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Regional Aspects of Brazil's Trade Policy

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C O N T E N T S

REGIONAL ASPECTS OF BRAZIL'S TRADE POLICY

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Fernando S. Perobelli ***

This paper aims to evaluate a number of spatial aspects of Brazil's current trade policy, emphasizing those relating to economic integration in general, and bilateral trade with Argentina in particular. A national computable general equilibrium model was developed and implemented (EFES-ARG), in order to evaluate the sectoral impact of different trade integration strategies with specific economic countries/blocs. Moreover, EFES-ARG was integrated with an interstate trade model such that the national results obtained were regionalized. The analysis of the short-run regional aspects of Brazilian trade policy reveals a trend towards concentration of the level of economic activity in the states of the Brazilian south and southeast. The results draw attention to a phenomenon that has permeated the debate on the regional issue, namely the role of trade as an engine of growth.

Contents

I. INTRODUCTION

One of the key elements of the ongoing liberalization process in the Brazilian economy involves trading relations in a context of increasing regionalism. The latter was leveraged by the creation of Mercosur in the early 1990s, and is currently in a stage of negotiations aimed at geographic expansion of trading arrangements. Whether motivated by economic objectives or political ones, the country has pursued different regional integration strategies in an attempt to gain additional momentum for economic development.

From its position at the forefront of negotiations on the future of Mercosur, Brazil foresees three major alternatives for the development of trade blocs. Firstly, the country is directly involved in the creation of the Free Trade Area of the Americas (FTAA), furthering the process initially proposed in 1994 for the integration of western hemisphere economies in a single free trade arrangement. Alongside these negotiations, the Brazilian government has been promoting an agreement among South American countries to create a bloc to counter-balance United States hegemony in the continent and increase their bargaining power in relation to that country. Secondly, a trade agreement between Mercosur and the European Union (EU) has already obtained political commitment from the parties involved, although implementation is being held up by specific problems that are hard to resolve in the short term. In addition, Brazil also participates in the more general multilateral negotiation in the World Trade Organization (WTO), which highlights its role as a global trader.

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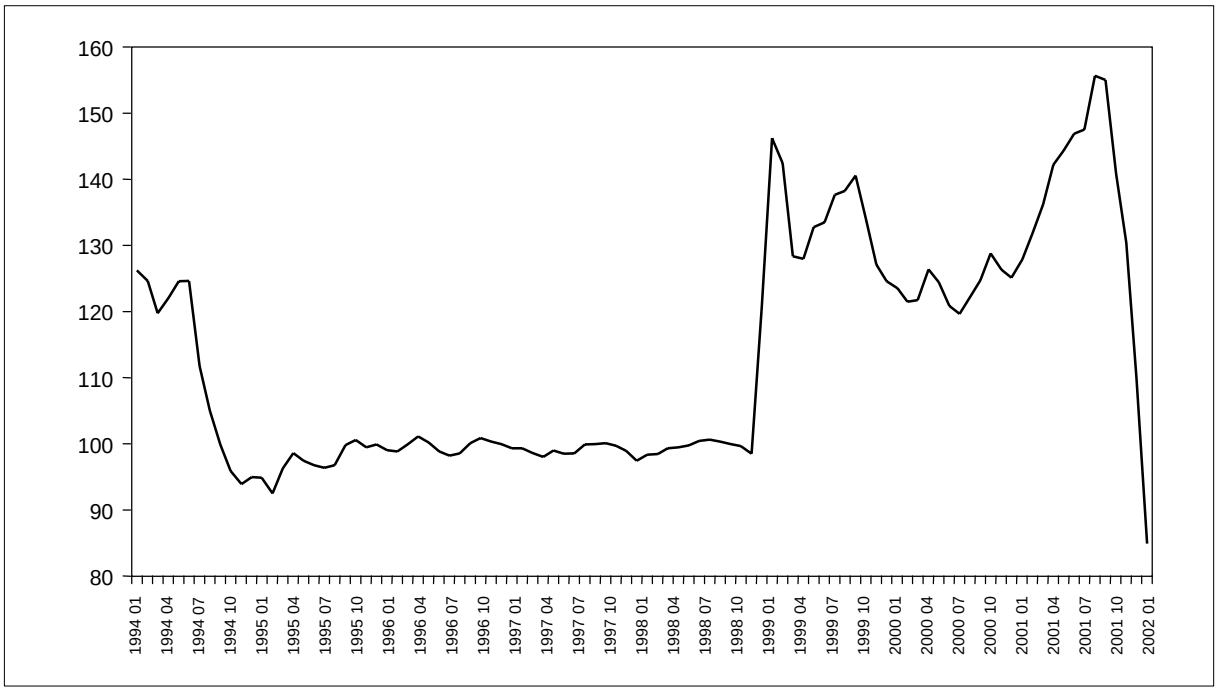
Since its establishment in December 1994 at the Ouro Preto meeting, Mercosur has endured at least three major crises (devaluation of the *real* in January 1999, global economic recession starting in the second half of 2000, and the recent Argentine crisis). It is hard to envisage favorable prospects for its reintegration and consolidation in the near future. The economy of Argentina, the main trading partner in the bloc, achieved large surpluses in its trade with Brazil, thanks to the steady appreciation of the *real* during 1995-1998 (Figure 1). These trade surpluses enabled Argentina to offset the difficulties it was increasingly facing in its trade with the United States, the European Union and Southeast Asia, resulting from a lack of competitiveness in its main productive sectors. The devaluation of the *real* reversed Brazil-Argentina trade flows, generating an increase in Brazil's exports to its neighbor. In addition to losing this considerable trade surplus, Argentina faced other problems such as dwindling privatization-related capital inflows, deteriorating terms of trade, and mistrust surrounding the sustainability of the currency board (which involved free peso-dollar convertibility at a fixed parity) -all of this against a backdrop of domestic political instability. At the present time, with the Argentine economy in a state of near-collapse following the demise of convertibility, the future of Mercosur seems uncertain.

FIGURE 1
REAL EXCHANGE RATE: R$/PESO
(1996.12 = 100)



Sources: Exchange rate (R$/US$, Peso/US$) and domestic price index (IGP-DI) series - IPEADATA; Argentine price index (IPM) - INDEC.

This paper aims to evaluate a number of spatial aspects of Brazil's current trade policy, emphasizing those relating to economic integration in general, and bilateral trade with Argentina in particular. Apart from this introduction and the final thoughts, the second section of the study provides a description of trade flows between the Brazilian states and other countries in Mercosur (highlighting

trade with Argentina). Following this, we identify the "strong points" in each state's international trade with Mercosur as a whole, with Argentina and with the rest of Mercosur. Sections IV and V present the models used in our trade policy simulations. Section VI describes the short-run impacts of the main trade integration strategies envisaged by the Brazilian government, while section VII presents the results of simulations involving hypothetical developments of bilateral agreements with Argentina, and changes in the parameters of trade between the two countries, identifying their implications for Brazil at the subnational level.

II. STRUCTURE OF TRADE: 1996-2001[1]

To analyze the structure of Brazil's international trade, especially with Argentina in 1996-2001, it is first necessary to make a few brief comments on the external situation, current circumstances in Brazil and issues concerning the process of Mercosur consolidation. The period 1997-2000 was one of instability in the global economy, marked by economic crises in various parts of the world that had direct consequences on Brazil's trade flows: (a) it became more difficult to finance the country's external trade; (b) there was a decline in the purchasing power of several agricultural-goods-importing countries; (c) contagion caused a slowdown in the growth of Latin American economies; and (d) the performance of EU countries also weakened.

During this period the situation in Brazil was characterized by very small increases in GDP in the middle years (0.2% in 1998 and 0.8% in 1999), flanked by higher growth rates in 1997 (3.3%) and 2000 (4.5%). In January 1999 the exchange rate regime was revamped[2] and the *real* was put into a float, resulting in a steep devaluation of the local currency. The external and domestic situations had impacts on Brazil's trade balance. Following a period in which exports and imports both expanded (by 11% and 15%, respectively, in 1997 compared to the previous year), the country's external trade retreated in the two ensuing years, before recovering again in 2000 with exports rising by 15% and imports by 13% compared to 1999. This stronger performance was largely the result of changes in export promotion policy, the entry of foreign firms, and also the strategies of firms operating in external trade.[3]

With regard to Mercosur, despite progress made in the integration process, there are still a variety of factors that hinder the expansion of trade between the countries of the bloc. These include balance of payments instability in a number of countries, infrastructure shortcomings especially in the transport sector; domestic inequalities; technological differences between productive sectors; and the productive structures of the various countries.[4] Accordingly, steps need to be taken to reduce the differences that exist between member-countries, with a view to overcoming the persistent obstacles that prevent economic integration being brought to fruition.

According to Mendes [1997], analysis of trade structure based on *aggregate* trade flows identifies the short-run circumstantial elements of the process more accurately than structural ones, but does not show the behavior of the various economic sectors and types of products involved in trade. Accordingly, as a contribution to our understanding of these aspects, this section aims to study the composition of import and export baskets and the main sectors involved.

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[1] The authors gratefully acknowledge assistance provided by William Thomas in compiling the data used in this section.

[2] Until January 1999, exchange-rate fluctuations were managed by the Central Bank in a currency band system allowing for variations of between 7% and 8% per year.

[3] For a more detailed analysis of Brazil's trade balance in 1997-2000, see Piccinini and Puga [2001].

[4] Allied to differences in productive structures, soil and climate differences stimulate specialization in the production of certain goods and services, resulting in different modes of integration in the intra-bloc trading process from country to country.

Characteristics of Brazil-Mercosur Trade

Table 1 presents data on Brazil's trade with the three other Mercosur countries during 1995-2000, and table 2 shows each Mercosur country's share of Brazil's inerrable trade. Analysis of table 1 shows that the latter's trade balance with Mercosur was in deficit during the period. Brazil achieved a substantial surplus in 1994, but failed to repeat this during the period analyzed. This was largely due to its trade deficit with Argentina, which is its major trading partner in Mercosur accounting for approximately 80% of its intra-bloc exports and 85% of its imports in 2000. Between 1994 and 2000, Brazil's exports to Mercosur grew by 30.6%, while its imports from the bloc expanded by 70.1%.

TABLE 1
BRAZILIAN TRADE WITH MERCOSUR COUNTRIES, 1995-2000
(US$ million - F.O.B.)

