the production of crude oil ('Petroleum oils' is the second item of the rank), eight items of the top ten are manufactured products, some of which high-tech.

[10] The 3-digit SITC classification includes 233 items; we have excluded all those for which data were not available for all countries and those belonging to group 9. The 200 items considered cover a share of total trade close to 95 per cent for each country under analysis.

[11] These shares have remained broadly stable since the beginning of the 1980s and they have actually increased for some items.

Some hints about the degree of polarization of the specialization pattern of the five Latin American countries might be deduced from the relative weight of the first ten items of specialization. Only Venezuela is almost exclusively devoted to the production of oil: the value of exchanges of the first two items (Crude oil and refined petroleum products) weight close to half of the entire trade of the economy. In the other countries trade exchanges seem to be more heterogeneously distributed, with a weight on trade of the top ten items ranging from 17 per cent in Brazil to 26 per cent in Mexico.

We now address the following issue: to what extent are specialization models in Latin America and, in particular, in Argentina, 'efficient'? Although the definition of 'efficiency' can be somewhat ambiguous in this context, here we define as 'efficient' an economy specialized in those goods whose world demand is relatively more dynamic, hence an economy potentially able to increase its overall export shares on world markets.

As a first step, we have ordered the 200 items of the 3-digit SITC classification according to the average growth rates of world imports recorded in the 1990s. Two caveats must be born in mind: since the standing is computed on imports at current prices (US dollars), it could be somewhat influenced by currency volatility; however, in this case, the problem is less relevant since we are taking average growth rates over a long time.[12] Moreover, in our ordering we do not consider the relative weight of each item in overall world imports, so that a good whose demand has increased very rapidly will get a high position in the standing, even if it represents only a small fraction of world demand. The rationale is that dynamic products are generally also the most innovative and hence truly 'new', and therefore can still weigh little in total expenditures.

Over the period 1990-2000 the non-weighted average rate of growth of world imports referred to the 200 items considered here was 4.7 per cent a year (in current dollar terms), pretty close to the median value (4.5 per cent); fifteen items (almost all non-manufactured goods) displayed a negative rate (Table 3).[13]

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[12] A different, more serious problem is that of relative prices changes. For instance, the rank of oil has been crucially affected by the large swings in its price in the last two decades.

[13] Note that the weighted average growth over the same period is higher (6.8 per cent), suggesting that the items which grew at the fastest rates were also the most traded.

The best performing item was 'Optical instruments and apparatus' with a rate of growth of 19.3 per cent, while the worst is 'Sulphur and unroasted iron pyrites', with a negative rate of 9 per cent. Grouping the 200 items into four sets starting from the slowest to the fastest, we can classify them as low (1st to 50th), medium-low (51st to 100th), medium-high (101st to 150th) and high (151st to 200th) growth items. The non-weighted average rate of the first group is only slightly positive (0.6 per cent), that of the fourth is 8.9 per cent: therefore there is high variability across the four groups; moreover, the standard deviation in the first and last is much higher than in the central. The bulk of non-manufactured goods (76 per cent) belongs to the low and medium-low groups, while a large majority of manufactures (63 per cent) belong to the medium-high and high growth groups. Note that, in the latter group, whose rates of growth range from 6.9 to 19.3 per cent, there are only eight items belonging to groups 0 to 4 of the SITC classification.

We now focus on the cumulative distribution of the Lafay Index (1998-2000 average). For each country the graph starts with the value of the Lafay Index (positive or negative) of the item with the slowest growth and ends at zero - since the sum of all values of the index is zero by definition - corresponding to the fastest item. The shape of the distribution will be increasing for the items in which there is a comparative advantage (positive Lafay Index) and decreasing in the opposite case (negative Lafay Index). We have also computed the aggregate value of the Lafay Index for each of the four fifty-item groups described above.

In 1998-2000 Argentine comparative advantages were confined to the low and medium-low growth items (Figure 2A). The curve is almost monotonously increasing in the first half of the graph, a reduction of the cumulated value of the index being limited to few cases. This means that Argentina has a comparative advantage in the great majority of low and medium-low growth products. Within the first half of the rank one can find four of the top five items of the Argentine specialization pattern (see Table 2A). In particular, the first item in which Argentina is specialized ('Feeding stuff for animals') corresponds to the 62nd position.

The opposite pattern can be found on the right-hand side of the graph (medium-high and high growth items). The curve is smoothly decreasing with the only significant exception of 'Petroleum oil', for which the value of the Lafay Index is highly positive (3.7

per cent). All the ten bottom items of the Argentine specialization pattern are in this part of the rank, equally distributed between the medium-high and the high growth groups.

In sum, Argentina exhibits a relatively strong specialization in the first and second set of products and a severe de-specialization in the third and fourth. The cumulated Lafay Index for the first fifty items is 6.8 per cent, with only five items showing a slight de-specialization. In the medium-low growth products, the sum of the indexes is 9 per cent, thanks to the presence of several items belonging to the 'Food and live animals' group of the SITC classification, in which Argentina has strong comparative advantages. The values of the cumulated Lafay Index in the third and fourth set are instead strongly negative: -4.3 and -11.5 per cent, respectively.

The cumulated graph for Brazil is characterized by a strong specialization in the medium-low growth group and a strong de-specialization in the high growth group (Figure 2B). In the medium-low group there are the first three Brazilian specialization items ('Iron ore and concentrates', 'Coffee' and 'Oil seeds') and another three of the top ten, whereas seven out of the bottom ten belong to the high growth group. In the remaining two groups positive and negative signs alternate evenly, the cumulated value of the Lafay Index being slightly positive in both cases.

Chile's specialization pattern is very similar to that of Argentina (Figure 2C). Although many items exhibit a negative Lafay Index, the low growth group has a cumulative value of over 4 per cent, due to the presence of 'Ores and concentrates of base metals', the second top item, with a Lafay value of 6.8 per cent. In the second group we find 'Copper' (first item, with a Lafay value of 16 per cent) and the other top items, all related to natural resources and food products. Like Argentina, Chile is highly de-specialized in the items belonging to the third and fourth groups.

