

Transaction costs and regional trade

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This paper uses the transaction cost theory to discuss the economic foundations of the contemporary trend toward regional integration. It reviews the evolution of bilateral trade flows in five regional blocs and shows that the decline of information costs is a key variable for explaining the generalized growth of intra-industry trade during the last 15 years. Technical progress in the computer industry has generated new forms of international competition wherein the regional supply of intermediate inputs plays a strategic role. Regionalization trends are likely to be even stronger in the near future, but they do not imply any threat to the multilateral trading system.

1. Introduction

Since the early eighties, regional trade has been growing faster than world trade, despite the outstanding performance of the latter, and this has engendered an intense debate on regionalism *versus* multilateralism. Curiously, the debate has been centered on the behavior of governments, not on the economic foundations of such phenomenon. As Paul Krugman noted, “in some sense, the question of whether regional trading arrangements are good or bad is a moot point. There is nobody who is in a position to decree regional blocs either into or out of existence. So we need to ask why such blocs are in fact emerging” (1993:73).

This paper answers this question as follows: a cluster of technological innovations – which included personal computers, new generations of software, fax machines, modems and better telecommunication systems – has allowed a sharp decline of transaction costs worldwide and, consequently, created new forms of competition. To face the new economic environment, firms had to refocus their strategies, by reducing the scope of their production lines in order to keep only those activities they could perform according to the best international practice. This restructuring process opened new markets for intermediate products and services at home and abroad. Due to the time constraints of contemporary production processes, firms prefer suppliers from neighbor countries when subcontracting services abroad or importing inputs. Thus, the trend toward regional integration strengthens the multilateral trading system. At each economy, firms establish their domestic and regional networks in order to face global competition. When signing preferential trading agreements, governments are just sanctioning the institutional framework dictated by market forces. They may commit mistakes, but their attitude is essentially coherent with the idea of free trade.

Besides reconciling regionalism with multilateralism, the argument presented here has

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two merits. First, it provides a theoretical foundation to the gravity model. The distance between countries and their respective sizes are important variables for explaining bilateral trade flows, not because of Newton's law, but due to the peculiarities of the competition process. Second, it introduces an additional element to the list of factors that justify intra-industry trade. Even in the absence of product differentiation and increasing returns, every industry generates a certain amount of regional trade flows which depend upon the ratio of transaction costs to production costs borne by incumbent firms, adjusted by the difference between domestic and foreign prices.

Section 2 shows how the interplay between transaction costs and production costs creates regional trade, and illustrates the process of corporate refocusing with some examples from the American economy. Section 3 reviews the evolution of intra-industry trade in five regional blocs: Andean Pact, Australia-New Zealand, European Union, the Southern Common Market (Mercosur) and the North American Free Trade Agreement (Nafta). These trade flows are treated as dependent variables that follow the behavior of transaction costs. Finally, some concluding remarks are made in section 4.

2. Corporate Refocusing: Origins and Consequences

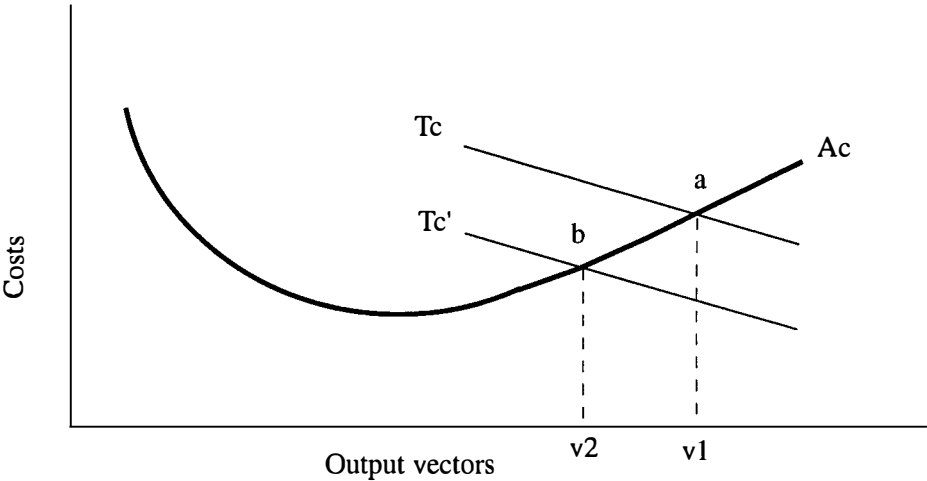
As Ronald Coase pointed out some 60 years ago, firms exist because there are transaction costs in the economic system. Every contract between economic agents presupposes a set of activities for its implementation, such as information gathering, bargaining, monitoring and enforcing. All these activities generate transaction costs. Whenever production costs were lower than transaction costs, firms will find opportunities to circumvent market operations through the expansion of in-house activities. Conversely, an eventual decline of transaction costs will reduce the scope of production vectors and firms will be compelled to refocus their capabilities on those production lines that remained profitable. In other words, the relationship between transaction costs and production costs indicates the convenient degrees of output diversification and vertical integration of the existing firms, i.e., their input/output ratios.

It should be noted that this approach to transaction costs is rather different from the conventional view presented in the international trade literature, which does not distinguish such costs from transportation costs. According to Jeffrey Frankel et al., for instance, the "notion of transportation costs should probably be understood as transaction costs, encompassing not just physical transportation of goods but also costs of communications and the idea that countries tend to have a better understanding of their neighbors and their institutions" (1995:76). In contrast, my definition includes only one type of transaction cost: expenditures provoked by imperfect knowledge. As Carl Dahlman (1979) well explained, information gathering is needed because there is insufficient data about the profile of trading opportunities, bargaining costs result from the lack of information on the preferences of economic agents, monitoring and enforcing costs exist because contracts are always incomplete. Therefore, all transaction costs are, in fact, information costs.

Moreover, transportation costs should not be treated as transaction costs for two additional reasons. First, while the former costs are proportional to the amount of foreign

trade, the later vary according to the scope of activities carried out by domestic firms, but independently from the levels of production and trade. Second, the same logic underlying the relationship between transaction costs and production costs can be applied in regard to transportation costs, as the following discussion indicates.