Years	Argentina			Paraguay			Uruguay			Total		
	Exp	Imp	Bal	Exp	Imp	Bal	Exp	Imp	Bal	Exp	Imp	Bal
1994	4,136	3,662	474	1,054	353	701	732	569	163	5,922	4,583	1,338
1995	4,041	5,591	-1,550	1,301	515	786	812	738	74	6,154	6,844	-690
1996	5,170	6,805	-1,635	1,325	552	773	811	944	-133	7,305	8,301	-996
1997	6,770	8,032	-1,262	1,407	518	889	870	967	-97	9,047	9,517	-470
1998	6,748	8,034	-1,286	1,249	351	898	881	1,042	-161	8,878	9,427	-549
1999	5,364	5,812	-448	744	260	484	670	647	23	6,778	6,719	59
2000	6,233	6,843	-610	832	351	481	669	602	67	7,734	7,796	-62

Source: SECEX (2001).

TABLE 2
SHARE OF MERCOSUR COUNTRIES IN BRAZIL'S INTRA-BLOC TRADE, BY COUNTRY OF DESTINATION AND ORIGIN
(1995-2000)

Years	Argentina		Paraguay		Uruguay		Total	
	Exp	Imp	Exp	Imp	Exp	Imp	Exp	Imp
1994	69.85	79.90	17.79	7.69	12.36	12.41	100	100
1995	65.67	81.70	21.14	7.52	13.19	10.78	100	100
1996	70.77	81.98	18.13	6.65	11.10	11.37	100	100
1997	74.83	84.40	15.55	5.44	9.62	10.16	100	100
1998	76.01	85.22	14.07	3.72	9.92	11.05	100	100
1999	79.14	86.50	10.98	3.87	9.88	9.63	100	100
2000	80.59	87.78	10.76	4.50	8.65	7.72	100	100

Source: SECEX (2001).

Export and Import Baskets

Brazil's export basket contains a relatively wide variety of items, reflecting the diversified productive structure of its economy. In this section, we discuss specific features of the list of products traded between Brazil and the rest of Mercosur. Analysis of table 3, which shows the 10 main products[5] traded in each direction reveals a degree of similarity between the items in each basket, but very different shares. The 10 leading product categories account for 60.69% of Brazil's total exports to other Mercosur countries, the top three being other vehicles (14.00%), nuclear reactors (11.64%) and electrical machinery (7.91%). On the import side, the top three product categories are other vehicles (21.79%), mineral fuels (15.84%), and cereals (15.49%). The 10 leading import products account for 73.05% of Brazil's total purchases from Mercosur.

Broadly speaking, this analysis reveals a degree of specialization in intra-Mercosur trade: Brazil mainly exports manufactured goods but imports mostly primary or semi-manufactured products. The complementary nature of the two baskets is interesting in view of their similarities, such as other vehicles, nuclear reactors and electrical machinery.

TABLE 3
BRAZIL -MERCOSUR MERCHANDISE TRADE, 2001

Main exports from Brazil	(%)	Main imports from Mercosur	(%)
87 - Other vehicles	14.00	87 - Other vehicles	21.79
84 - Nuclear reactors	11.64	27 - Mineral fuels	15.84
85 - Electrical machinery	7.91	10 - Cereals	15.49
39 - Plastics and articles thereof	5.66	39 - Plastics and articles thereof	5.45
48 - Paper and paperboard	5.60	84 - Nuclear reactors	4.20
72 - Iron and steel	3.01	85 - Electrical machinery	2.44
73 - Articles of iron and steel	2.83	12 - Oilseeds and oleaginous fruits	2.02
64 - Footwear	2.66	29 - Organic chemicals	2.01
29 - Organic chemicals	2.64	7 - Edible vegetables	1.93
40 - Rubber and articles thereof	2.58	4 - Dairy produce, birds eggs, natural honey	1.89

Source: Ministry of Development, Industry and International Trade (MDIC) - Foreign trade data analysis system (Alice) (authors' calculations).

Structure of State Trade: 1996-2001

The heterogeneous nature of regional development in the Brazilian economy is clear; and some authors (e.g. Mendes [1997]; Barros [1998]; Baer, *et al* [1998]) have suggested this could be accentuated by further consolidation of Mercosur. This makes it necessary to analyze the behavior of imports and exports, between individual Brazilian states and Mercosur and other trade blocs, over time (Tables 4a, 4b and 5).

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[5] These products are classified according to the 99 chapters of the Harmonized Commodity Description and Coding System.

TABLE 4A

EXPORTS AND IMPORTS OF BRAZILIAN STATES BY DESTINATION AND ORIGIN, 1996-1998

(Percentages)

	Mercosur		FTAA		NAFTA		Rest of FTAA		EU		ROW	
	Exp	Imp	Exp	Imp	Exp	Imp	Exp	Imp	Exp	Imp	Exp	Imp
North	**4.31**	**1.18**	**24.76**	**32.81**	**15.46**	**27.63**	**4.99**	**4.00**	**37.46**	**11.89**	**37.78**	**55.29**
AC	2.31	2.01	67.07	86.12	30.34	83.47	34.41	0.65	7.26	10.53	25.67	3.34
AP	2.77	0.09	18.24	25.61	3.75	20.74	11.71	4.78	19.57	35.16	62.20	39.23
AM	30.09	0.47	74.80	30.81	0.00	26.97	44.71	3.37	12.67	10.90	12.52	58.29
PA	1.79	11.22	19.85	62.50	16.97	40.45	1.09	10.83	40.92	22.78	39.24	14.72
RO	19.78	5.56	55.38	48.75	30.97	20.56	4.63	22.63	0.38	8.99	44.24	42.26
RR	0.01	0.00	26.60	80.07	8.64	1.52	17.95	78.55	6.70	16.17	66.70	3.77
TO	0.55	14.65	36.15	18.70	35.47	3.82	0.13	0.23	61.00	33.91	2.85	47.39
Northeast	**13.47**	**16.92**	**45.27**	**53.38**	**27.37**	**23.93**	**4.43**	**12.53**	**25.18**	**17.15**	**29.55**	**29.46**
AL	2.82	18.04	34.22	51.89	30.77	33.36	0.63	0.49	10.87	11.31	54.91	36.80
BA	18.04	13.68	49.67	57.06	26.24	24.30	5.39	19.07	24.50	12.74	25.82	30.20
CE	15.39	24.17	78.82	56.53	55.23	23.32	8.19	9.05	11.68	14.96	9.50	28.51
MA	7.12	4.25	25.54	53.84	18.07	28.74	0.35	20.85	38.69	29.40	35.77	16.76
PB	10.69	15.38	49.59	30.62	34.71	13.83	4.20	1.41	29.34	25.65	21.07	43.73
PE	11.58	21.64	37.18	51.23	19.65	21.72	5.95	7.88	17.43	17.29	45.39	31.48
PI	2.56	8.28	33.97	46.65	29.50	35.79	1.91	2.58	48.87	15.96	17.16	37.39
RN	9.06	10.71	42.46	38.42	28.42	25.00	4.97	2.71	38.51	23.27	19.03	38.31
SE	24.80	30.70	48.56	54.84	9.97	23.57	13.78	0.57	47.88	33.70	3.56	11.46
Southeast	**19.66**	**13.41**	**52.34**	**46.39**	**17.55**	**29.51**	**15.13**	**3.47**	**23.22**	**30.91**	**24.43**	**22.70**
ES	5.35	28.94	37.74	59.09	30.34	26.73	2.05	3.41	28.62	16.34	33.64	24.57
MG	10.47	20.65	35.23	44.03	20.41	19.57	4.34	3.80	35.59	43.95	29.18	12.02
RJ	17.58	9.66	57.04	44.94	24.50	33.37	14.96	1.91	7.16	24.29	35.80	30.78
SP	25.46	11.14	60.58	45.25	13.93	30.40	21.19	3.71	19.29	32.45	20.13	22.30
South	**15.09**	**34.37**	**39.87**	**55.44**	**19.11**	**18.05**	**5.67**	**3.02**	**31.44**	**25.22**	**28.69**	**19.34**
PR	11.05	31.00	22.63	52.07	7.80	17.87	3.78	3.20	43.68	29.65	33.69	18.28
SC	16.32	31.57	44.12	54.77	20.94	20.01	6.86	3.19	30.34	29.48	25.54	15.75
RS	17.60	38.22	51.00	58.55	26.85	17.52	6.55	2.81	22.65	19.95	26.35	21.50
Center-west	**6.31**	**19.26**	**12.93**	**55.87**	**4.54**	**32.47**	**2.07**	**4.14**	**63.43**	**18.88**	**23.64**	**25.25**
DF	0.22	4.00	2.14	54.87	1.21	48.98	0.71	1.89	32.56	23.59	65.30	21.54
GO	5.47	17.21	19.38	38.11	11.98	18.54	1.93	2.37	59.83	17.34	20.79	44.55
MT	1.44	15.42	5.32	40.96	1.99	24.81	1.90	0.74	69.78	6.16	24.90	52.87
MS	20.46	39.11	23.87	67.24	0.60	19.68	2.81	8.45	53.73	18.20	22.40	14.56
Brazil	**16.81**	**15.92**	**45.96**	**47.34**	**18.23**	**27.32**	**10.92**	**4.10**	**27.44**	**27.50**	**26.60**	**25.16**

Source: MDIC - Alice system (authors' calculations).