The disaggregate analysis confirms a sharp difference between Mexico and the other Latin American countries. Mexico shows a well-balanced specialization pattern: the cumulative index fluctuates between +2 and -5 per cent, and the positive and negative signs alternate almost regularly along the horizontal axis (Figure 2D). Within the low and medium-low growth groups negative signs prevail, but they are small in magnitude (the cumulated values are -1.8 and -2.2, respectively). The medium-high growth group includes

the first, third and fifth top items of Mexico ('Passenger motor cars', 'Television receivers' and 'Motor vehicles for transport of goods'), while in the high growth group there are six other items of top specialization; the cumulative value in both cases is positive, although some minus signs appear.[14]

3. Productive shifts and world demand dynamics

In order to assess to what extent Argentina, Brazil, Chile, Mexico and Venezuela were able to modify their productive structures, we consider the changes in the specialization patterns over time. We first analyze the stability of the Lafay Index for the 200 items; we then try to detect whether a shift towards the most dynamic products has occurred in the last two decades.

The first step is then to asses whether the Latin American countries under analysis have become more or less specialized in each of the 200 items of the 3-digit SITC classification. To this end, we have run, for each country, the following regression:[15]

$$(2) \qquad LFI_{ij}^{98-00} = \alpha_i + \beta_i LFI_{ij}^{80-82} + \varepsilon_{ij} \qquad j = 1,...200$$

where the superscript '98-00' and '80-82' refers to the final and the initial periods of our sample, respectively, α and β are the standard linear regression parameters and ε is the residual term. However, in our exercise we expect the value of α to be non-significant, given that both endogenous and exogenous variables have a zero mean. As for β the interpretation of the regression results is straightforward. A coefficient equal to 1 means that the specialization pattern has remained unchanged over the last two decades; β>1 shows that the country has become more (less) specialized in items in which it initially had a competitive advantage (disadvantage); 0<β<1 indicates that, on average, the specialization pattern has remained the same, although the Lafay Index has improved for items with initial low values

[14] Actually, nine of the ten items of strongest de-specialization are also to be found in the second half of the rank. These items, with the only exception of "Refined petroleum products", belong to the manufactured good groups (5 to 8) of the SITC classification.

[15] This methodology relies on the contributions of Pavitt (1989) and Cantwell (1989); for empirical analyses using more accurate approaches see Brasili et al. (2000), Proudman and Redding (2000) and Zaghini (2003).

and worsened for those with initial high values. Finally, β <0 points to a radical change of comparative advantages.

Table 4 reports the regression results. Since β is significantly different from both 1 and 0 for all the countries, this suggests that some changes have actually occurred in the last two decades. In particular, it is possible to reject the null $\beta=0$ that a random pattern characterizes the specialization model of the countries under analysis. Given that $0<\beta<1$, comparative advantages have increased for products in which Latin American countries were initially relatively less specialized and has decreased for those in which they were initially highly specialized. Moreover, as expected α = 0. There are, however, remarkable differences among countries; the stability of the specialization pattern is higher for Chile and, above all, Venezuela, lower for Brazil and, especially, Mexico, while Argentina stands in the middle. It is worth noting that, in the case of Mexico, the estimate of β is very low: only 0.11.

To gain some information also about the changes in the dispersion of the distribution of comparative advantages we can exploit the following relation:

$$(3) \qquad \frac{STDEV(LFI_i^{98-00})}{STDEV(LFI_i^{80-82})} = \frac{\beta_i}{R_i}.$$

When $\beta=R$ the standard deviation of the LFI distribution has not changed, when $\beta>R$ (a rise in the dispersion) the specialization pattern has become more polarized, while the opposite holds for $\beta<R$ (a reduction in the dispersion). Note that R can be considered a measure of the mobility of products along the LFI distribution: a large value of R indicates that the relative positions of the single items have remained almost unchanged ('low mobility').

The joint analysis of the regression and the mobility effect not only confirms that the specialization pattern of Chile and Venezuela is relatively stable (high values for both R and β/R), but it also suggests that Argentina, too, has hardly changed its trade structure. On the other hand, Brazil and especially Mexico display features typical of OECD catching-up

economies,[16] that is a tendency to change the pattern of comparative advantages (low value of R) and to increase specialization in products in which they were relatively less specialized and to decrease it in those in which they were highly specialized (low value of β).

In order to check whether these changes have resulted in an 'efficient' adjustment of the productive structure towards the most dynamic items, we now compare the cumulated curve of the Lafay Index in 1980-1982, where items are ordered according to their world demand growth in the 1980s, with that illustrated in Section 2.[17]

In the 1980s the non-weighted average rate of growth of world imports was 6.0 per cent, very close to the value of the weighted growth (6.1 per cent), but lower than the median value (6.8 per cent). In particular, among the twenty items that showed a negative rate of growth, the worst performer was 'Petroleum oil', with a negative rate of close to 5 per cent,[18] while the best performing item was 'Automatic data processing machines' (18.3 per cent).

Between the 1980s and the 1990s, 104 items changed their position; however, the distribution of the items within the four growth groups has remained almost identical. In the low and medium-low growth groups there are, respectively, 33 and 18 items belonging to groups 0 to 4 of the 1-digit SITC classification, amounting to more than three quarters of total non-manufactured goods. In the second half of the rank there are 85 manufactured goods (almost two thirds of the total) and only fifteen items belonging to groups 0 to 4.[19] Moreover, most of the items that lost at least fifty positions are non-manufactured goods or belong to declining manufacture sectors (such as textiles and paper and printing industry); whereas, with few exceptions (margarine, rice, coffee and fixed vegetables oils), those items which gained the most are manufactures. A special case is 'Petroleum oil' whose robust rate

[16] For extensive empirical analyses of the characteristics of OECD export specialization patterns and trade models see Amendola et al. (1992), Laursen (2000) and Redding (2002).

[17] The cumulated curve of the Lafay Index in 1980-1982 relates to the average growth rate of world imports in the 1980s, while the curve of the Lafay Index in 1998-2000, proposed in Section 2, relates to world imports in the 1990s.

[18] This is not surprising, since in the mid-1980s the price of crude oil collapsed as a result of the "counter oil-shock".

[19] The best performing non-manufactured item is 'Tobacco', the 10th item from the top, with a rate of growth of 12.8 per cent.

of growth in the 1990s (7.2 per cent) places it in the high growth group (rank 159th), while it was the worst performing item in the 1980s.