Transaction costs, average costs and output vectors



Transaction costs can be raised by several factors such as interventionist economic policies, cumbersome judicial systems, inefficient public services or lack of human capital. Likewise, they can be reduced by factors such as deregulation, trade liberalization, transparent public procedures and technical progress, which is, by far, the most important. While the former reducing factors normally yield once for all effects, technical progress continually reshapes the interplay between transaction costs and production costs, as the figure shows. Curves *Ac* and *Tc* describe the levels of average costs and transaction costs for different ranges of output vectors. Each output vector includes all firms activities, from in-house produced inputs to final goods sold in the market. Imagine one firm producing *v1* goods at level *a* of average costs. If a new technology shifts the transaction costs curve from *Tc* to *Tc'*, the firm will concentrate its activities on a narrower range of products, *v2*, at level *b* of average costs. Now, the output vector [*v1*–*v2*] will be carried out by other firms which have cost structures more fitted to the new market conditions.

New technologies may shift the transaction costs curve by generating three types of effects: (a) the decline of information costs; (b) more flexible production processes, with a greater number of “technologically separable interfaces”, which, as Williamson (1989) has argued, expand the opportunities for new market transactions; (c) a lower degree of interdependence among the different stages of the production process, which reduces the need for in-house coordinating efforts and creates the conditions for corporate refocusing. The movement from vector *v1* to *v2* corresponds to a restructuring process whereby the

firm redefines its *intrinsic core*, i.e., those elements “that are idiosyncratically synergistic, inimitable, and noncontestable” (Langlois & Robertson, 1995:7), and selects the *ancillary capabilities* that should be transferred to other producers.

In a free trade environment, the market created by the new ratio Tc'/Ac will be served by three main groups of firms: (a) domestic firms that can produce those goods at competitive prices; (b) foreign exporters offering final goods included in vector $[v1-v2]$; (c) exporters from neighbor countries selling inputs to the firm that has refocused its production lines. Evidently, all types of goods can be imported from everywhere, but, when outsourcing, firms are very concerned with delivery times and inventory costs. These constraints benefit neighboring suppliers. Thus, lower transaction costs stimulate trade, but specially intra-industry trade among countries in the same region. Indeed, the greater the difference between the declining rates of transaction costs and transportation costs, the stronger the trend toward regional integration, as section 3 will describe.

If, instead of free trade, all countries apply a uniform tariff on imports, the exporters of intermediate goods and their clients would favor any trading arrangement which eliminates that tariff. In fact, the higher the levels of intra-industry trade, the greater the support governments will get from the private sector for signing regional integration agreements. These agreements increase the international competitiveness of domestic firms and, therefore, may lead to further trade liberalization at the multilateral level.

The performance of the American economy in the eighties well illustrates the facts described in the figure on page 107. As Constantinos Markides pointed out: “More firms were refocusing in the 1980s than in the 1960s. For example, in the 1960s only 1% of the top American companies were refocusing, while fully 25% were diversifying. By contrast, in the 1980s more than 20% of these firms were refocusing, while only 8% were diversifying. As a result the trend toward diversification that began more than 50 years ago is now reversing itself. In particular, there was a significant increase in the single-business firms, and a decrease in the unrelated-business firms within the population of Fortune 500 firms. This represents a major evolutionary change for the American corporation” (1995:8).

His interpretation follows the logic described by the figure on page 107: “... we will argue that over the past 20 years, changes in the real and financial markets have reduced the optimal level of diversification for most firms. Thus even firms that were optimally diversified a few years ago are now in a state of disequilibrium. A reduction in the optimal level of diversification will occur either because the costs of diversification have increased or because the benefits of diversification have decreased” (ibid., p. 23).

Not by chance, since the eighties the American government became more committed to regional integration!

3. Computer Prices and Economic Integration

The table on page 110 summarizes the data to be discussed in this section. It shows the evolution of world exports, transportation costs, computer prices and the bilateral

economic relations of six pairs of countries from 1980 to 1995. Four aspects of the bilateral relations have been included: (a) the intra-industry trade index, measured as a weighted average of 25 industries listed in the appendix;¹ (b) the bilateral trade flows; (c) the rhythm of economic integration, measured as the product of the two preceding variables; and (d) the correlation between the performance of computer prices and the progress of economic integration, measured by two coefficients, one for the entire period (listed on the 1980 column) and another for a shorter period (1983-95).

Transportation costs are described by the "Liner index" compiled by the ministry of Transport of Germany, which is based on monthly weighted assessments of freight rates on cargoes loaded or discharged by liners of all flags at ports in the Antwerp/Hamburg range. This index shows that intercontinental transportation costs did not change very much during the last 15 years. Despite the declining trend since 1985, in 1995, freight rates were still approaching the 1980 level. Therefore, we may ignore this variable and focus our attention on information costs only.

Within the limits of the analytical framework presented in section 2, a convenient indicator for information costs is the hedonic price index for personal computers compiled by the U.S. Bureau of Economic Analysis (BEA). This is a quality-adjusted index that captures innovations introduced in PC models regarding memory size, speed and hard disk capacity. For the period 1982-95, the figures listed in the table are based on the comprehensive revision made by BEA in 1996. For 1980-82, I used a previous estimate released in 1985 (see Cartwright, 1986).²

The performance of computer prices is a key evidence for checking the transaction cost theory because it affects the three mechanisms that may shift the transaction costs curve, by reducing the costs of data processing, allowing new operational structures and simplifying the decision making process. And the facts registered in the table are remarkable. In loose terms, they imply that, in 1995, any economic agent established in the U.S. market had a data processing capacity that was at least 10 times greater than its corresponding level in 1982. As Tom Forester commented a decade ago: "... if the automobile and airplane businesses had developed like the computer business, a Rolls Royce would cost \$2.75 and run for 3 million miles on one gallon of gas. And a Boeing would cost just \$500 and circle the globe in 20 minutes on five gallons of gas" (Quoted by Berndt, 1991:102).