TABLE 4B

EXPORTS AND IMPORTS OF BRAZILIAN STATES, BY DESTINATION AND ORIGIN, 1999-2001

(Percentages)

	Mercosur		FTAA		NAFTA		Rest of FTAA		EU		ROW	
	Exp	Imp	Exp	Imp	Exp	Imp	Exp	Imp	Exp	Imp	Exp	Imp
North	**9.14**	**1.66**	**34.16**	**29.18**	**18.58**	**21.27**	**6.44**	**6.26**	**30.66**	**12.89**	**35.18**	**57.93**
AC	23.72	7.80	36.18	8.55	7.01	0.40	5.45	0.35	54.77	89.89	9.05	1.56
AP	3.05	0.56	6.47	41.01	3.20	12.16	0.22	28.29	34.83	23.11	58.70	35.88
AM	33.41	0.92	78.01	26.48	19.83	19.99	24.78	5.58	3.81	11.97	18.18	61.55
PA	1.89	9.86	21.24	64.82	18.27	40.48	1.07	14.47	38.77	19.38	39.99	15.80
RO	13.59	5.71	41.48	40.69	25.13	34.20	2.76	0.78	25.28	55.83	33.24	3.48
RR	0.01	0.00	81.58	80.88	0.22	16.00	81.35	64.89	10.19	0.78	8.23	18.34
TO	1.00	46.25	39.30	54.96	38.02	7.61	0.28	1.10	23.22	4.48	37.48	40.56
Northeast	**11.58**	**20.14**	**49.60**	**53.16**	**33.65**	**17.01**	**4.38**	**16.01**	**26.52**	**14.24**	**23.88**	**32.61**
AL	0.68	29.03	18.27	47.90	16.88	18.64	0.70	0.23	5.86	11.19	75.86	40.91
BA	14.44	20.99	53.99	54.06	34.69	16.63	4.86	16.45	24.40	13.08	21.62	32.86
CE	12.13	28.24	74.02	60.05	53.03	12.54	8.86	19.28	18.13	13.61	7.85	26.34
MA	7.89	2.07	32.47	39.34	24.24	14.10	0.34	23.17	44.42	8.40	23.11	52.25
PB	9.84	14.82	66.43	31.67	50.15	15.00	6.45	1.86	19.08	33.23	14.49	35.10
PE	13.55	21.59	43.69	57.35	23.66	21.40	6.48	14.36	23.72	16.56	32.58	26.09
PI	1.48	8.14	35.50	21.24	32.27	12.43	1.74	0.66	50.17	38.82	14.33	39.94
RN	5.31	22.27	53.71	53.18	44.05	28.14	4.35	2.77	33.27	20.44	13.01	26.38
SE	33.47	41.15	48.82	65.47	13.49	23.11	1.86	1.20	49.13	23.43	2.05	11.10
Southeast	**14.00**	**10.51**	**53.18**	**45.19**	**29.91**	**31.46**	**9.26**	**3.22**	**23.74**	**29.98**	**23.08**	**24.83**
ES	3.04	16.82	39.76	49.76	34.03	26.57	2.69	6.37	29.19	18.57	31.05	31.67
MG	7.85	17.32	32.63	44.23	20.43	23.00	4.34	3.90	37.28	37.18	30.09	18.60
RJ	14.30	14.66	59.57	46.35	29.10	29.74	16.18	1.95	15.48	25.19	24.95	28.46
SP	17.44	8.23	61.09	44.60	32.58	33.30	11.06	3.07	19.39	31.25	19.52	24.15
South	**13.97**	**26.43**	**45.40**	**46.63**	**25.33**	**15.83**	**6.10**	**4.38**	**27.98**	**29.50**	**26.62**	**23.87**
PR	11.65	20.33	33.83	40.81	17.24	15.96	4.94	4.52	36.22	38.11	29.95	21.08
SC	13.95	25.55	49.31	44.52	28.80	15.58	6.56	3.38	26.71	33.81	23.98	21.67
RS	15.82	33.80	52.72	53.97	30.10	15.73	6.80	4.45	22.04	18.37	25.24	27.66
Center-west	**4.06**	**9.21**	**12.82**	**43.74**	**4.71**	**25.24**	**4.05**	**9.29**	**61.56**	**27.47**	**25.62**	**28.79**
DF	2.89	1.41	29.37	36.53	25.08	34.50	1.40	0.62	23.23	41.06	47.40	22.41
GO	4.24	18.61	19.06	36.98	12.56	15.50	2.26	2.87	53.96	14.50	26.98	48.51
MT	1.20	12.15	6.64	49.87	1.65	36.58	3.78	1.14	68.64	18.34	24.72	31.80
MS	13.41	13.84	23.49	78.88	2.30	5.30	7.78	59.73	50.50	15.04	26.01	6.09
Brazil	**13.17**	**13.40**	**48.39**	**44.97**	**27.47**	**26.73**	**7.76**	**4.85**	**26.78**	**27.34**	**24.83**	**27.69**

Source: MDIC - Alice system (authors' calculations).

TABLE 5
BRAZILIAN STATES' SHARE OF NATIONAL EXPORTS BY DESTINATION AND ORIGIN, 1996-1998 AND 1999-2001
(Percentages)

	Mercosur		NAFTA		Rest of FTAA		EU		ROW	
	96-98	99-01	96-98	99-01	96-98	99-01	96-98	99-01	96-98	99-01
North	**0.6**	**0.9**	**4.31**	**4.00**	**2.32**	**4.91**	**6.94**	**6.78**	**7.22**	**8.38**
AC	0.0	0.0	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00
AP	0.0	0.0	0.03	0.01	0.16	0.00	0.11	0.09	0.36	0.17
AM	0.2	0.4	0.00	0.95	1.66	4.20	0.19	0.19	0.19	0.96
PA	0.3	0.3	4.12	2.93	0.44	0.61	6.61	6.37	6.53	7.08
RO	0.0	0.0	0.12	0.10	0.03	0.04	0.00	0.10	0.11	0.15
RR	0.0	0.0	0.00	0.00	0.01	0.06	0.00	0.00	0.02	0.00
TO	0.0	0.1	0.03	0.02	0.00	0.00	0.04	0.01	0.00	0.02
Northeast	**7.6**	**12.6**	**11.65**	**9.07**	**3.14**	**4.18**	**7.12**	**7.33**	**8.62**	**7.12**
AL	0.3	0.3	1.05	0.30	0.04	0.04	0.25	0.11	1.28	1.47
BA	2.3	5.9	5.36	4.56	1.84	2.26	3.33	3.29	3.62	3.15
CE	1.9	2.5	2.22	1.72	0.55	1.02	0.31	0.60	0.26	0.28
MA	0.2	0.2	1.37	1.11	0.04	0.06	1.95	2.09	1.86	1.17
PB	0.3	0.3	0.31	0.29	0.06	0.13	0.18	0.11	0.13	0.09
PE	2.1	2.7	0.78	0.49	0.39	0.47	0.46	0.50	1.23	0.74
PI	0.0	0.0	0.20	0.11	0.02	0.02	0.22	0.18	0.08	0.06
RN	0.1	0.3	0.30	0.46	0.09	0.16	0.27	0.36	0.14	0.15
SE	0.4	0.6	0.05	0.02	0.11	0.01	0.15	0.09	0.01	0.00
Southeast	**58.3**	**51.2**	**55.86**	**63.23**	**80.39**	**69.35**	**49.12**	**51.48**	**53.30**	**53.96**
ES	11.7	5.9	8.29	6.08	0.94	1.70	5.20	5.35	6.30	6.14
MG	7.6	7.0	15.52	9.12	5.51	6.87	17.97	17.07	15.20	14.86
RJ	5.3	10.0	4.88	3.99	4.97	7.86	0.95	2.18	4.89	3.79
SP	33.8	28.3	27.17	44.03	68.98	52.92	25.00	26.89	26.91	29.18
South	**31.9**	**33.7**	**27.44**	**23.08**	**13.58**	**19.69**	**29.99**	**26.15**	**28.24**	**26.83**
PR	11.2	12.6	3.84	5.48	3.10	5.57	14.26	11.82	11.35	10.54
SC	4.6	3.2	6.22	5.58	3.40	4.50	5.98	5.31	5.20	5.14
RS	16.1	17.9	17.39	12.02	7.08	9.62	9.75	9.03	11.69	11.15
Center-west	**1.6**	**1.6**	**0.73**	**0.62**	**0.56**	**1.87**	**6.83**	**8.25**	**2.62**	**3.70**
DF	0.1	0.1	0.00	0.01	0.00	0.00	0.03	0.01	0.07	0.03
GO	1.2	0.9	0.55	0.43	0.15	0.27	1.82	1.89	0.65	1.02
MG	0.1	0.2	0.16	0.12	0.26	0.99	3.83	5.20	1.41	2.02
MS	0.2	0.3	0.02	0.05	0.15	0.61	1.14	1.14	0.49	0.63
Brazil	**100.0**	**100.0**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Source: MDIC - Alice system (authors' calculations).

To carry out this analysis we compare the periods 1996-1998 and 1999-2001. This division is justified because the first period saw consolidation of the Real Plan, and in 1999 Brazil revamped its currency regime. These two elements are *a priori* highly relevant in understanding the behavior of Brazil's external trade.

It would be logical to expect trade with Mercosur to be concentrated in the states of the southeast and south of Brazil, partly because of the friction of distance (lower transport costs) and the productive structure of these regions of the country.

During 1996-1998, Brazil's total exports and imports were well distributed between the leading trade blocs (Mercosur, NAFTA, the rest of FTAA, EU, and rest of the world) in terms of destination and origin. Focusing down on the different regions of Brazil, however, reveals a somewhat more varied pattern. For example, the center-west and northern regions send most of their exports to the EU and the rest of the world - 87.07% and 75.24%, respectively. From the origin point of view, 55.29% of imports into the northern region come from the rest of the world.

The southeast region displays a similar export structure to that of Brazil as a whole, the main export destinations being EU and the rest of the world (23.22% and 24.43% respectively).

Between 1996 and 1998 Mercosur still had not consolidated its position as the leading export destination for the southern region of Brazil, accounting for just 15.09% of its total exports.

The main trading partners for the northeast of Brazil, in destination terms, are the rest of the world and NAFTA (absorbing 29.55% and 27.37%, respectively). The distribution between country blocs is more homogeneous on the origin side.

A comparison of the structure of regional exports for the periods 1996-1998 and 1999-2001 reveals the following: (a) in the northern region, exports to Mercosur grew from 4.31% to 9.14%. Nonetheless, despite losing share, the EU and the rest of the world remain the leading destinations for the region's products; (b) NAFTA has established itself as the main destination for exports from the northeast of the country (33.65% of the total), with the EU also gaining ground; (c) two interesting developments show through in the southeast region -the declining share of Mercosur and the increasing importance of NAFTA; (d) the southern region displays the same pattern as the southeast, with the EU as the main destination for its products (absorbing 27.98% of total exports); and (e) the west-west region continues to divide most of its exports between the EU and the rest of the world (87.00% of the total).

Table 5 shows that the southeast region accounted for over 50% of trade with all five of the blocs during the period analyzed.

Characteristics of Brazil-Argentina Trade

Table 6 shows the 10 leading export and import categories in Brazil's trade with Argentina. The 10 leading export products account for 61.53% of Brazil's total exports to Argentina. This demonstrates an aspect of concentration in Brazil's export product list. The same feature is also present on the import side, with the 10 leading products accounting for 78.76% of Brazil's total imports from its neighbor. The data shown in table 6 reveal the existence of intra-industry trade, since similar

products are included in both baskets in the following chapters: other vehicles, nuclear reactors, plastics and products thereof, organic chemicals and mineral fuels.