Differences in the shape of the cumulative Lafay Index curves between the two periods can be attributed not only to a change in the comparative advantages *per sè*, but also to a change in the rank of commodities. Thus, a country may benefit from an improvement in the rank of items in which it has a comparative advantage; conversely, it may be hurt by a weakening of world demand for items in which it is specialized. However, our point is that a dynamic economy, whose productive structure is relatively strong and competitive, should be able to improve its comparative advantages, within a sufficiently long time span, in favour of products whose world demand has been relatively more dynamic. Therefore, we evaluate as positive a reduction over time of comparative advantages (or an increase in disadvantages) in the low and medium-low growth groups, whereas we consider negative a similar change (reduction of comparative advantages or increase in disadvantages) when it takes place in the medium-high and high growth groups.[20]

In the beginning of the period under analysis (1980-1982), Argentine comparative advantages were more concentrated in low-growth products and less in medium-low ones than in the period 1998-2000 (Figure 2A). The change in the shape of the curve in 1998-2000 can be largely attributed to the shift over time of twelve items from the low to the medium-low growth group; among them, there are two products in which Argentina has always had strong comparative advantages: 'Oil seeds and oleaginous fruit' and 'Fixed vegetables oils'. Nevertheless, the cumulated Lafay Index for the first 100 items has decreased significantly from 20.4 to 15.8 per cent, thus implying a reallocation of the specialization patterns towards the second half of the distribution. Here again, the improvement of almost 5 percentage points in the medium-high growth sector has to be attributed more to the convergence in the group of items in which Argentina was already specialized ('Refined petroleum products', 'Other fixed vegetables oils' and 'Leather'), than to a true improvement in comparative advantages. In the high growth group, some relevant changes have occurred, although the value of the overall Lafay Index has remained broadly

[20] A similar interpretation has been proposed by Bender (2001) in the analysis of the 'Beneficial Structural Index'.

unchanged. De-specialization in the most dynamic manufactured items has actually deepened, but this has been almost completely offset by the positive and large Lafay Index for 'Petroleum oils', whose world demand, as pointed out above, accelerated sharply in the 1990s. Therefore, apart from oil, the performance of the high-growth items worsened considerably in the 1990s.

Among the other 24 items that shifted from the first and second to the third and fourth growth groups, only in five cases was Argentina able to maintain a comparative advantage, whereas it maintained a disadvantage in eighteen; only in a single case ('Fuel wood') the initial disadvantage was transformed into an advantage.

We can then conclude that, although the overall specialization pattern has remained broadly constant over the last two decades, Argentina was able to improve its position in the low and medium-high growth groups by reducing its initially large advantage and disadvantage, respectively. However, the improvement in the medium-high growth group has been essentially due to an upward shift in the rank of some items in which Argentina was already specialized. As regards the medium-low and the high growth groups, the adjustments, on the contrary, occurred in the 'wrong' direction. Moreover, changes of the Lafay Index from a negative to a positive value in the most dynamic items (high growth group) were not only extremely limited (four items including oil), but they did not involve manufactured goods.

The specialization pattern of Brazil has deteriorated in three groups; in particular, in the high-growth group a shift from a comparative advantage (albeit very small) to a large disadvantage has taken place (Figure 2B). This is due to an increase in the de-specialization in many manufactured goods, especially high technology items. Differently from Argentina, Brazil maintained a disadvantage in the production of oil and was therefore unable to compensate for the loss induced in the cumulated value of the Lafay Index. Symmetrically, the switching from a large disadvantage to a positive balance in the low growth group is attributable to the exit of 'Petroleum oil', whose Lafay Index is significantly negative (more than 3 percentage points).

For Chile as well the negative changes in the specialization pattern are mainly due to the underlying shifts along the rank (Figure 2C). However, the large increase of comparative

advantages in the low growth group is due not only to the exit of oil (with a negative Lafay Index), but also to a sizeable increase in the specialization in 'Ores and concentrates of base metals' (from 3.5 to 6.8 per cent). The widening of the disadvantage in the medium-high growth group is due to the shift of a few positive items from that group to others. As for Brazil, the bad relative performance of the high growth group is mainly attributable to the entry of 'Petroleum oil'.

As expected, Mexico's performance over time differs considerably from that of other Latin American countries. At the end of the 1990s the Mexican economy exhibited a well-balanced specialization pattern, while at the beginning of the 1980s comparative advantages were concentrated in low growth items (basically oil). Not only are the changes over time in three of the four groups in the right direction, but the final distribution achieved also shows a well-balanced mix of de-specialization in low and medium-low growth items and specialization in medium-high and high growth products (Figure 2D).[21]

The radical change in the shape of the cumulated curve cannot be attributed to the simple shifting of items from one group to another. At the beginning of the 1980s, eight items out of ten of the top specialization belonged to the first half of the rank, while at the end of the 1990s they were reduced to only one ('Fresh and frozen vegetables'). Moreover, Mexico switched from a comparative disadvantage to an advantage for six of the ten fastest growing items in the 1990s, thus successfully adapting the specialization pattern towards the most dynamic products. As for petroleum, Mexico maintained a positive, if mild, specialization in the production of crude oil (the Lafay Index for 'Petroleum oil' lost almost 30 percentage points to 3.6 per cent) and it became de-specialized in refined products.

Finally, Venezuela is a clear example of what we can label 'passive improvement' (Figure 2E): a country benefits from a change in the composition of world demand over time without adjusting its comparative advantages. Apart from some minor changes, the

[21] The drastic changes in Mexican comparative advantages are obviously strictly related to its participation in NAFTA at the beginning of the 1990s, which has fostered the integration of its productive structure with that of the US and Canada.

Venezuelan specialization model has continued to hinge largely on oil.[22] As already mentioned, 'Petroleum oil' switched from the low to the high growth group, so that the shape of the Lafay curve reversed. This idea is also confirmed by the analysis of the specialization model without oil. As depicted in Figure 2F, it is possible to see that there are limited changes along the horizontal axis. The switch from de-specialization to specialization in the medium-low group is to be attributed almost entirely to a single movement along the horizontal axis: the upward shift of 'Iron ore and concentrates' from the first to the second growth group.

Summing up, apart from Mexico, the improvements occurred over the last two decades in the shape of the specialization patterns of Latin American countries have essentially been due to shifts in the items' rank (the case of oil is the most striking) rather than to 'genuine' changes in comparative advantages towards more dynamic products.

4. Conclusions

In the paper we have analyzed the specialization pattern of Argentina and the other major Latin American countries as 'revealed' by their trade flows. The main findings, based on the Lafay Index of international specialization, can be summarized as follows. At the end of the 1990s the comparative advantages of Argentina were concentrated in raw materials and agricultural and food products; at the same time deficiencies were evident in almost all manufactured goods. These features are broadly in line with those of the other major Latin American countries, with the notable exception of Mexico, whose comparative advantages were more evenly distributed among items, with a strong specialization in several manufactured products.