We can review now some economic consequences of this technological revolution. The six pairs of trading partners included in the table are widely different in many aspects, such as size of their domestic markets, geographical attributes, levels of economic development and trade policies applied to third countries. But they share two important common characteristics: a bilateral trade relation that expands faster than world trade, and a trend toward economic integration sustained by increasing rates of intra-industry trade.

¹The formula used was: $I = 1 - (\sum (xi/X) - (mi/M))/2$, where (xi/X) and (mi/M) are the export and import shares of industry i on the country's total figures. The index varies between 0 (no intra-industry trade) and 1 (full intra-industry trade).

²Compared to other econometric exercises, BEA's estimates seem conservative. Berndt, Griliches and Rappaport (1993), for instance, found a price decline of about 30% per year during 1989-92, while Berndt and Griliches (1993) estimated a 28% annual decline for the period 1982-88.

Trade, economic integration and transaction costs (1980-95)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
World exports	110	108	100	98	104	105	116	140	160	172	197	203	218	216	244	289
Freight rates	84	98	100	99	127	134	112	103	102	105	94	99	97	95	92	88
PC's prices	117	107	100	70	60	57	42	38	34	32	27	23	17	14	12	9
Argentina/Brazil	-0.60			-0.78												
Economic integration	51	49	24	21	36	27	22	37	49	63	66	101	169	224	295	402
Bilateral trade	158	122	100	83	102	84	104	98	120	150	174	259	392	521	640	787
IIT index	0.32	0.40	0.24	0.25	0.35	0.32	0.21	0.38	0.41	0.42	0.38	0.39	0.43	0.43	0.46	0.51
Australia/New Zealand	-0.83			-0.91												
Economic integration	47	53	50	50	63	70	69	87	112	124	138	143	156	163	213	244
Bilateral trade	104	110	100	98	124	113	110	148	187	214	234	239	252	254	323	375
IIT index	0.45	0.48	0.50	0.51	0.51	0.62	0.63	0.59	0.60	0.58	0.59	0.60	0.62	0.64	0.66	0.65
Canada/United States	-0.88			-0.90												
Economic integration	61	69	66	77	97	101	102	110	131	134	146	145	154	171	204	233
Bilateral trade	96	107	100	114	138	143	142	154	181	189	202	202	217	241	279	311
IIT index	0.64	0.64	0.66	0.68	0.70	0.71	0.72	0.71	0.72	0.71	0.72	0.72	0.71	0.71	0.73	0.75
Colombia/Venezuela	-0.60			-0.78												
Economic integration	18	15	17	11	13	12	11	14	19	18	34	38	65	83	99	151
Bilateral trade	66	105	100	71	67	51	37	47	55	54	73	107	142	231	238	326
IIT index	0.27	0.14	0.17	0.15	0.20	0.23	0.31	0.29	0.35	0.34	0.47	0.36	0.46	0.36	0.42	0.47
France/Germany	-0.81			-0.94												
Economic integration	99	86	80	79	76	80	109	134	147	161	203	200	216	180	206	253
Bilateral trade	119	104	100	97	92	98	133	166	185	195	240	240	253	211	239	299
IIT index	0.83	0.83	0.80	0.82	0.83	0.81	0.82	0.81	0.80	0.82	0.84	0.83	0.85	0.85	0.86	0.85
Mexico/United States	-0.71			-0.83												
Economic integration	33	43	26	32	50	60	78	51	87	97	140	153	411	431	422	445
Bilateral trade	141	176	100	82	109	123	114	90	142	169	216	285	498	526	596	598
IIT index	0.23	0.25	0.26	0.39	0.45	0.49	0.69	0.57	0.61	0.57	0.65	0.54	0.83	0.82	0.71	0.74

Sources: IMF – Direction of Trade Statistics; United Nations, Comtrade Data Base; US Bureau of Economic Analysis; Unctad – *Review of Maritime Transport*.

A conventional reasoning would argue that this coincidence was produced by the preferential trade agreements (PTAs) implemented by those countries in the recent past.³ Although correct for the case of South America, as discussed below, this explanation does not answer the following questions: (a) why PTAs became fashionable during a period marked by an intense growth of multilateral trade? (b) why intra-industry trade became so predominant? (c) why the growth of bilateral trade among OECD countries started in 1983, several years before the proliferation of PTAs? (d) why countries like France and Germany, which already had attained high and stable rates of intra-industry trade before 1980 (see table A5), were able to keep increasing rates of economic integration afterwards?

As we saw in section 2, the transaction cost theory has a standard answer for all these questions — the decline of information costs — which renders convincing indicators for the OECD countries, where the correlation coefficients between the performance of computer prices and the advancement of economic integration are generally high for the whole studied period, and even higher during 1983-95. This reinforces the view that the personal computer is the core technology of a cluster of Schumpeterian innovations that launched a process of creative destruction throughout the world economy, which can also be described as a sequence of shifts of the T_c curve in the figure on page 107. Thus, corporate refocusing, regional integration and global competition are complementary aspects of a single mutation process that is far from being completed. If we compare the present profile of trade flows between France and Germany with other bilateral relations, we may notice that there is yet enough room for strengthening economic integration in the rest of the world (see tables A1 to A6 in the appendix).

The above process did not include South America for several years. Although foreign trade was blooming everywhere after 1983, Argentina-Brazil bilateral flows had a 50% cut between 1980 and 1985, while Colombia-Venezuela figures declined 65% during 1981-86. Indeed, the tight import controls enacted by those governments to face the debt crisis, jointly with the bureaucratic apparatus inherited from the period of import substituting policies, voided the impact of the computer industry innovations on the transaction costs of those economies. Such trends were subsequently reversed by a series of governmental efforts, such as the protocols signed by Argentina and Brazil in 1986-88, the reformulation of the Andean Pact in 1990, the Mercosur project and, more importantly, the unilateral trade reforms carried out in the region since the late eighties. But, as tables A1 and A4 indicate, the strong catching-up process attained in the present decade has not been sufficient to create stable intra-industry links. According to the argument presented in section 2, this is likely to be the next stage of the integration process of those countries.