TABLE 6
BRAZIL-ARGENTINA MERCHANDISE TRADE, 2001

Main exports from Brazil	(%)	MAIN IMPORTS FROM ARGENTINA	(%)
87 - Other vehicles	15.55	87 - Other vehicles	28.93
84 - Nuclear reactors	12.29	27 - Mineral fuels	16.47
85 - Electrical machinery	8.43	10 - Cereals	14.73
39 - Plastics and products thereof	5.54	39 - Plastics and products thereof	5.00
48 - Paper and paperboard	5.28	84 - Nuclear reactors	4.31
29 - Organic chemicals	3.21	85 - Electrical machinery	2.44
72 - Iron and steel	3.15	7 - Edible vegetables	2.00
73 - Iron and steel products	2.91	29 - Organic chemicals	1.90
64 - Footwear	2.73	4 - Dairy products, birds eggs, natural honey	1.52
27 - Mineral fuels	2.44	11 - Products of the milling industry	1.45

Source: MDIC - Alice system (authors' calculations).

As observed by Mendes [1997], a more detailed analysis of the regional and sectoral characteristics of Brazil's trade with other Mercosur countries makes it possible to more precisely identify the different patterns in the macroregions, federal units and main productive sectors involved in trade with Mercosur. This analysis leads to inferences concerning: (a) the general conditions of sectors in the context of the country's productive structure; (b) the behavior of each sector as trade evolves; (c) the share of each state and/or region in trade with these countries; and (d) interaction between the evolution of trade and local productive structure.

In its trade with Argentina, Brazil's exports slipped from 12.46% (1996-1998) to 10.46% (1999-2001), partly as the result of a worsening of the Argentine crisis (see Table 7).

In terms of Brazil's macroregions, this trend shows through as a decline in Argentina's importance as a destination for exports from the southeast (from 19.66% to 11.57%), and from the northeast and west-west. Exports from the southern region of Brazil to Argentina held steady throughout the period. In contrast, trade between Brazil's northern region and Argentina expanded from 4.31% (1996-1998) to 8.17% (1999-2001).

Table 7 shows the importance of Argentina as a destination for merchandise exports from a number of Brazilian states. Of total exports from Amazonas, about 21% was sent to Argentina in the first period, rising to 29.74% in 1999-2001. In the northeast region, the states of Bahia, Ceará and Sergipe claimed the largest proportion of trade with Argentina in both periods.

For the vast majority of federal units, exports to Argentina exceed the total exported to Paraguay and Uruguay. Table 7 shows the small proportion of exports from Brazil's macroregions and states that goes to these countries.

Brazil's external trade with Argentina displays great regional concentration, with the southeast and southern regions accounting for over 85% of the total exported in both periods (Table 8). The southern region gained share at the expense of the southeast during the period under analysis.

The state of São Paulo accounted for over 50% of exports to Argentina, followed by Rio Grande do Sul, Minas Gerais, Paraná, Santa Catarina, Bahia and Rio de Janeiro, which between them accounted for 39% of exports to that country.

This structural differentiation between regions and states stems from the historical concentration of economic activity in the southeast and south of the country. Another relevant point is that a proportion of exports from the southern and southeastern states may include products manufactured or originating in other states and regions of Brazil (i.e., re-exports). Thus the simple analysis of external trade cannot capture interstate trade, yet in many cases this generates more income for the state than international trade does.

TABLE 7
BRAZILIAN STATES' EXPORTS AND IMPORTS BY DESTINATION AND ORIGIN, 1996-1998 AND 1999-2001
(Percentages)

	Argentina				Rest of Mercosur			
	1996-1998		1999-2001		1996-1998		1999-2001	
	Exp	Imp	Exp	Imp	Exp	Imp	Exp	Imp
North	**3.39**	**1.13**	**8.17**	**1.20**	**0.93**	**0.05**	**0.98**	**0.46**
AC	1.38	1.98	22.90	7.80	0.94	0.03	0.82	0.00
AP	2.30	0.09	2.86	0.50	0.47	0.00	0.20	0.06
AM	21.13	0.45	29.74	0.44	8.96	0.02	3.67	0.48
PA	1.71	10.84	1.82	9.85	0.07	0.38	0.07	0.02
RO	10.12	3.81	8.00	3.61	9.66	1.74	5.58	2.10
RR	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00
TO	0.36	14.22	0.29	46.16	0.18	0.43	0.71	0.09
Northeast	**11.52**	**15.24**	**10.49**	**18.79**	**1.95**	**1.69**	**1.09**	**1.35**
AL	0.99	16.74	0.62	21.16	1.83	1.30	0.07	7.87
BA	16.16	13.21	13.56	20.67	1.88	0.48	0.88	0.32
CE	11.06	22.12	9.17	25.03	4.33	2.05	2.97	3.20
MA	7.12	4.00	7.89	2.05	0.00	0.25	0.00	0.03
PB	7.58	10.74	8.21	11.13	3.11	4.63	1.63	3.68
PE	8.58	18.59	11.67	19.83	3.00	3.04	1.88	1.76
PI	0.84	2.54	0.75	5.61	1.72	5.75	0.74	2.54
RN	7.02	9.89	4.23	18.51	2.05	0.82	1.07	3.76
SE	19.13	26.00	23.30	36.33	5.67	4.70	10.18	4.82
Southeast	**15.20**	**11.86**	**11.57**	**9.60**	**4.46**	**1.55**	**2.43**	**0.91**
ES	4.92	27.64	2.75	16.08	0.43	1.31	0.29	0.74
MG	8.31	19.75	6.89	16.77	2.16	0.91	0.97	0.56
RJ	12.61	8.49	11.56	13.90	4.97	1.16	2.74	0.76
SP	19.59	9.41	14.28	7.23	5.87	1.73	3.16	1.00
South	**9.45**	**21.74**	**9.61**	**21.32**	**5.65**	**12.63**	**4.36**	**5.11**
PR	6.45	25.86	8.33	16.54	4.60	5.15	3.33	3.79
SC	11.31	14.88	9.79	14.18	5.02	16.69	4.16	11.37
RS	10.87	20.56	10.54	28.63	6.72	17.66	5.27	5.17
Center-west	**3.27**	**15.66**	**2.16**	**7.57**	**3.04**	**3.60**	**1.90**	**1.63**
DF	0.14	3.70	2.26	1.28	0.09	0.30	0.64	0.13
GO	3.10	10.50	2.08	18.25	2.38	6.71	2.16	0.36
MT	0.48	4.20	1.00	11.79	0.96	11.22	0.21	0.36
MS	10.91	35.16	6.21	3.22	9.55	3.95	7.20	10.62
Brazil	**12.46**	**12.81**	**10.46**	**11.75**	**4.35**	**3.11**	**2.71**	**1.65**

Source: MDIC - Alice system (authors' calculations).

TABLE 8
BRAZILIAN STATES' SHARE OF NATIONAL EXPORTS AND IMPORTS BY DESTINATION AND ORIGIN, 1996-1998 AND 1999-2001
(Percentages)

	Argentina				Rest of Mercosur			
	1996-1998		1999-2001		1996-1998		1999-2001	
	Exp	Imp	Exp	Imp	Exp	Imp	Exp	Imp
North	**1.4**	**0.7**	**4.6**	**0.7**	**1.1**	**0.1**	**2.1**	**1.9**
AC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AM	0.7	0.2	3.7	0.2	0.8	0.0	1.8	1.8
PA	0.6	0.4	0.8	0.4	0.1	0.1	0.1	0.0
RO	0.1	0.0	0.1	0.0	0.2	0.0	0.2	0.1
RR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TO	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Northeast	**7.2**	**8.5**	**7.4**	**13.4**	**3.5**	**3.9**	**3.0**	**6.9**
AL	0.0	0.3	0.0	0.2	0.3	0.1	0.0	0.6
BA	4.8	2.8	4.7	6.6	1.6	0.4	1.2	0.7
CE	0.6	2.1	0.8	2.5	0.7	0.8	1.0	2.3
MA	0.8	0.2	0.9	0.2	0.0	0.1	0.0	0.0
PB	0.1	0.3	0.1	0.2	0.1	0.5	0.1	0.5
PE	0.5	2.2	0.6	2.9	0.5	1.5	0.4	1.8
PI	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
RN	0.1	0.1	0.1	0.2	0.1	0.0	0.1	0.3
SE	0.1	0.4	0.1	0.6	0.1	0.3	0.2	0.5
Southeast	**70.8**	**64.1**	**64.2**	**53.4**	**59.4**	**34.5**	**52.1**	**35.9**
ES	2.0	13.8	1.3	6.5	0.5	2.7	0.5	2.1
MG	9.2	9.1	8.1	7.8	6.9	1.7	4.4	1.8
RJ	3.7	5.8	4.2	10.8	4.1	3.2	3.8	4.2
SP	55.9	35.5	50.7	28.3	47.9	26.8	43.4	27.8
South	**19.9**	**25.1**	**23.0**	**31.0**	**33.9**	**60.0**	**40.3**	**53.0**
PR	4.6	11.6	7.0	11.7	9.5	9.5	10.7	19.1
SC	4.9	2.7	5.0	2.0	6.2	12.4	8.2	11.6
RS	10.3	10.8	11.1	17.3	18.2	38.1	21.4	22.2
Center-west	**0.8**	**1.6**	**0.7**	**1.5**	**2.1**	**1.5**	**2.5**	**2.3**
DF	0.0	0.2	0.0	0.1	0.0	0.1	0.0	0.1
GO	0.2	1.3	0.2	1.1	0.5	0.6	0.7	0.1
MT	0.1	0.1	0.2	0.2	0.3	0.3	0.2	0.1
MS	0.5	0.1	0.4	0.1	1.3	0.6	1.6	2.0
Brazil	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: MDIC - Alice system (authors' calculations).

III. PATTERN OF TRADE AND REVEALED COMPARATIVE ADVANTAGE

Comparative advantage is a concept that is widely used in explaining a region's pattern of trade. Ricardian theory basically explains the concept in terms of cost differences (supply side) that arise from the specific technologies and resource endowments of regions participating in trade (Bowen, *et al* [1998]). In this section we use a number of indicators to describe the pattern of Brazilian states' trade with other countries, highlighting the comparative advantages revealed in the period analyzed. We then consolidate an indicator of revealed comparative advantage (Balassa [1965]) with the trade coverage index, to determine "strong points" in state economies' trade, using the methodology suggested by Gutman and Miotti [1996].