A first note of concern is related to the fact that the products in which Argentina is specialized are also those whose world demand has been less dynamic. By ordering the 200 items of the 3-digit SITC classification according to the rate of growth of their world demand in the 1980s and the 1990s, we have shown that Argentine comparative advantages

[22] In three cases only, out of the 24 for which the item moved from the first to the second half of the rank, Venezuela switched from de-specialization to mild specialization ('Vegetables textile fibres', 'Alcohols and phenols' and 'Fuel wood').

have been remarkably stable over time and concentrated in low and medium-low growth products. Moreover, the few changes that have occurred over the last twenty years in the shape of the specialization pattern have essentially been related to movements of some items along the rank rather than to efficient productive reallocation. The declining importance in world trade of the items in which Argentina is specialized could eventually lead to a decreasing weight in international markets, even if the country were able to preserve or even increase its comparative advantages and its market shares in those products.

As a final consideration, since international prices of agricultural and raw materials are set on international markets in reference currencies, usually dollars, any devaluation of the domestic currency (such as the one that occurred in 2002) would not immediately affect competitiveness and spur the Argentine economy through exports, as was the case for Mexico in 1995 and for the Asian countries in the aftermath of the currency crisis in 1997-98.

Tables and Figures

Table 1

LATIN AMERICA: COMPOSITION OF EXPORTS BY MAIN COMMODITY GROUPS

Commodities Groups	*Latin America*	*Argentina*	*Brazil*	*Chile*	*Mexico*	*Venezuela*
Food, live animals, beverages and tobacco	19.2	35.3	21.7	26.3	5.3	2.2
Crude materials, inedible, animal and vegetable oils and fats	8.5	16.0	16.9	25.1	1.3	1.5
Mineral fuels, lubricants and related materials	13.4	13.0	1.1	0.7	7.8	81.0
Manufactured goods, included transportation equipment	58.9	35.7	60.3	47.9	85.6	15.3
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0

Source: WTA Statistics Canada. Calculated on average data of the period 1998-2000.

Table 2A

ARGENTINA: TOP TEN AND BOTTOM TEN ITEMS OF THE SPECIALIZATION MODEL

TOP 10	*World Share*	*Weight on trade*	*BOTTOM 10*	*World Share*	*Weight on trade*
081-Feeding stuff for animals	10.77	4.39	764-Telecommunications equipment and parts	0.02	3.10
333-Petroleum oils, crude	0.89	4.39	784-Parts & accessories of motor vehicles	0.37	3.62
423-Fixed vegetable oils, soft, crude, refined	23.23	2.42	752-Automatic data processing machines & units	0.01	1.50
041-Wheat and meslin, unmilled	8.02	2.35	641-Paper and paperboard	0.11	1.39
044-Maize,unmilled	12.01	2.15	751-Office machines	0.01	0.93
424-Other fixed vegetable oils,fluid or solid	6.92	1.82	778-Electrical machinery and apparatus	0.08	1.10
611-Leather	5.31	1.64	792-Aircraft & associated equipment and parts	0.08	1.10
222-Oil seeds and oleaginous fruits	6.33	1.75	728-Specialized machinery & equipment	0.11	1.13
334-Petroleum products, refined	0.76	2.24	583-Polymerization and copolymerization products	0.19	1.53
011-Meat, edible meat offals, fresh and chilled	1.73	1.58	741-Heating & cooling equipment and parts	0.02	2.40

Source: WTA Statistics Canada; period 1998-2000.

Table 2B

BRAZIL: TOP TEN AND BOTTOM TEN ITEMS OF THE SPECIALIZATION MODEL

TOP 10	World Share	Weight on trade	BOTTOM 10	World Share	Weight on trade
281-Iron ore and concentrates	33.01	2.93	333-Petroleum oils, crude	0.10	3.16
071-Coffee and coffee substitutes	16.81	2.23	764-Telecommunications equipment and parts	0.30	3.45
222-Oil seeds and oleaginous fruits	15.75	1.98	776-Thermionic,cold & photo-cathode valves and tubes	0.07	1.53
061-Sugar and honey	15.60	1.67	728-Specialized machinery & equipment	0.24	1.55
081-Feeding stuff for animals	8.63	1.71	751-Office machines	0.03	1.02
011-Meat, edible meat offals, fresh and chilled	3.94	1.50	334-Petroleum products,refined	0.40	1.85
672-Ingots and other primary forms of iron	12.48	1.19	041-Wheat and meslin, unmilled	0.00	0.81
058-Fruit, preserved, and fruit preparations	9.85	1.24	752-Automatic data processing machines & units	0.15	1.38
121-Tobacco, unmanufactured	14.77	0.88	515-Organo-inorganic and heterocyclic compound	0.33	0.97
684-Aluminium	2.71	1.52	714-Engines and motors, non-electric	0.20	0.93

Source: WTA Statistics Canada; period 1998-2000.

Table 2C

CHILE: TOP TEN AND BOTTOM TEN ITEMS OF THE SPECIALIZATION MODEL

TOP 10	World Share	Weight on trade	BOTTOM 10	World Share	Weight on trade
682-Copper	15.45	14.56	333-Petroleum oils, crude	0.00	4.01
287-Ores and concentrates of base metals	11.82	6.61	764-Telecommunications equipment and parts	0.00	2.33
057-Fruit & nuts(not includ. oil nuts),fresh	4.04	3.78	781-Passenger motor cars	0.01	2.03
034-Fish,fresh (live or dead),chilled or frozen	5.21	3.46	782-Motor vehicles for transport of goods	0.13	2.34
112-Alcoholic beverages	1.93	1.95	728-Specialized machinery & equipment	0.02	1.41
248-Wood,simply worked,and railway sleepers	1.72	1.41	752-Automatic data processing machines & units	0.01	1.19
081-Feeding stuff for animals	1.58	1.43	792-Aircraft & associated equipment and parts	0.03	1.12
058-Fruit,preserved,and fruit preparations	1.63	0.73	583-Polymerization and copolymerization products	0.06	1.19
037-Fish,crustaceans and molluscs,prepared	2.12	0.69	723-Civil engineering & contractors plant	0.11	0.88
512-Alcohols and phenols	1.52	0.73	744-Mechanical handling equipment and parts	0.05	0.77

Source: WTA Statistics Canada; period 1998-2000.