³ In 1980, among the countries included in our sample, only France and Germany were active members of a PTA. Colombia and Venezuela are founding partners of the Andean Pact, which existed since 1969, but became effective only after 1990. The Aladi (Latin American Integration Association) agreements were, in fact, ancillary instruments of managed trade among closed economies. Australia and New Zealand launched their PTA in 1983, the liberalization between Argentina and Brazil began in 1986, the U.S.-Canadian PTA started in 1989, and Nafta in 1994.

4. Conclusion

In the international trade literature, the effects of technical progress discussed here are often presented from an opposite view. Bhagwati and Dehejia, for instance, argue that "... the world economy is now increasingly integrated and that the convergence of technology among the Organization for Economic Cooperation and Development (OECD) countries and the spread of global multinational corporations around the world have brought many modern industries within the grasp of countries. Many more industries therefore are 'footloose' now than before: small shifts in costs can cause comparative advantage to shift suddenly from one country to another. Thus, we suspect that comparative advantage has, over time, become kaleidoscopic: one country may have comparative advantage in X and another in Y today, and tomorrow it may suddenly go the other way" (1994:56).

As we have seen, technical progress has reduced the optimal level of diversification for most firms in several countries. But instead of turning "footloose", such firms have reinforced their regional networks in order to face global competition. Consequently, in a world of steady intra-industry links there is no room for "kaleidoscopic" comparative advantage.

The importance of proximity as a source of comparative advantage and the trend toward intra-industry trade among countries in the same region are well-documented facts (see Frankel et al., 1995; Greenaway and Hine, 1991; Balassa and Bauwens, 1998). But, as Leamer and Levinsohn (1995) have pointed out, they have had little impact on the field of international economics, due to the lack of a good story that would tell the relevance of those facts. The transaction cost theory fulfils this task. It explains how the interplay between technical change and firms' behavior affects regional trade, and demonstrates that there is no potential conflict between regionalism and multilateralism.

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Appendix

Intra-industry trade indexes:

- Argentina — Brazil, Australia — New Zealand, Canada — United States,
- Colombia — Venezuela, France — Germany, Mexico — United States.

Table A1
Intra-industry trade indexes, Argentina and Brazil

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Live animals	0.07	0.53	0.21	0.62	0.27	0.86	0.50	0.89	0.87	0.65	0.58	0.90	0.28	0.45	0.04	0.01
Meat and preparations	0.77	0.72	0.80	0.58	0.50	0.00	0.01	0.00	0.05	0.01	0.00	0.16	0.43	0.46	0.98	0.61
Dairy products	0.81	0.00	0.62	0.53	0.00	0.58	0.04	0.44	0.00	0.00	0.00	0.05	0.61	0.22	0.03	0.01
Fish and preparations	0.36	0.97	0.44	0.60	0.69	0.92	0.03	0.07	0.00	0.01	0.06	0.27	0.53	0.28	0.23	0.17
Sugar	0.07	0.04	0.21	0.50	0.63	0.53	0.02	0.95	0.51	0.03	0.02	0.43	0.77	0.44	0.17	0.52
Coffee, tea and cocoa	0.02	0.01	0.01	0.00	0.00	0.01	0.00	0.01	0.03	0.53	0.11	0.03	0.05	0.09	0.14	0.53
Other food products	0.19	0.26	0.08	0.14	0.18	0.18	0.04	0.03	0.04	0.05	0.03	0.08	0.14	0.16	0.10	0.09
Beverages	0.42	0.36	0.92	0.00	0.67	0.60	0.92	0.28	0.94	0.97	0.70	0.57	0.23	0.22	0.60	0.36
Tobacco	0.00	0.00	0.95	0.03	0.00	0.00	--	--	0.00	0.62	0.12	0.70	0.82	0.48	1.00	0.99
Leather and footwear	0.52	0.06	0.00	0.01	1.00	0.00	0.00	0.00	0.01	0.05	0.01	0.05	0.24	0.19	0.30	0.25
Rubber and manufactures	0.01	0.11	0.20	0.13	0.14	0.17	0.29	0.83	0.70	0.45	0.74	0.23	0.16	0.36	0.56	0.81
Cork, wood and furniture	0.01	0.00	0.00	0.01	0.06	0.22	0.04	0.05	0.13	0.90	0.30	0.39	0.04	0.03	0.08	0.63
Pulp and paper	0.02	0.01	0.04	0.03	0.30	0.71	0.42	0.99	0.91	0.59	0.56	0.36	0.12	0.08	0.14	0.49
Textiles and apparel	0.10	0.15	0.15	0.02	0.01	0.29	0.98	0.83	0.48	0.22	0.38	0.89	0.60	0.68	0.95	0.75
Fertilizers	0.43	0.63	0.43	0.28	0.49	0.75	0.88	0.80	0.83	0.93	0.96	0.88	0.78	0.59	0.69	0.52
Petroleum and energy	0.99	0.66	0.41	0.55	0.90	0.47	0.04	0.51	0.48	0.06	0.58	0.18	0.30	0.23	0.24	0.09
Chemicals	0.99	0.94	0.41	0.40	0.38	0.54	0.68	0.72	0.96	0.95	0.94	0.84	0.68	0.52	0.57	0.60
Pharmaceuticals	0.78	0.62	0.45	0.23	0.01	0.03	0.05	0.14	0.11	0.98	0.98	0.86	0.60	0.58	0.73	0.79
Plastics	0.03	0.01	0.14	0.19	--	0.31	0.42	0.40	0.27	0.83	0.90	0.72	0.68	0.49	0.55	0.72
Manufactures of metals	0.15	0.16	0.18	0.14	0.10	0.12	0.21	0.33	0.28	0.43	0.54	0.40	0.22	0.23	0.25	0.42
Iron and steel	0.20	0.91	0.16	0.01	--	0.03	0.07	0.01	0.00	0.80	0.45	0.20	0.07	0.10	0.06	0.12
Industrial machinery	0.32	0.31	0.57	0.26	0.13	0.25	0.54	0.64	0.99	0.77	0.94	0.71	0.42	0.42	0.47	0.77
Vehicles	0.45	0.52	0.63	0.30	0.74	0.96	1.00	0.95	0.62	0.75	0.97	0.60	0.41	0.70	0.82	0.85
Professional instruments	0.86	0.84	0.97	0.88	0.78	0.88	0.53	0.69	0.50	0.29	0.46	0.86	0.85	0.70	0.57	0.61
Other industries	0.24	0.25	0.21	0.22	0.10	0.13	0.64	0.57	0.94	0.80	0.81	0.76	0.34	0.18	0.34	0.97
Total	0.32	0.40	0.24	0.25	0.35	0.32	0.21	0.38	0.41	0.42	0.38	0.39	0.43	0.43	0.46	0.51