For economic policy purposes we need to consider sectors that have a comparative advantage in a given country or region, and how these change through time. In addition, detailed knowledge and identification of such sectors is helpful in evaluating the impacts of changes in trade policy, and contributes to policy proposals aimed at redirecting and reallocating resources, in the event of outcomes that conflict with the national development agenda.

Identification of the products in which each Brazilian state displayed a comparative advantage during 1996-2001 is initially based on the index of revealed comparative advantage (RCA). The RCA indicator, as specified in this paper, measures the degree of internationalization in the state economies. It calculates the share of exports of a given product from a given state, in relation to nationwide exports of the same product, and then compares this quotient with total state exports expressed as a share of total exports nationwide. Thus, we have:

$$RCA_{ij\ ij} = \frac{\left(X_{ij} / X_{ic}\right)}{\left(X_{\bullet j} / X_{\bullet c}\right)}$$

where:

X_{ij} is the value of exports of product *i* from state *j*

X_{ic} is the value of exports of product *i* from country *c*

$X_{\bullet j}$ is the value of total exports from state *j*

$X_{\bullet c}$ is the value of total exports from country *c*

Accordingly, at the national level, a given state *j* has a revealed comparative advantage in product *i* if $RCA_{ij} > 1$. The RCA index enables us to make inferences based on the relative structure of exports from a given state, suggesting that a region which exports a large quantity of a given product, compared to exports of the same product by the country as a whole, has a comparative advantage in its production. An analysis of a region's indicators of revealed comparative advantage over time involves its behavior in terms of specialization or non-specialization in the product concerned.

As this specification of the RCA index does not consider worldwide exports, thereby failing to reflect the specific nature of Brazilian products in the world market, we use another indicator to

outline the implicit hypothesis that Brazilian export products have a comparative advantage abroad, complementing the methodology of identifying the "strong points" in state economies. The coverage rate of product *i* from state *j* (TC_{ij}) can be defined as the ratio between its exports and imports. Thus,

$$TC_{ij} = \frac{X_{ij}}{M_{ij}}$$

where:

M_{ij} is the value of product *i* imports by state *j* from abroad

Accordingly, the strong points in a state economy's international trade are defined as products for which the RCA and TC indices are both greater than one.

To calculate the indicators described in this section, we use the database of the Foreign Trade Secretariat of the Ministry of Industry, Trade and Tourism (SECEX/MICT) for 1996-2001. The availability of trade flow data by product and trade bloc allows us to identify specific strong points for each region (Mercosur, Argentina, rest of Mercosur).[6] In terms of defining indicators, an additional dimension has been introduced that considers the origin and destination of states' international trade flows. The results of applying this methodology, analyzed below, are shown in table 9.

Analysis of Results

As mentioned above, the general result shows a concentration of trade with Mercosur in the southeast and southern regions of Brazil. Factors explaining this include: (a) characteristics of the states in these regions (productive structure); (b) facility of access to the external market (Mercosur in this case); and (c) transport costs (the highway network linking this region with the other countries in the bloc).

Northern region. This region has a small share of trade with other Mercosur countries. Apart from Amazonas and Pará, the other states in the region do not have any "strong point" products. While Amazonas has strong points in manufactured goods such as electrical machinery, Pará's strong points in trade with the blocs discussed in this paper are in primary products.

Northeast region.[7] The results of the RCA index indicate that the states in the northeast display a stronger trend towards internationalization than those in the northern region. States displaying the best results in trade with Argentina and the rest of Mercosur were Bahia, Paraíba, Pernambuco and Ceará. This is corroborated in the study by Sourcenele, *et al* [2001], which classifies these states, along with Maranhão, as the region's largest exporters. Most northeastern states have strong points among low-level manufactures and intermediate inputs. Bahia is the state with the largest number of trade strong points.

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[6] A total of 99 product categories were considered in accordance with the Harmonized System.

[7] For an overview of strong points in the economy of the northeast during 1975-1995, see Hidalgo [1998].

The state of Pernambuco produces goods with greater technological content (e.g. electrical machinery). Products identified as strong points in trade with Argentina among the 15 leading products in the state's export basket, are a lot less diversified, as shown by Sourcenele, *et al* [2001].

The state of Ceará[8] has strong points in trade with Argentina among primary and textile products in 1996-2001. This state still has a very limited export basket. According to Sourcenele, *et al* [2001], just eight products account for over 90% of its total exports.

In the case of Paraíba, textile and footwear products were the strong points in its trade with Argentina during the period analyzed. It is worth highlighting the diversification of textile products (man-made fibers, coated fabrics, and non-knitted clothing). This result is strongly supported by Sourcenele, *et al* [2001], who classify the clothing sector and its accessories (not knitted), together with the footwear sector, as the second and third most important sectors in the state's export basket.

Southeast region.[9] As noted in the previous section, this region accounts for the largest share of Brazil-Argentina trade. Apart from Espírito Santo, the states in this region have a wide range of products as strong points.

The state of Espírito Santo has articles of stone, and iron and steel as strong points in its trade with Argentina. This is consistent with the state's main economic activities: articles of stone, resulting from the exploitation of mineral resources (marble and granite) in the region of Cachoeiro de Itapemirim; and iron and steel (the Vale do Rio Doce Corporation).

In the case of Minas Gerais, strong points in the state's trade with Argentina include products related to the mineral-metallurgy sector (ores, slag and ash; iron and steel; articles of iron and steel; articles of base metal, aluminum and articles thereof; among others). Thus trade between Minas Gerais and Argentina reflects the heavy concentration of the state's economic activity in the metallurgy and mineral extraction sectors.

Strong points in trade between the state of Rio de Janeiro and Argentina are concentrated in the food, chemical, and metallurgical industries (iron and steel, articles of iron and steel, among others), together with the textile industry. The presence of Companhia Siderúrgica Nacional in Volta Redonda explains the strong showing by articles of iron and steel. The increase in output from Bacia de Campos may explain the chemical industry result.

Strong points in trade between the state of São Paulo and Argentina are distributed among the various manufacturing sectors, ranging from semi-processed products to those of higher technological content.

Southern region.[10] The strong points of the Paraná economy are concentrated in the food industries, wood and wood charcoal, paper, furniture, and products of higher technological content (e.g. optical,

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[8] For discussion of participation in international trade the state of Ceará in earlier decades, see Gomes and Reis [2001].

[9] For an overview of trade strong points in the main states of the southeast, in aggregate form during 1992-1999, see Vieira Filho [2001].

[10] For an overview of trade strong points in the southern states, in aggregate form during 1992-1999, see Vieira Filho [2001].

precision, and surgical instruments, etc.). In most cases the strong points in Paraná-Argentina trade are similar to those in the state's overall trade. Vieira Filho [2001] points out that a large proportion of products classified as strong points for the state have little technological diffusion power and are of low value-added.

The state of Santa Catarina has a variety of products as strong points. These are located in the food sector, the textile industry (knitted garments, non-knitted clothing, and other textile articles), ceramic products, furniture and furnishings, and electrical machinery. The strength of the food group can be explained by the major food industries located in the state, such as Ceval, Sadia and Seara. The presence of the textile industry is explained by the performance of the sector in Blumenau and Joinville, where there are plants belonging to Teka, Hering and Marisol, among others. In the case of ceramic products, the state of Santa Catarina is one of the country's largest producers in the sector.

The state of Rio Grande do Sul has the largest number of strong points in trade with Argentina. These encompass the chemical sector, textiles, footwear, iron and steel, furniture, tobacco, and nuclear reactors.

Results for the footwear sector can be explained by the benefits of specialization in this sector and export incentives. Azaléia and Beira Rio are examples of plants in this sector. According to Vieira Filho [2001], textiles, clothing, beverages and tobacco were all considered strong points in the state's overall trade.

West-west. Lastly, results for center-west region reflect its small share in trade with Argentina and other Mercosur countries. States in this region show a degree of specialization in their trade with the bloc, such as wood and wood charcoal in Mato Grosso. The state of Mato Grosso do Sul has strong points in oilseeds and oleaginous fruits (including soybeans) and preparations of cereals, flour, etc. In the state of Goiás, the strong points identified also include preparations of cereals, flour, etc.

TABLE 9
STRONG POINTS IN EXTERNAL TRADE WITH MERCOSUR: BRAZILIAN STATES, 1996-2001

	Mercosur	Argentina	Rest of Mercosur
North			
AC	--	--	--
AP	--	--	--
AM	*Electrical machinery* Various articles	*Electrical machinery* Various articles	*Electrical machinery*
PA	Preparations of vegetables	Preparations of vegetables	--
RO	--	--	--
RR	--	--	--
TO	--	--	--
Northeast			
AL	--	--	--
BA	Inorganic chemical products *Organic chemical products* *Plastics and articles thereof* Copper and articles thereof Soaps and waxes	Inorganic chemical products *Organic chemical products* *Plastics and articles thereof* Copper and articles thereof Soaps and waxes	*Organic chemical products*

TABLE 9 (CONT.)