Table 2D

MEXICO: TOP TEN AND BOTTOM TEN ITEMS OF THE SPECIALIZATION MODEL

TOP 10	World Share	Weight on trade	BOTTOM 10	World Share	Weight on trade
781-Passenger motor cars	4.59	6.01	776-Thermionic,cold & photo-cathode valves and tubes	1.01	4.21
333-Petroleum oils, crude	4.41	3.61	784-Parts & accessories of motor vehicles	3.67	4.82
761-Television receivers	21.54	2.13	893-Articles of materials derived from polymerization	2.62	2.10
752-Automatic data processing machines & units	3.43	3.20	728-Specialized machinery & equipment	0.95	1.50
782-Motor vehicles for transport of goods	6.25	2.28	772-Electrical appliances	4.58	3.57
773-Equipment for distributing electricity	16.35	3.19	583-Polymerization and copolymerization products	0.88	1.24
842-Men's outer garments, of textile fabrics	6.09	1.71	334-Petroleum products,refined	0.64	1.12
764-Telecommunications equipment and parts	4.11	5.19	641-Paper and paperboard	0.23	0.56
054-Vegetables,fresh,chilled or frozen	8.79	0.87	736-Mach.tools for working metal	0.16	0.46
778-Electrical machinery and apparatus	6.22	3.61	699-Manufactures of base metal (residual)	4.24	1.81

Source: WTA Statistics Canada; period 1998-2000.

Table 2E

VENEZUELA: TOP TEN AND BOTTOM TEN ITEMS OF THE SPECIALIZATION MODEL

TOP 10	World Share	Weight on trade	BOTTOM 10	World Share	Weight on trade
333-Petroleum oils, crude	5.39	32.53	781-Passenger motor cars	0.03	2.45
334-Petroleum products,refined	5.14	16.40	764-Telecommunications equipment and parts	0.00	1.87
684-Aluminium	1.57	2.16	723-Civil engineering & contractors plant	0.01	1.62
671-Pig iron,spiegeleisen,sponge iron,iron or steel	3.17	0.71	741-Heating & cooling equipment and parts	0.01	1.29
281-Iron ore and concentrates	1.45	0.39	782-Motor vehicles for transport of goods	0.04	1.10
322-Coal,lignite and peat	0.80	0.40	728-Specialized machinery & equipment	0.01	0.93
122-Tobacco manufactured	0.52	0.26	784-Parts & accessories of motor vehicles	0.12	1.61
661-Lime,cement,and fabricated construction materials	1.12	0.37	752-Automatic data processing machines & units	0.00	0.80
036-Crustaceans and molluscs,fresh,chilled,frozen	0.62	0.28	744-Mechanical handling equipment and parts	0.01	0.79
674-Universals,plates and sheets,of iron or steel	0.40	1.09	678-Tubes,pipes and fittings,of iron or steel	0.12	0.76

Source: WTA Statistics Canada; period 1998-2000.

Table 3

RATES OF GROWTH OF WORLD IMPORTS
(percentages)

	1980-1990	1990-2000
Total average	6.1	4.8
Low growth group (1-50)		
Average	0.1	0.6
Standard deviation	2.3	2.1
Best-performing item	3.1	2.6
Worst-performing item	-4.8	-9.0
Medium-Low growth group (51-100)		
Average	4.9	3.7
Standard deviation	1.0	0.5
Best-performing item	6.8	4.5
Worst-performing item	3.1	2.7
Medium-High growth group (101-150)		
Average	8.0	5.9
Standard deviation	0.7	0.7
Best-performing item	9.1	6.9
Worst-performing item	6.9	4.6
High growth group (151-200)		
Average	11.3	8.9
Standard deviation	2.0	2.5
Best-performing item	18.3	19.3
Worst-performing item	9.2	6.9

Source: WTA Statistics Canada

Table 4

LAFAY'S SPECIALIZATION MODEL: STABILITY TEST
(percentages)

	α	β	R	β/R
Argentina	0.00	0.53#*	0.63	0.63**
Brazil	0.00	0.21#*	0.63	0.63*
Chile	0.00	0.75#*	0.92	0.92*
Mexico	0.00	0.11#*	0.52	0.52*
Venezuela	0.00	0.83#*	0.99	0.99**

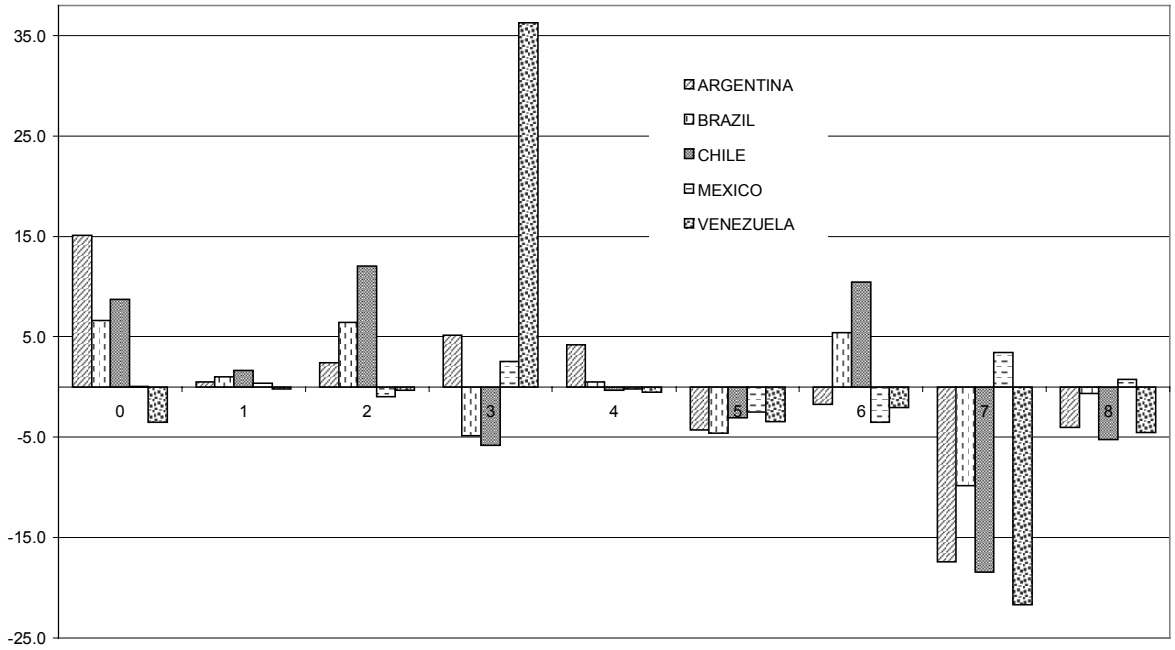
# denotes significantly different from zero at 1%