Source: United Nations. Comtrade Data Base.

Table A2
Intra-industry trade indexes, Australia and New Zealand

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Live animals	0.58	0.55	0.82	0.81	0.76	0.85	0.89	0.35	0.31	0.17	0.19	0.41	0.37	0.21	0.18	0.36
Meat and preparations	0.39	0.47	0.20	0.32	0.22	0.13	0.52	0.98	0.59	0.60	0.96	0.96	0.91	0.83	0.98	0.91
Dairy products	0.06	0.07	0.07	0.12	0.13	0.08	0.09	0.09	0.09	0.24	0.25	0.11	0.11	0.20	0.22	0.28
Fish and preparations	0.23	0.17	0.16	0.14	0.20	0.08	0.09	0.14	0.07	0.10	0.07	0.07	0.07	0.08	0.09	0.08
Sugar	0.17	0.20	0.28	0.17	0.41	0.49	0.57	0.68	0.91	0.91	0.77	0.85	0.71	0.69	0.67	0.47
Coffee, tea and cocoa	0.58	0.89	0.97	0.99	0.93	0.77	0.66	0.96	0.59	0.65	0.39	0.71	0.65	0.48	0.50	0.38
Other food products	0.80	0.83	0.93	0.94	0.92	0.91	0.94	0.98	0.80	0.76	0.88	0.94	0.97	1.00	0.99	0.99
Beverages	0.48	0.86	0.90	0.70	0.81	1.00	0.97	0.89	0.98	0.76	0.67	0.63	0.57	0.54	0.48	0.48
Tobacco	0.56	0.70	0.62	0.80	0.89	0.83	0.59	0.26	0.52	0.68	0.86	0.20	0.02	0.06	0.20	0.36
Leather and footwear	0.75	0.66	0.66	0.49	0.62	0.62	0.57	0.59	0.59	0.56	0.63	0.58	0.64	0.65	0.77	0.75
Rubber and manufactures	0.57	0.71	0.55	0.73	0.89	0.83	0.87	0.84	0.97	0.87	0.89	0.66	0.84	0.81	0.68	0.78
Cork, wood and furniture	0.19	0.23	0.25	0.22	0.17	0.15	0.26	0.34	0.33	0.22	0.25	0.19	0.14	0.15	0.17	0.26
Pulp and paper	0.20	0.16	0.23	0.26	0.28	0.30	0.30	0.38	0.33	0.32	0.41	0.49	0.63	0.56	0.50	0.45
Textiles and apparel	0.50	0.45	0.49	0.50	0.49	0.41	0.51	0.54	0.50	0.67	0.80	0.81	0.80	0.81	0.90	0.89
Fertilizers	0.18	0.18	0.20	0.32	0.67	0.92	0.20	0.67	0.88	0.98	0.74	0.50	0.92	0.56	0.80	0.45
Petroleum and energy	0.04	0.04	0.00	0.00	0.06	0.74	0.62	0.51	0.86	0.59	0.57	0.73	0.94	0.92	0.95	0.72
Chemicals	0.22	0.25	0.33	0.44	0.60	0.64	0.59	0.55	0.72	0.54	0.54	0.56	0.59	0.62	0.76	0.78
Pharmaceuticals	0.38	0.50	0.68	0.62	0.71	0.84	0.76	0.70	0.55	0.54	0.53	0.51	0.57	0.50	0.55	0.56
Plastics	0.69	0.71	0.66	0.73	0.55	0.64	0.60	0.52	0.45	0.54	0.45	0.46	0.48	0.53	0.58	0.70
Manufactures of metals	0.64	0.70	0.78	0.76	0.70	0.87	0.81	0.68	0.72	0.67	0.67	0.76	0.75	0.79	0.80	0.72
Iron and steel	0.08	0.23	0.31	0.43	0.34	0.45	0.51	0.48	0.75	1.00	0.88	0.97	1.00	0.99	0.69	0.71
Industrial machinery	0.68	0.73	0.87	0.69	0.75	0.87	0.75	0.70	0.76	0.73	0.69	0.61	0.59	0.63	0.65	0.60
Vehicles	0.32	0.30	0.26	0.28	0.19	0.31	0.32	0.11	0.15	0.18	0.18	0.38	0.22	0.17	0.13	0.12
Professional instruments	0.19	0.19	0.33	0.34	0.38	0.37	0.52	0.33	0.47	0.45	0.37	0.30	0.36	0.29	0.25	0.21
Other industries	0.87	0.89	0.86	0.93	0.91	0.97	0.98	0.94	0.57	0.50	0.47	0.41	0.53	0.85	0.75	0.69
Total	0.45	0.48	0.50	0.51	0.51	0.62	0.63	0.59	0.60	0.58	0.59	0.60	0.62	0.64	0.66	0.65

Source: United Nations. Comtrade Data Base.