	Mercosur	Argentina	Rest of Mercosur
Northeast			
CE	Preparations of vegetables Man-made fibers *Articles of iron and steel*	Preparations of vegetables Man-made fibers Knitted fabrics	--
MA	--	--	--
PB	Coated fabrics Man-made fibers Apparel and clothing, not knitted *Footwear*	Coated fabrics Apparel and clothing, not knitted	--
PE	*Plastics and articles thereof* Rubber and articles thereof Special fabrics Aluminum and articles thereof *Electrical machinery* Man-made fibers	*Plastics and articles thereof* Rubber and articles thereof Special fabrics Aluminum and articles thereof *Electrical machinery* Man-made fibers	*Electrical machinery*
PI	--	--	--
RN	--	--	--
SE	--	--	--
Southeast			
ES	Articles of stone *Iron and steel*	Articles of stone *Iron and steel*	--
MG	Ceramic products *Iron and steel* *Articles of iron and steel* Aluminum and articles thereof Articles of base metal Ores, slag and ash Zinc and articles thereof	Tanning or dyeing extracts Ceramic products *Articles of iron and steel* Articles of base metals *Iron and steel* Zinc and articles thereof Ores, slag and ash	*Iron and steel* *Articles of iron and steel* Aluminum and articles thereof Inorganic chemicals Optical, precision, surgical instruments etc.
RJ	Preparations of meat, fish, etc. *Organic chemicals* Tanning or dyeing extracts Miscellaneous chemical products Rubber and articles thereof Coated fabrics Articles of stone Glass and glassware Precious stones and metals *Iron and steel* *Articles of iron and steel* Optical, precision, surgical instruments, etc. Miscellaneous articles	Preparations of meat, fish, etc. *Organic chemicals* Miscellaneous chemical products Rubber and articles thereof Coated fabrics Apparel and clothing, knitted Apparel and clothing, not knitted Articles of stone Glass and glassware Precious stones and metals *Iron and steel* *Articles of iron and steel* Optical, precision, surgical instruments, etc. Miscellaneous articles Tanning or dyeing extracts	Preparations of meat, fish, etc. *Organic chemicals* Photographic goods Miscellaneous chemical products Rubber and articles thereof *Iron and steel* Optical, precision, surgical instruments, etc. Glass and glassware
SP	*Live plants, etc.* *Gums, resins, etc.* *Sugars and confectionary* Beverages, spirits and vinegar Tanning or dyeing extracts Essential oils Soaps and waxes Photographic goods Rubber and articles thereof Cork and articles of cork Felt and non-wovens Carpets, etc. Knitted fabrics Glass and glassware Aluminum and articles thereof Lead and articles thereof *Nuclear reactors* *Electrical machinery* Locomotives and infrastructure (track, etc.) *Other vehicles* Optical, precision, surgical instruments, etc.	*Gums, resins, etc.* Tanning or dyeing extracts Essential oils Propellent powders and explosives Photographic goods Rubber and articles thereof Cork and articles of cork Felt and non-wovens Carpets, etc. Knitted fabrics Glass and glassware Aluminum and articles thereof *Nuclear reactors* *Electrical machinery* Locomotives and infrastructure (track, etc.) *Other vehicles* Aircraft Optical, precision, surgical instruments, etc. Lead and articles thereof	Edible fruit Sugars and confectionary Preparations of cereals, flour, etc. Beverages, spirits and vinegar Inorganic chemicals Tanning or dyeing extracts Essential oils Soaps and waxes Albuminoidal substances Rubber and articles thereof *Paper and paperboard* Carpets, etc. Coated fabrics Knitted fabrics Headgear, etc. Glass and glassware Aluminum and articles thereof Articles of base metals *Electrical machinery* *Other vehicles* Optical, precision, surgical instruments, etc. Toys and games

TABLE 9 (CONT.)

	Mercosur	Argentina	Rest of Mercosur
South			
PR	Meat Coffee, tea, maté and spices Fertilizers Albuminoidal substances Wood and wood charcoal Paper and paperboard Optical, precision, surgical instruments, etc. Furniture and furnishings	Meat Coffee, tea, maté and spices Albuminoidal substances Wood and wood charcoal Paper and paperboard Felt and non-wovens Special fabrics Articles of base metals Optical, precision, surgical instruments, etc. Furniture and furnishings	Fertilizers *Paper and paperboard* *Electrical machinery* Furniture and furnishings Edible vegetables Coffee, tea, mate and spices Salt, sulphur, etc. Mineral fuels Soaps and waxes
SC	Meat Preparations of meat, fish, etc. Albuminoidal substances Wood and wood charcoal *Paper and paperboard* Apparel and clothing, knitted Apparel and clothing, not knitted Other textile products Ceramic products *Articles of iron and steel* *Nuclear reactors* *Electrical machinery* Furniture and furnishings Miscellaneous articles Products of animal origin n.e.s.	Meat Preparations of meat, fish, etc. Wood and wood charcoal *Paper and paperboard* Apparel and clothing, knitted Apparel and clothing, not knitted Other textile products Ceramic products *Articles of iron and steel* *Nuclear reactors* Furniture and furnishings Miscellaneous articles	Preparations of meat, fish, etc. Wood and wood charcoal *Paper and paperboard* Special fabrics Apparel and clothing, knitted Other textile products Ceramic products *Articles of iron and steel* *Nuclear reactors* Edible fruit
RS	Meat Preparations of meat, fish, etc. Residues and waste from the food industries Tobacco *Organic chemicals* Fertilizers *Plastics and articles thereof* Pulp of wood Wool, etc. Man-made fibers Knitted fabrics *Footwear* Articles of stone *Articles of iron and steel* Tools and implements *Nuclear reactors* Arms and ammunition Furniture and furnishings Toys and games Miscellaneous articles Tobacco Albuminoidal substances Miscellaneous chemical products	Meat Preparations of meat, fish, etc. Residues and waste from the food industries Tobacco *Organic chemicals* Fertilizers Miscellaneous chemical products *Plastics and articles thereof* Cork and articles of cork Pulp of wood Man-made fibers Knitted fabrics Apparel and clothing, not knitted *Footwear* Articles of stone Precious stones and metals *Articles of iron and steel* Tools and implements *Nuclear reactors* Optical, precision, surgical instruments, etc. Arms and ammunition Furniture and furnishings Toys and games Miscellaneous articles Products of animal origin n.e.s. Albuminoidal substances Skins and hides, manufactures thereof	Animal or vegetable fats and oils Fertilizers Albuminoidal substances *Plastics and articles thereof* Pulp of wood Wool, etc. *Footwear* Precious stones and metals *Articles of iron and steel* Tools and implements Articles of base metals *Nuclear reactors* Furniture and furnishings Toys and games Miscellaneous articles Preparations of vegetables
Center-west			
DF	--	--	--
GO	Preparations of cereals, flour, etc.	--	--
MT	Wood and wood charcoal	--	--
MS	Oil seeds and oleaginous fruits Preparations of cereals, flour, etc.	--	--

IV. THE EFES-ARG MODEL

A national computable general equilibrium model was developed and implemented (EFES-ARG), in order to evaluate the sectoral impact of different trade integration strategies with specific economic countries/blocs. The model's structure represents an extension of the EFES model (Haddad and Domingues [2001]), which is a deterministic model, specified to generate annual projections for the Brazilian economy. It can also be used for comparative statics exercises in short-run simulations (with constant capital stock). In section VI we present a number of results obtained using this analytical instrument to evaluate regional integration strategies.

The model identifies 42 sectors and 80 products, two products used as margin (commerce and transport services), three types of indirect tax, and five user groups (producers, investors, families, external sector and "other demands"). Its extension (EFES-ARG) pays special attention to the specification of international flows. The external sector was broken down into six different components representing specific trade blocs, namely Argentina, rest of Mercosur, NAFTA, rest of FTAA, EU, and rest of the world. This makes it possible to evaluate the effect of policies relating to changes in the structure and determinants of bilateral trade flows in the Brazilian economy.[11]

The mathematical structure of EFES-ARG is based on the MONASH model, developed for the Australian economy (Dixon and Parmenter [1996]). EFES-ARG belongs to the Johansen class of models, which produce solutions on the basis of a system of linearized equations. A typical result shows the percentage variation in the set of endogenous variables following implementation of a given economic policy, compared to their values in the absence of that policy in a given economic setting. The schematic presentation of Johansen solutions for these models is standard in the literature. Further details can be found in Dixon, *et al* [1982], Harrison and Pearson [1994, 1996], and Dixon and Parmenter [1996].

In this paper EFES-ARG was integrated with an interstate trade model such that the national results obtained were regionalized. The interstate model is presented in the next section.

[11] The basic structure of the model is presented in Annex 1.

V. INTERSTATE TRADE MODEL [12]

The development of the interstate trade model is based on Haddad, *et al* [1999] and was implemented for the first time in Haddad et al (2001). Whereas that article dealt with trade flows between countries in a global economy, the present study focuses attention on interactions between states in a national economy. A matrix of interstate trade flows was constructed for 1997, based on data from the Conselho de Política Fazendária (Confaz, 1999) and IBGE (IBGE, 1999). Given production and final demand in each state, the following identity is established:

$$X_i + C_i + I_i + G_i \equiv M_i + Y_i \qquad (1)$$

where:

$X_i + C_i + I_i + G_i \rightarrow$ total demand for the production of state i (2)

$M_i + Y_i \rightarrow$ total expenditure of state i (3)

and:

$C_{IF} \rightarrow$ private consumption in state i

$I_i \rightarrow$ investment in state i

$G_{ig} \rightarrow$ government spending in state i

$I \rightarrow$ exports from state i

$M_i \rightarrow$ imports by state i

X and M are composed of inter-regional domestic and external flows, i.e. they encompass both interstate and international flows. The components of domestic absorption are consumption, investment and government expenditure.

The trade flows X and M for each state can be broken down into two parts, domestic and external:

$$X_i = \sum_{j=1}^{n} x_{ij} + \overline{X}_i \qquad (4)$$

$$M_i = \sum_{j=1}^{n} m_{ij} + \overline{M}_i \qquad (5)$$

x_{ij} represents sales from state i to state j; $\overline{X}_i$ represents exports from state i to other countries; similarly, m_{ij} represents purchases by state i from state j, and $\overline{M}_i$ represents purchases made by state i abroad. By definition, the interstate flow matrices $[x_{ij}]$ and $[m_{ij}]$ are the same.

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[12] This section is based on Haddad, *et al* [2001].

Substituting (4) and (5) in (1), gives:

$$\sum_{j=1}^{n} x_{ij} + \overline{X}_i + C_i + I_i + G_i = \sum_{j=1}^{n} m_{ij} + \overline{M}_i + Y_i = Z_j \qquad (6)$$

This enables us to obtain a matrix similar to the traditional input-output system, the rows of which contain the sales made by each state to all other states (interstate flows) together with final demand, representing the total distribution of the state's production. The columns represent the structure of expenditure in each state.

In this theoretical framework, the key assumption involves a fixed domestic import coefficient, similar to the technical coefficient of the input-output matrix:

$$[t_{ij}] = \frac{1}{Z_j}[x_{ij}] \text{ where } Z_j \text{ is total expenditure by state } j$$

The coefficient t_{ij} measures the proportion of total expenditure by state j on imports from state i, and the diagonal element (t_{ij} for $i=j$) is null. As in input-output models, this proportion is assumed fixed regardless of the state's total expenditure. Accordingly, for each state there is an optimal amount of imports for any level of expenditure in a given period.

Based on this hypothesis, equation (6) can be written as follows:

$$\sum_{j=1}^{n} t_{ij} Z_i + F_i = Z_i \text{ for } i = 1,...,n \qquad (7)$$

Where F_i is the final demand in state i.