* denotes significantly different from 1 at 1%

** denotes significantly different from 1 at 5%

Figure 1

LATIN AMERICA: SPECIALIZATION MODEL BY MAIN GROUPS OF COMMODITIES
(Lafay index)

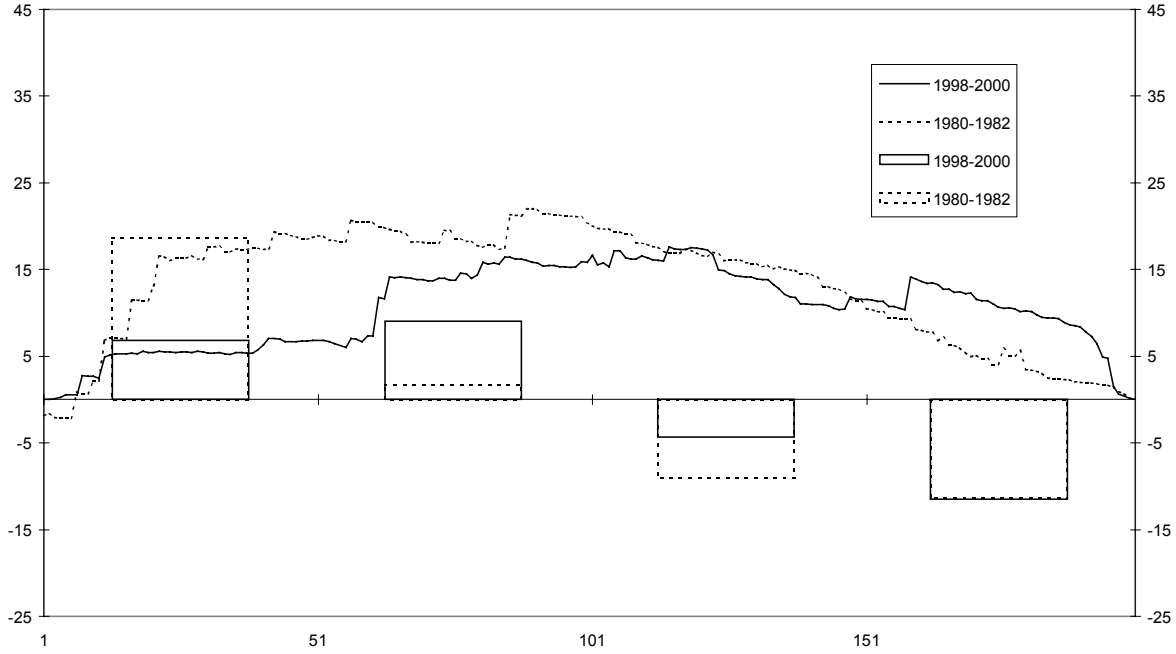


Source: WTA Statistics Canada; period 1998-2000.

Figure 2A

SPECIALIZATION MODEL OF ARGENTINA AND ITS EVOLUTION OVER TIME

(Cumulated Lafay index; items ordered by world imports growth rate)

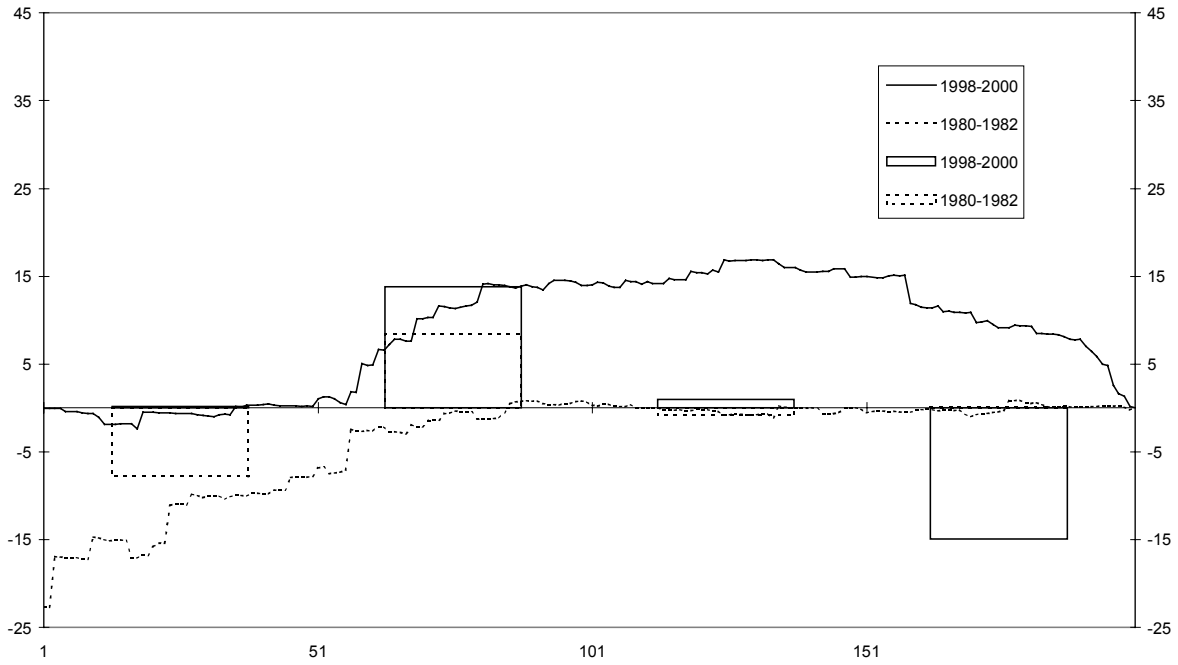


Source: WTA Statistics Canada; period 1998-2000.