Table A3
Intra-industry trade indexes, Canada and United States

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Live animals	0.66	0.97	0.63	0.59	0.32	0.38	0.64	0.63	0.31	0.37	0.20	0.26	0.19	0.21	0.26	0.20
Meat and preparations	0.59	0.65	0.50	0.58	0.63	0.52	0.47	0.50	0.66	0.81	0.83	0.95	0.89	0.83	0.84	0.83
Dairy products	0.53	0.58	0.63	0.78	0.74	0.71	0.61	0.68	0.97	0.94	0.92	0.88	0.76	0.70	0.65	0.74
Fish and preparations	0.52	0.44	0.39	0.41	0.45	0.39	0.36	0.38	0.38	0.43	0.41	0.41	0.41	0.46	0.47	0.53
Sugar	0.65	0.74	0.75	0.63	0.56	0.70	0.60	0.76	0.91	0.84	1.00	0.99	0.86	0.94	0.88	0.89
Coffee, tea and cocoa	0.39	0.40	0.45	0.46	0.59	0.67	0.86	0.95	0.98	0.94	0.91	0.93	1.00	0.96	0.96	0.93
Other food products	0.34	0.39	0.42	0.46	0.46	0.53	0.53	0.56	0.58	0.61	0.63	0.64	0.70	0.76	0.87	0.86
Beverages	0.21	0.18	0.16	0.16	0.14	0.24	0.15	0.18	0.25	0.37	0.33	0.34	0.32	0.32	0.36	0.42
Tobacco	0.58	0.94	0.96	0.85	0.95	0.67	0.54	0.33	0.44	0.58	0.38	0.18	0.11	0.05	0.54	0.59
Leather and footwear	0.73	0.72	0.82	0.79	0.81	0.83	0.77	0.72	0.79	0.83	0.89	0.99	0.96	0.94	0.90	0.84
Rubber and manufactures	0.93	0.86	0.71	0.77	0.80	0.71	0.69	0.78	0.79	0.79	0.97	0.99	0.97	0.98	0.98	0.99
Cork, wood and furniture	0.39	0.44	0.33	0.31	0.30	0.28	0.31	0.32	0.44	0.49	0.50	0.55	0.51	0.44	0.41	0.43
Pulp and paper	0.21	0.23	0.23	0.25	0.25	0.24	0.25	0.24	0.26	0.29	0.29	0.34	0.37	0.39	0.42	0.39
Textiles and apparel	0.31	0.36	0.48	0.46	0.56	0.65	0.74	0.75	0.73	0.64	0.69	0.72	0.78	0.80	0.85	0.87
Fertilizers	0.56	0.53	0.56	0.56	0.52	0.59	0.64	0.66	0.57	0.58	0.52	0.51	0.52	0.53	0.49	0.52
Petroleum and energy	0.47	0.40	0.38	0.30	0.33	0.24	0.34	0.30	0.28	0.34	0.33	0.20	0.19	0.16	0.16	0.16
Chemicals	0.98	0.94	0.89	0.97	0.99	0.99	0.92	0.92	0.94	0.87	0.88	0.84	0.88	0.86	0.86	0.90
Pharmaceuticals	0.23	0.29	0.34	0.34	0.32	0.44	0.48	0.46	0.49	0.47	0.51	0.48	0.48	0.48	0.58	0.62
Plastics	0.27	0.32	0.33	0.34	0.40	0.51	0.60	0.62	0.68	0.64	0.70	0.70	0.75	0.79	0.86	0.94
Manufactures of metals	0.89	0.86	0.84	0.89	0.84	0.89	0.85	0.82	0.83	0.89	0.83	0.87	0.89	0.91	0.87	0.83
Iron and steel	0.70	0.70	0.68	0.67	0.56	0.64	0.55	0.56	0.75	0.80	0.94	0.91	0.77	0.74	0.77	0.81
Industrial machinery	0.52	0.55	0.60	0.64	0.67	0.67	0.65	0.66	0.67	0.69	0.73	0.75	0.74	0.74	0.78	0.81
Vehicles	0.93	0.93	0.88	0.89	0.88	0.90	0.89	0.91	0.88	0.84	0.78	0.79	0.76	0.75	0.76	0.76
Professional instruments	0.30	0.32	0.34	0.39	0.41	0.37	0.46	0.49	0.62	0.55	0.51	0.56	0.61	0.58	0.59	0.60
Other industries	0.57	0.69	0.60	0.64	0.71	0.74	0.72	0.69	0.82	0.75	0.93	0.99	0.98	0.95	0.89	0.86
Total	0.64	0.64	0.66	0.68	0.70	0.71	0.72	0.71	0.72	0.71	0.72	0.72	0.71	0.71	0.73	0.75

Source: United Nations. Comtrade Data Base.