This n-equation system can be written in matrix notation as follows:

$$TZ + F = Z \qquad (8)$$

where:

T is the matrix of interstate import coefficients (nxn)

Z is the vector of total output (nx1)

F is the final demand vector (nx1)

Solving (8) gives the output of each state needed to satisfy the total demand for domestic production:

$$Z = (I - T)^{-1} F \qquad (9)$$

In other words, given the exogenous components of domestic absorption and external demand, Z measures the output of each state needed to satisfy this final demand. $(I - T)^{-1}$ is the Machlup-Goodwin domestic trade multiplier matrix, which captures the direct and indirect impacts of changes in final demand in a given state on the total production of all states, given the existing interstate trade structure.

In the same way input-output models operate, the effects of an increase in final demand can be observed through $(I - T)^{-1}$. For example, assuming an increase in final demand in the state of São Paulo, and given that state's menu of domestic imports (t_{ij} for j = São Paulo), the first impact would be a direct rise in the state's import requirements and, hence, an increase in exports to São Paulo from other states. The income generated by São Paulo's purchases in other states generates an increase in production followed by further increases in expenditure. These effects have repercussions throughout the economy, whose total effect is given by the trade multiplier matriz $(I - T)^{-1}$.

VI. REGIONAL EFFECTS OF TRADE INTEGRATION

A recent study (Haddad, *et al* [2001]) evaluated the sectoral and regional impacts of different strategies for trade integration with specific economic blocs. The basic experiment involved simulations of three trade integration strategies for the Brazilian economy: (a) implementation of FTAA; (b) implementation of a free trade area including Mercosur and European Union Countries; and (c) generalized bilateral agreements involving Brazil and its trading partners.[13]

Analysis of short-run macroeconomic and sectoral impacts gave the following summarized results:

(a) *FTAA*: in this case the overall impact on GDP would be relatively small; in sectoral terms, manufacturing industry would gain a larger share of GDP, boosted by growth in traditional sectors (textiles, clothing and footwear) and more technology-intensive sectors such as transport equipment;

(b) *European Union (EU)*: the GDP effects would be greater in this case than under FTAA, with a relatively larger impact on the agriculture and livestock sector. There would be changes in Brazil's export basket as its agricultural products gain access to that region (the effect on the manufacturing sector would be even greater than under FTAA, with wider dispersion of results);

(c) *Generalized agreement (All)*: this is the strategy giving the most "desirable" results, namely faster economic growth, diversification of the export basket and more balanced sectoral impacts.

The results presented in table 10 show that all three strategies analyzed tend to increase the spatial concentration of economic activity. Although the effects on exports from the less developed states would be greater, three factors contribute to better performance by economies in the center-south region: (a) higher value-added in products exported from the region; (b) greater commercial openness among the states of the south and southeast, making exports relatively more important as an engine of growth; and (c) closer integration of regional economies, enhancing spillover and feedback effects as productive interdependence between states causes part of the gains from increased exports in the country's less developed states to leak into the more developed ones.[14]

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[13] These scenarios are referred to as FTAA, EU and All.

[14] It should be noted that benefits from a "cheapening" of imports are not taken into account in the regional breakdown of the results. This might expand the spatial concentration of the benefits in the center-south, since the region's industrial sectors could exploit more competitive cost structures (e.g. imports of machinery and equipment).

TABLE 10
IMPACT ON STATE ACTIVITY LEVEL OF DIFFERENT BRAZILIAN TRADE POLICY STRATEGIES
(Percentages)

	FTAA	EU	All
AC	0.04	0.05	0.14
AL	0.09	0.11	0.45
AP	0.06	0.12	0.35
AM	0.20	0.17	0.52
BA	0.19	0.17	0.51
CE	0.17	0.06	0.28
DF	0.01	0.02	0.05
ES	0.19	0.17	0.52
GO	0.07	0.24	0.40
MA	0.04	0.07	0.49
MS	0.09	0.78	1.09
MT	0.07	0.26	0.44
MG	0.20	0.25	0.66
PA	0.14	0.34	0.88
PB	0.08	0.06	0.19
PR	0.18	0.58	1.08
PE	0.07	0.06	0.20
PI	0.04	0.07	0.15
RN	0.07	0.14	0.26
RS	0.45	0.33	1.19
RJ	0.12	0.08	0.30
RO	0.05	0.08	0.19
RR	0.04	0.03	0.12
SC	0.29	0.47	1.31
SP	0.30	0.26	0.78
SE	0.08	0.10	0.24
TO	0.04	0.07	0.14

Source: Haddad, *et al*. [2001].

VII. REGIONAL ASPECTS OF BRAZIL-ARGENTINA TRADE POLICY

In this section, we use the EFES-ARG and interstate trade models to evaluate aspects of Brazil-Argentina trade policy.

Description of Simulations

The simulations performed in this section represent four Brazil-Argentina trade scenarios. They were developed on the basis of recent events in Argentina and aim to capture potential developments in trading relations between the two countries.

The first simulation imposes a 20% reduction in Brazil's exports to Argentina. This scenario reflects the recession in the Argentine economy, and its direct repercussions on external demand from that country. The percentage fall stipulated was based on estimates made in the specialist press. As the impacts on the Brazilian economy are measured relative to this shock, its precise magnitude is unimportant. Analysis of the results focuses on the sectors and regions of the Brazilian economy that are relatively most affected.

One of the measures discussed for responding to the Argentine crisis involves enhancing trade openness in Mercosur, in order to stimulate intra-bloc trade and help economic activity in Argentina to recover. Accordingly, the second simulation estimates the impact of full Brazil-Argentina trade liberalization, with abolition of all import tariffs on bilateral trade between the two countries. The EFES-ARG model simulates this by abolishing tariffs on imports from Argentina and imposing subsidies on Brazilian exports to that country such that a zero-tariff-equivalent reduction in their prices could be implemented. The latter seeks to capture the improved access for Brazilian exports to the Argentine market, as a result of tariff reduction. The results obtained from the simulations capture not only the macroeconomic impact on the Brazilian economy, but especially its sectoral and spatial implications.

As discussed in section II of this study, one of the key areas in Brazil-Argentina trade is the automotive sector. The sectoral regime in Brazil aims, among other things, to regulate trade flows between the two countries in the automotive product chain. Given the importance of that sector in the structure of the Brazilian economy, a specific simulation was carried out, imposing trade openness between Brazil and Argentina in the automotive sector alone. As this represents a subset of the shocks generated by the full openness simulation, its results can be viewed comparatively. In other words, the relative weight of automotive sector openness in the impact of full liberalization between Brazil and Argentina can be directly observed.

A final simulation was carried out to project the impact on the Brazilian economy of exchange-rate devaluation in Argentina. Currency devaluations are one of the most characteristic features of balance of payments crises, and a movement in this direction can already be discerned in Argentina. Insofar as exchange-rate devaluations directly make Argentine exports more competitive, a shift impact on Brazilian imports and production can be expected. This is simulated in the EFES-ARG model, via a shift in the FOB price of Argentine imports in the Brazilian market, equivalent to the

20% devaluation of the Argentine peso against the Brazilian *real*. This scenario assumes the Brazilian monetary authorities do not retaliate.

Results

Table 11 shows the results of the four simulations for selected macroeconomic variables. The sectoral impacts of each simulation are presented in table 12, through a breakdown of GDP components. Table 13 then shows the regional impacts, in terms of variations in activity level. These results are illustrated graphically in maps 1 through 4. Table 14 summarizes the spatial impact by analyzing the effect on the Williamson coefficient of variation, which measures regional inequality. The results of each simulation are discussed in turn below.

Simulation 1: 20% reduction in Brazilian exports to Argentina

This scenario implies a 0.105% fall in Brazil's real GDP. Although small, the impact is not negligible, bearing in mind the share of exports to Argentina in Brazil's total external trade. This drop in activity level entails a reduction in imports, although less than the fall in exports, probably resulting in a marginal trade deficit (Table 1).

Given the structure of Brazil's exports to Argentina, the industrial sector is most affected, especially in branches with high technological content, such as machinery and transport equipment (Table 2). This sectoral concentration, together with interstate trade relations, results in a negative impact concentrated in the states of the south and southeast (especially Minas and São Paulo), in addition to Bahia and Amazonas (Table 14 and Map 1).

Simulation 2: Liberalization of Brazil-Argentina trade flows

Full trade liberalization between the two largest Mercosur partners boosts real GDP growth. In this scenario, exports expand by nearly three times the rise in imports, which suggests the potential for a marginal trade surplus (Table 11). This result naturally depends on the import tariff estimate used (see Annex 2).

As in the previous simulation, industry is the sector most effected, albeit positively this time. The machinery and transport equipment segments benefit most in this scenario. In addition, the rise in other branches of industry, and in service sectors (such as transport and communication), implies a major intra-industry and inter-sectoral impact (Table 12). The spatial distribution of these positive impacts (Table 14 and Map 2) indicates greater benefit for states with high levels of exports to Argentina, such as São Paulo, Amazonas and those of the southern region.

Simulation 3: Liberalization of the automotive sector

This simulation is a subset of the full openness simulation, so its results are qualitatively similar, including positive GDP growth and an improvement in the marginal trade balance. An interesting

aspect of this exercise is its evaluation of the relative importance of automotive-sector openness in the framework of full Brazil-Argentina trade liberalization. The results given in table 11 show that about 30% of the impact of full Brazil-Argentina trade openness is provided by liberalization in the automotive sector. Table 12 suggests even greater dependence in the case of industry: nearly 44% of the positive impact of openness stems from the impact of liberalization in the automotive sector. The importance of liberalization in this sector can also be seen in the growth of directly related sectors, such as metallurgy, or indirectly related ones, such as construction, commerce, communications and financial institutions.

The regional effect shown in table 14 and map 3 reveals that the impact is concentrated in the main producer states (São Paulo, Paraná and Minas Gerais), in the production of both automobiles and autoparts. The positive impact in Amazonas is explained partly by exports of electronics and autoparts from the duty free zone, and the high share of electronics shipped as inputs in producer states.

Simulation 4: Currency devaluation in Argentina

The simulation of exchange-rate devaluation in Argentina produces a negative impact on real GDP in Brazil, tending towards a marginal trade deficit, with exports growing nearly three times less than imports (Table 11). This scenario entails a major negative impact on agriculture-livestock and industry, especially extractive activities and non-metallic minerals (Table 12). These are probably the sectors most affected by the increasing competitiveness of Argentine products in the Brazilian market, with potentially significant input substitution effects.

The spatial distribution of the results is shown in table 14 and map 4. There is a major negative effect on states with strong agricultural production, such as Santa Catarina, Rio Grande do Sul, Mato Grosso and Mato Grosso do Sul. The trend towards input substitution has major implications in states such as São Paulo, Bahia, Rio de Janeiro and Amazonas.