Figure 2B

SPECIALIZATION MODEL OF BRAZIL AND ITS EVOLUTION OVER TIME

(Cumulated Lafay index; items ordered by world imports growth rate)

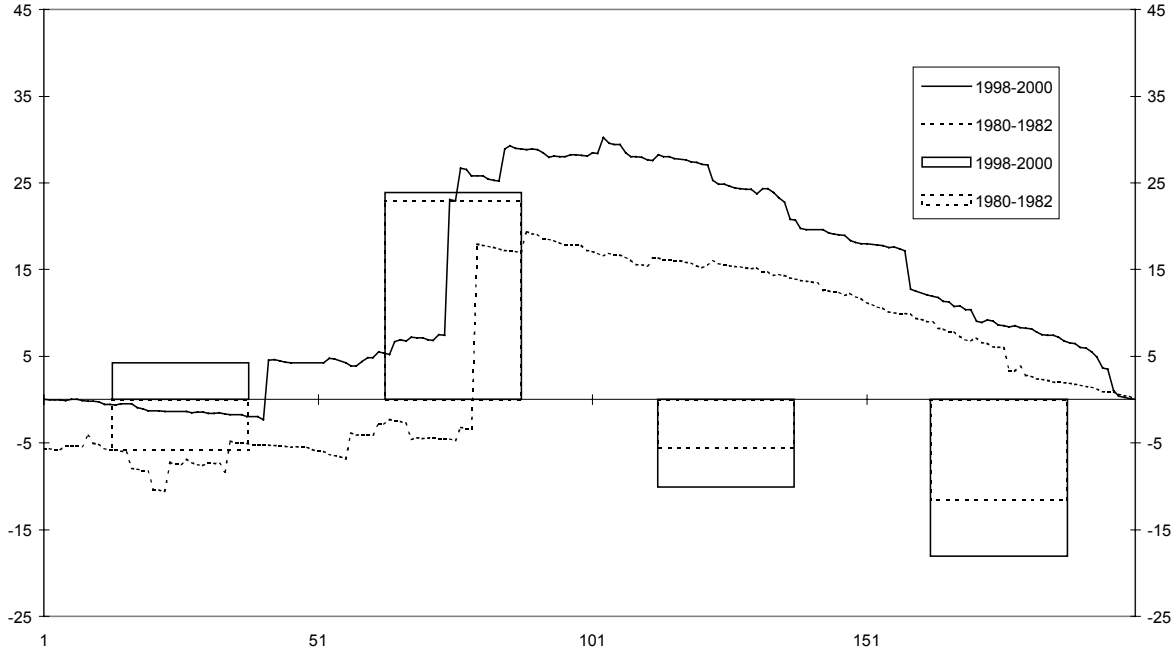


Source: WTA Statistics Canada; period 1998-2000.

Figure 2C

SPECIALIZATION MODEL OF CHILE AND ITS EVOLUTION OVER TIME

(Cumulated Lafay index; items ordered by world imports growth rate)

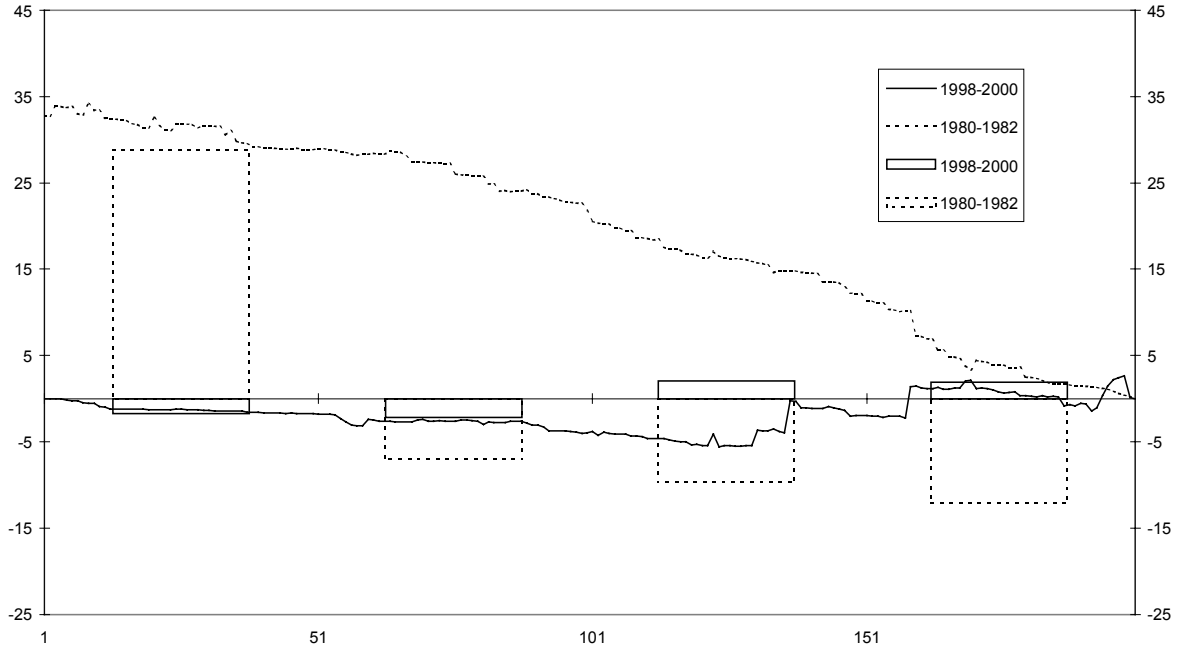


Source: WTA Statistics Canada; period 1998-2000.

Figure 2D

SPECIALIZATION MODEL OF MEXICO AND ITS EVOLUTION OVER TIME

(Cumulated Lafay index; items ordered by world imports growth rate)