Table A4
Intra-industry trade indexes, Colombia and Venezuela

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Live animals	0.00	0.01	0.25	0.56	0.89	0.00	--	--	0.78	0.32	0.72	0.01	0.02	0.69	0.03	0.16
Meat and preparations	0.00	0.00	0.00	0.00	0.00	0.71	0.05	--	0.00	0.00	0.00	0.01	0.50	0.13	0.00	0.64
Dairy products	0.00	0.00	0.00	0.00	--	--	0.00	0.00	--	--	0.17	0.02	0.55	0.80	0.60	0.21
Fish and preparations	0.00	0.00	0.00	0.00	0.09	0.00	0.00	--	--	0.00	0.03	0.50	0.02	0.65	0.75	0.54
Sugar	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.02	--	--	0.00	0.01	0.08	0.10	0.58	0.69
Coffee, tea and cocoa	0.00	--	--	--	0.00	0.00	--	--	0.00	--	--	0.07	0.10	0.87	0.01	0.91
Other food products	0.21	0.01	0.03	0.01	0.10	0.04	0.37	0.13	0.89	0.45	0.54	0.60	0.99	0.58	0.70	0.54
Beverages	--	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.31	0.60	0.49	0.96	0.47	0.14
Tobacco	0.00	0.00	0.26	0.96	0.44	0.00	0.00	0.47	0.00	0.81	0.07	0.05	0.16	0.06	0.64	0.74
Leather and footwear	0.28	0.26	0.08	0.41	0.32	0.04	0.01	0.01	0.00	0.05	0.58	0.05	0.15	0.32	0.34	0.24
Rubber and manufactures	0.06	0.14	0.31	0.36	0.24	0.27	0.83	0.57	0.76	0.62	0.75	0.78	0.75	0.24	0.25	0.64
Cork, wood and furniture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.25	0.01	0.04	0.09	0.14	0.35
Pulp and paper	0.45	0.67	0.68	0.89	0.29	0.93	0.21	0.31	0.32	0.04	0.22	0.57	0.68	0.89	0.81	1.00
Textiles and apparel	0.00	0.00	0.00	0.02	0.01	0.00	0.04	0.03	0.02	0.04	0.35	0.06	0.14	0.21	0.36	0.25
Fertilizers	0.77	0.25	0.09	0.02	0.01	0.59	0.16	0.12	0.03	0.37	0.03	0.23	0.70	0.35	0.10	0.19
Petroleum and energy	0.08	0.03	0.04	0.02	0.03	0.06	0.62	0.66	0.37	0.52	0.58	0.11	0.51	0.15	0.14	0.07
Chemicals	0.42	0.66	0.90	0.58	0.71	0.99	0.76	0.62	0.74	0.98	0.66	0.79	0.95	0.84	0.67	0.88
Pharmaceuticals	0.06	0.11	0.20	0.09	0.09	0.87	0.90	0.31	0.15	0.23	0.37	0.62	0.93	0.93	0.82	0.57
Plastics	0.71	0.67	0.65	0.34	0.44	0.25	0.67	1.00	0.79	0.94	0.65	0.71	0.86	0.84	0.88	0.85
Manufactures of metals	0.69	0.70	0.65	0.38	0.31	0.54	0.22	0.21	0.39	0.27	0.36	0.74	0.60	0.50	0.32	0.44
Iron and steel	0.08	0.05	0.02	0.02	0.02	0.13	0.02	0.04	0.02	0.01	0.02	0.11	0.10	0.05	0.13	0.18
Industrial machinery	0.25	0.14	0.26	0.56	0.87	0.29	0.49	0.34	0.54	0.63	0.61	0.46	0.39	0.42	0.61	0.55
Vehicles	0.93	0.34	0.46	0.57	0.81	0.91	0.83	0.56	0.47	0.33	0.36	0.96	0.60	0.24	0.09	0.35
Professional instruments	0.62	0.11	0.34	0.89	0.60	0.33	0.55	0.23	0.17	0.40	0.50	0.84	0.90	0.55	0.70	0.64
Other industries	0.09	0.04	0.08	0.16	0.10	0.04	0.10	0.02	0.05	0.15	0.26	0.22	0.28	0.41	0.66	0.51
Total	0.27	0.14	0.17	0.15	0.20	0.23	0.31	0.29	0.35	0.34	0.47	0.36	0.46	0.36	0.42	0.47

Source: United Nations, Comtrade Data Base.

Table A5
Intra-industry trade indexes, France and Germany

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Live animals	0.64	0.41	0.61	0.87	0.93	0.99	0.83	0.68	0.63	0.77	0.97	0.80	0.65	0.73	0.97	0.89
Meat and preparations	0.85	0.92	0.78	0.80	0.94	0.90	0.87	0.99	0.93	0.98	0.92	0.85	0.76	0.68	0.73	0.65
Dairy products	0.54	0.54	0.34	0.31	0.30	0.25	0.33	0.38	0.59	0.43	0.40	0.59	0.64	0.62	0.64	0.68
Fish and preparations	0.93	0.85	0.88	0.94	0.91	0.96	0.88	1.00	0.97	0.83	0.88	0.91	0.89	0.98	0.94	0.98
Sugar	0.21	0.24	0.19	0.21	0.20	0.19	0.23	0.27	0.22	0.19	0.23	0.27	0.32	0.33	0.40	0.58
Coffee, tea and cocoa	0.56	0.54	0.58	0.53	0.51	0.58	0.61	0.68	0.81	0.90	0.99	0.95	0.88	0.85	0.91	0.88
Other food products	0.46	0.43	0.42	0.38	0.49	0.42	0.45	0.42	0.44	0.50	0.53	0.52	0.55	0.57	0.60	0.63
Beverages	0.11	0.13	0.15	0.14	0.12	0.13	0.13	0.12	0.11	0.13	0.13	0.14	0.17	0.15	0.18	0.19
Tobacco	0.63	0.56	0.68	0.70	0.58	0.46	0.52	0.41	0.29	0.27	0.33	0.37	0.44	0.28	0.33	0.40
Leather and footwear	0.54	0.60	0.73	0.65	0.63	0.65	0.71	0.69	0.70	0.83	0.84	0.69	0.68	0.56	0.54	0.57
Rubber and manufactures	0.78	0.76	0.78	0.78	0.76	0.76	0.77	0.80	0.80	0.80	0.79	0.73	0.73	0.72	0.73	0.75
Cork, wood and furniture	0.98	0.95	0.84	0.95	0.94	0.86	0.77	0.76	0.77	0.82	0.85	0.97	0.96	0.90	0.91	0.90
Pulp and paper	0.87	0.83	0.77	0.80	0.79	0.77	0.78	0.78	0.76	0.77	0.78	0.84	0.84	0.88	0.87	0.88
Textiles and apparel	0.90	0.95	0.96	0.99	0.97	0.98	0.98	0.99	0.99	0.99	0.97	0.92	0.95	0.89	0.88	0.84
Fertilizers	0.85	0.94	0.85	0.93	0.90	0.95	0.92	0.99	0.92	1.00	0.98	0.96	0.95	0.85	0.91	0.97
Petroleum and energy	0.71	0.82	0.84	0.93	0.89	0.94	0.99	0.90	0.87	0.94	0.97	0.74	0.89	0.93	0.86	0.66
Chemicals	0.88	0.91	0.91	0.84	0.92	0.91	0.89	0.90	0.90	0.82	0.83	0.83	0.84	0.85	0.85	0.71
Pharmaceuticals	0.72	0.70	0.78	0.82	0.80	0.78	0.76	0.77	0.79	0.82	0.80	0.72	0.73	0.74	0.77	0.78
Plastics	0.84	0.79	0.75	0.79	0.81	0.76	0.75	0.75	0.80	0.76	0.75	0.77	0.74	0.78	0.78	0.75
Manufactures of metals	0.90	0.86	0.83	0.89	0.89	0.87	0.82	0.80	0.82	0.82	0.82	0.88	0.89	0.92	0.91	0.90
Iron and steel	0.86	0.89	0.83	0.92	0.96	0.94	0.99	0.97	0.99	1.00	0.99	0.95	0.95	0.90	0.93	0.93
Industrial machinery	0.71	0.71	0.64	0.71	0.73	0.72	0.69	0.69	0.70	0.71	0.75	0.83	0.86	0.91	0.92	0.93
Vehicles	0.82	0.72	0.57	0.70	0.68	0.73	0.77	0.73	0.63	0.72	0.88	0.94	0.87	0.95	0.92	0.90
Professional instruments	0.78	0.74	0.70	0.77	0.77	0.78	0.76	0.77	0.80	0.78	0.79	0.87	0.83	0.86	0.91	0.91
Other industries	0.77	0.75	0.68	0.71	0.76	0.71	0.67	0.68	0.69	0.72	0.77	0.85	0.86	0.89	0.91	0.82
Total	0.83	0.83	0.80	0.82	0.83	0.81	0.82	0.81	0.80	0.82	0.84	0.83	0.85	0.85	0.86	0.85