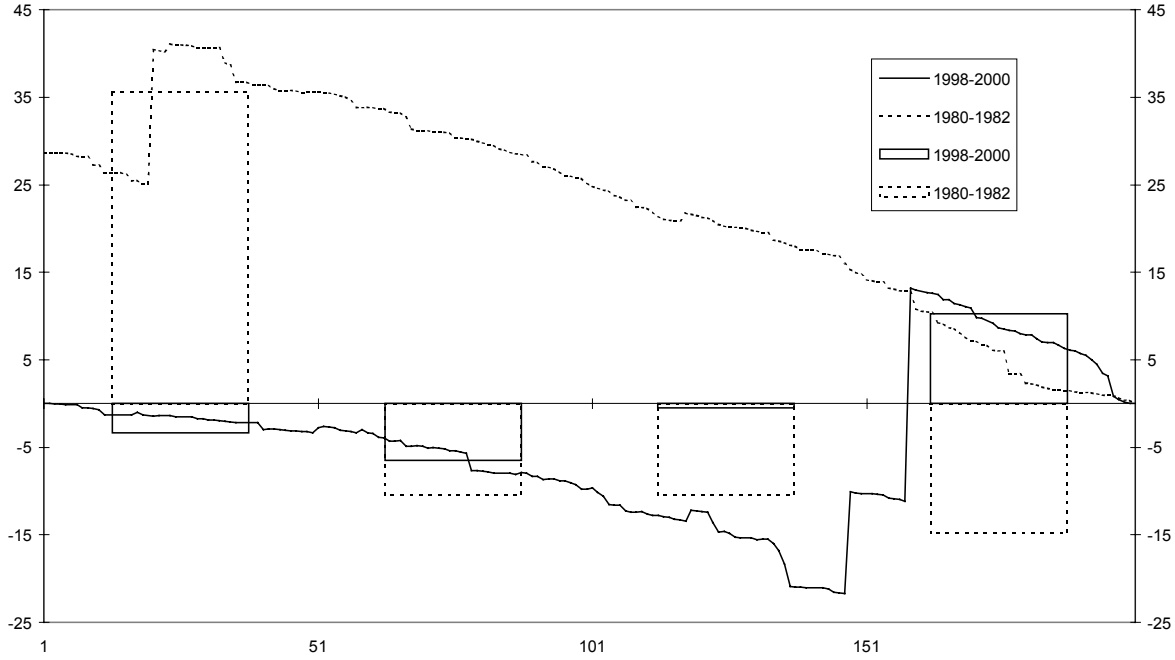


Source: WTA Statistics Canada; period 1998-2000.

Figure 2E

SPECIALIZATION MODEL OF VENEZUELA AND ITS EVOLUTION OVER TIME

(Cumulated Lafay index; items ordered by world imports growth rate)

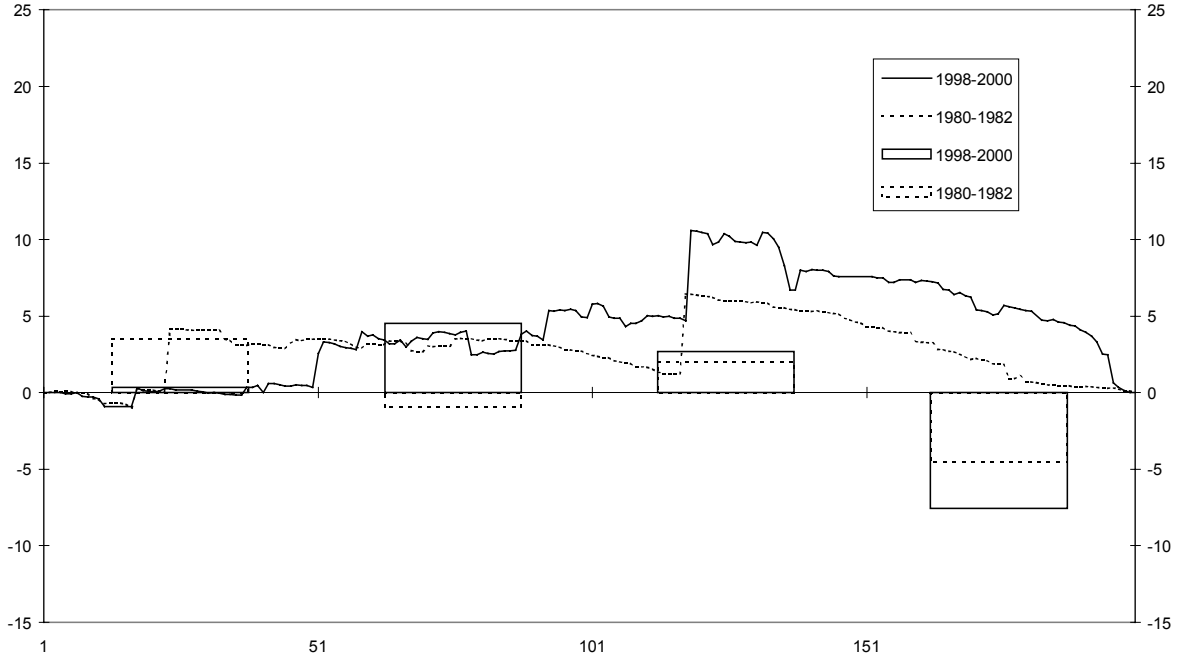


Source: WTA Statistics Canada; period 1998-2000.

Figure 2F

SPECIALIZATION MODEL OF VENEZUELA EXCLUDING OIL AND ITS EVOLUTION OVER TIME

(Cumulated Lafay index; items ordered by world imports growth rate)



Source: WTA Statistics Canada; period 1998-2000.

Appendix

For the sake of completeness we report in analytical terms the comparative advantages indexes quoted in the text. As in the main text x_j^i and m_j^i are exports and imports of product *j* of the generic country *i*, while *W* indicates the world aggregate; *N* is the number of traded groups.

(A) $$RCA_j^i = \frac{x_j^i \Big/ \sum_{j=1}^{N} x_j^i}{x_j^{Wi} \Big/ \sum_{j=1}^{N} x_j^{Wi}};$$

(B) $$M_j^i = \frac{x_j^i}{\sum_{j=1}^{N} x_j^i} \Big/ \frac{m_j^i}{\sum_{j=1}^{N} m_j^i};$$

(C)

$$BSCI_j^i = \sum_{j=1}^{N} \left\{ \left(\frac{x_j^i(t)}{\sum_{j=1}^{N} x_j^i(t)} \Big/ \frac{x_j^i(t-1)}{\sum_{j=1}^{N} x_j^i(t-1)} - 1 \right) \left(\frac{\frac{m_j^W(t)}{m_j^W(t-1)}}{Average\left(\frac{m_j^i(t)}{m_j^i(t-1)} \right)} - 1 \right) \frac{x_j^i(t)}{\sum_{j=1}^{N} x_j^i(t)} \right\};$$

$$TS_j^i = \sum_{j=1}^{N} \left(\frac{x_j^i + m_j^i}{\sum_{j=1}^{N} (x_j^i + m_j^i)} \frac{\left| x_j^i - m_j^i \right|}{x_j^i + m_j^i} \right).$$

RCA is the revealed comparative advantage index proposed by Balassa (1965), *M* is the index suggested by Michaely (1967), *BSCI* and *TS* are the beneficial structural change and the trade specialization indexes as in Bender (2001).

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