Source: United Nations. Comtrade Data Base.

Table A6
Intra-industry trade indexes, Mexico and United States

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Live animals	0.49	0.86	0.60	0.16	0.62	0.99	0.43	0.35	0.97	0.68	0.41	0.77	0.81	0.40	0.62	0.12
Meat and preparations	0.49	0.22	0.10	0.26	0.11	0.06	0.25	0.29	0.07	0.10	0.06	0.04	0.05	0.07	0.05	0.22
Dairy products	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.02	0.02
Fish and preparations	0.02	0.02	0.02	0.11	0.06	0.06	0.04	0.01	0.05	0.06	0.10	0.08	0.32	0.26	0.21	0.07
Sugar	0.30	0.13	0.71	0.85	1.00	0.44	0.10	0.05	0.14	0.65	0.22	0.32	0.63	0.68	0.82	0.60
Coffee, tea and cocoa	0.02	0.03	0.01	0.01	0.01	0.01	0.00	0.01	0.06	0.12	0.26	0.31	0.44	0.42	0.39	0.15
Other food products	0.44	0.49	0.90	0.44	0.62	0.72	0.91	0.97	0.77	0.67	0.90	0.92	0.75	0.87	0.79	1.00
Beverages	0.28	0.29	0.46	0.30	0.12	0.02	0.02	0.02	0.05	0.21	0.21	0.37	0.58	0.63	0.70	0.22
Tobacco	0.02	0.00	0.00	0.00	0.00	0.00	0.03	0.01	0.00	0.03	0.82	0.44	0.41	0.19	0.19	0.07
Leather and footwear	0.63	0.49	0.24	0.69	0.55	0.49	0.71	0.84	0.70	0.70	0.75	0.63	0.80	0.86	0.91	0.96
Rubber and manufactures	0.05	0.03	0.55	0.72	0.74	0.43	0.63	0.74	0.73	0.68	0.41	0.27	0.35	0.41	0.47	0.55
Cork, wood and furniture	0.63	0.70	0.21	0.43	0.57	0.73	0.68	0.67	0.90	0.85	0.73	0.69	0.96	0.94	0.91	0.71
Pulp and paper	0.02	0.03	0.27	0.60	0.46	0.44	0.60	0.42	0.50	0.41	0.32	0.26	0.48	0.45	0.30	0.42
Textiles and apparel	0.81	0.75	0.89	0.64	0.69	0.93	0.76	0.80	0.95	0.89	0.81	0.71	0.90	0.84	0.88	0.92
Fertilizers	0.77	0.84	0.97	0.53	0.56	0.59	0.76	0.76	0.87	0.71	0.87	0.73	0.94	1.00	0.98	0.82
Petroleum and energy	0.10	0.10	0.10	0.04	0.09	0.15	0.24	0.20	0.24	0.28	0.28	0.38	0.46	0.43	0.36	0.34
Chemicals	0.26	0.30	0.11	0.58	0.53	0.40	0.48	0.50	0.54	0.55	0.60	0.59	0.56	0.57	0.47	0.51
Pharmaceuticals	0.42	0.40	0.18	0.81	0.73	0.50	0.91	0.74	0.88	0.76	0.48	0.54	0.68	0.57	0.61	0.81
Plastics	0.02	0.03	0.07	0.28	0.33	0.30	0.36	0.50	0.49	0.35	0.38	0.31	0.39	0.36	0.33	0.43
Manufactures of metals	0.66	0.53	0.94	0.76	0.93	0.94	0.86	0.69	0.82	0.81	0.91	0.96	0.83	0.84	0.80	0.87
Iron and steel	0.09	0.08	0.77	0.74	0.81	0.87	0.99	0.82	0.89	0.87	0.93	0.70	0.49	0.58	0.86	0.92
Industrial machinery	0.10	0.11	0.14	0.95	0.91	0.89	0.96	0.92	0.78	0.76	0.65	0.55	0.97	0.99	0.91	0.85
Vehicles	0.16	0.15	0.02	0.72	0.67	0.67	0.89	0.57	0.73	0.52	0.99	0.51	0.87	0.99	0.56	0.47
Professional instruments	0.08	0.06	0.42	0.87	0.74	0.72	0.81	0.59	0.64	0.45	0.46	0.45	0.91	0.92	0.91	1.00
Other industries	0.52	0.44	0.25	1.00	0.95	0.86	0.85	0.79	0.43	0.54	0.49	0.15	0.69	0.71	0.45	0.58
Total	0.23	0.25	0.26	0.39	0.45	0.49	0.69	0.57	0.61	0.57	0.65	0.54	0.83	0.82	0.71	0.74

Source: United Nations. Comtrade Data Base.