TABLE 11
IMPACT ON SELECTED MACRO VARIABLES
(Percentages)

	Sim1	Sim2	Sim3	Sim4
Real GDP	-0.105	0.086	0.028	-0.101
Aggregate employment	-0.217	0.243	0.083	-0.227
Real wage	0.299	-0.229	-0.049	0.739
Volume of exports	-1.984	2.253	0.764	0.515
Volume of imports	-0.332	0.777	0.283	1.702

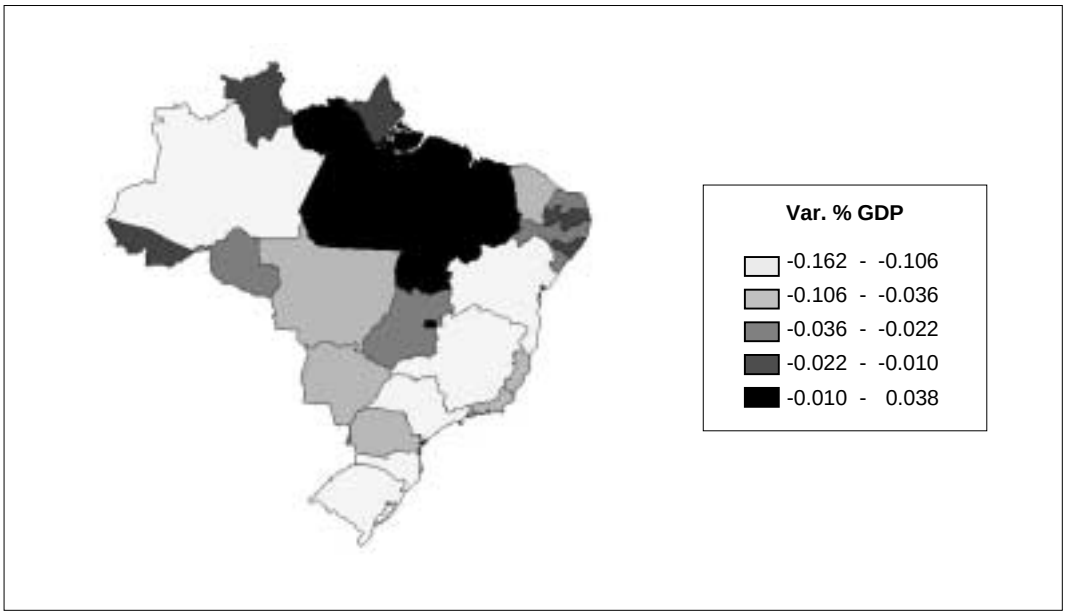
TABLE 12
IMPACT ON SECTORAL COMPONENTS OF GDP
(Percentage variation)

	Sim1	Sim2	Sim3	Sim4
Agriculture-livestock	-0.068	0.049	0.007	-0.147
Industry	-0.228	0.277	0.122	-0.172
Extractive	-0.342	0.391	0.041	-0.642
Manufacturing	-0.288	0.353	0.160	-0.196
Non-metallic minerals	-0.195	0.169	0.037	-1.308
Metallurgy	-0.355	0.500	0.248	-0.117
Machinery	-0.466	0.656	0.033	-0.264
Transport equipment	-0.727	1.210	1.194	-0.312
Chemicals	-0.225	0.172	0.034	-0.120
Textiles, clothing and footwear	-0.227	0.232	0.012	-0.195
Food	-0.078	0.027	0.004	-0.201
Other industries	-0.299	0.281	0.045	-0.259
Construction	-0.004	0.005	0.002	-0.004
Services	-0.070	0.062	0.014	-0.081
Industrial public utility services	-0.102	0.106	0.045	-0.226
Commerce	-0.091	0.097	0.037	-0.049
Transport	-0.311	0.286	0.026	-0.019
Communication	-0.135	0.111	0.033	-0.138
Financial institutions	-0.056	0.052	0.018	-0.059
Other services	-0.102	0.073	0.013	-0.272
Rental services	-0.007	0.006	0.001	-0.016
Public administration	-0.001	0.001	0.000	-0.001

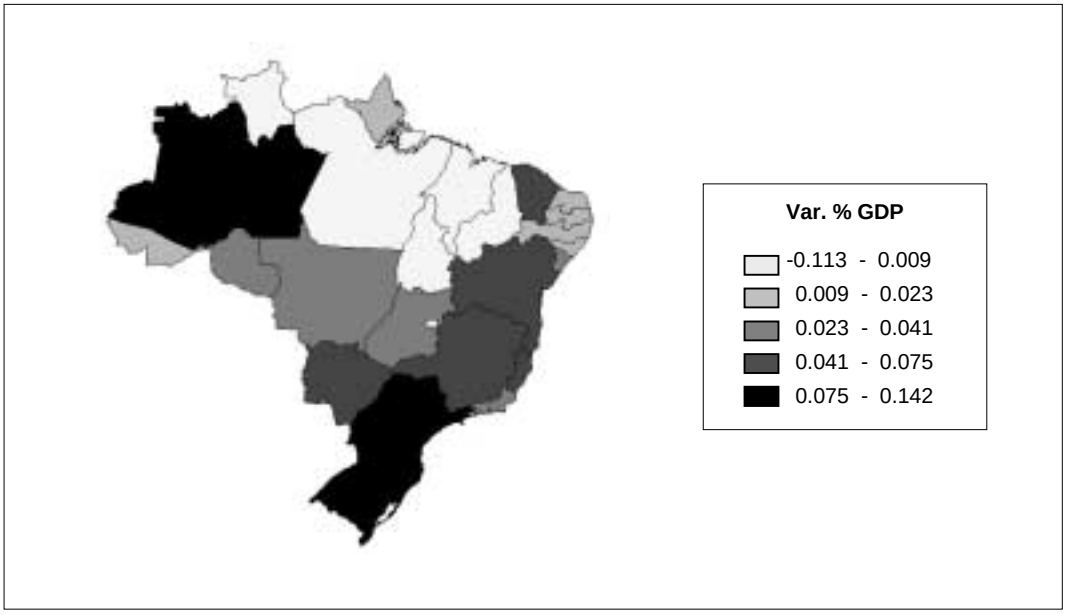
TABLE 13
IMPACT ON ACTIVITY LEVEL: BRAZILIAN STATES (%)

	SIM1	Sim2	Sim3	Sim4
AC	-0.021	0.016	0.007	-0.064
AL	-0.016	0.015	0.002	-0.095
AP	-0.013	0.023	0.002	-0.076
AM	-0.109	0.093	0.031	-0.182
BA	-0.106	0.071	-0.003	-0.119
CE	-0.036	0.042	0.002	-0.084
DF	-0.008	0.006	0.003	-0.042
ES	-0.085	0.067	0.014	-0.092
GO	-0.033	0.031	0.008	-0.102
MA	0.014	-0.113	-0.108	-0.075
MS	-0.038	0.041	0.013	-0.098
MT	-0.063	0.046	0.011	-0.096
MG	-0.112	0.075	0.041	-0.084
PA	0.038	-0.073	-0.069	-0.093
PB	-0.017	0.020	0.001	-0.087
PR	-0.093	0.099	0.022	-0.091
PE	-0.022	0.023	0.001	-0.102
PI	-0.007	0.006	0.001	-0.074
RN	-0.024	0.021	0.004	-0.299
RS	-0.128	0.130	0.023	-0.106
RJ	-0.053	0.037	0.007	-0.104
RO	-0.030	0.029	0.005	-0.080
RR	-0.010	0.009	0.003	-0.083
SC	-0.139	0.142	0.014	-0.124
SP	-0.162	0.132	0.059	-0.097
SE	-0.035	0.029	0.005	-0.217
TO	-0.008	0.006	0.001	-0.080

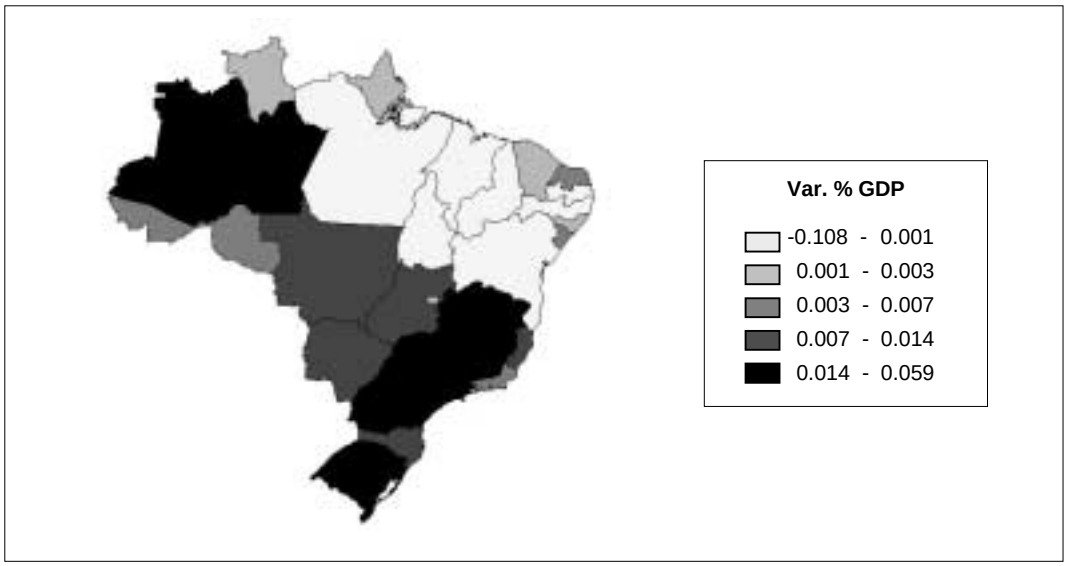
MAP 1
SHORT-RUN IMPACTS ON STATE ACTIVITY LEVEL OF A 20% REDUCTION IN BRAZILIAN EXPORTS TO ARGENTINA



MAP 2
SHORT-RUN IMPACTS ON STATE ACTIVITY LEVEL OF FULL LIBERALIZATION IN BRAZIL-ARGENTINA TRADE FLOWS



MAP 3
SHORT-RUN IMPACTS ON STATE ACTIVITY LEVEL OF LIBERALIZATION IN AUTOMOTIVE SECTOR



MAP 4
SHORT-RUN IMPACTS ON STATE ACTIVITY LEVEL OF DEVALUATION IN ARGENTINA

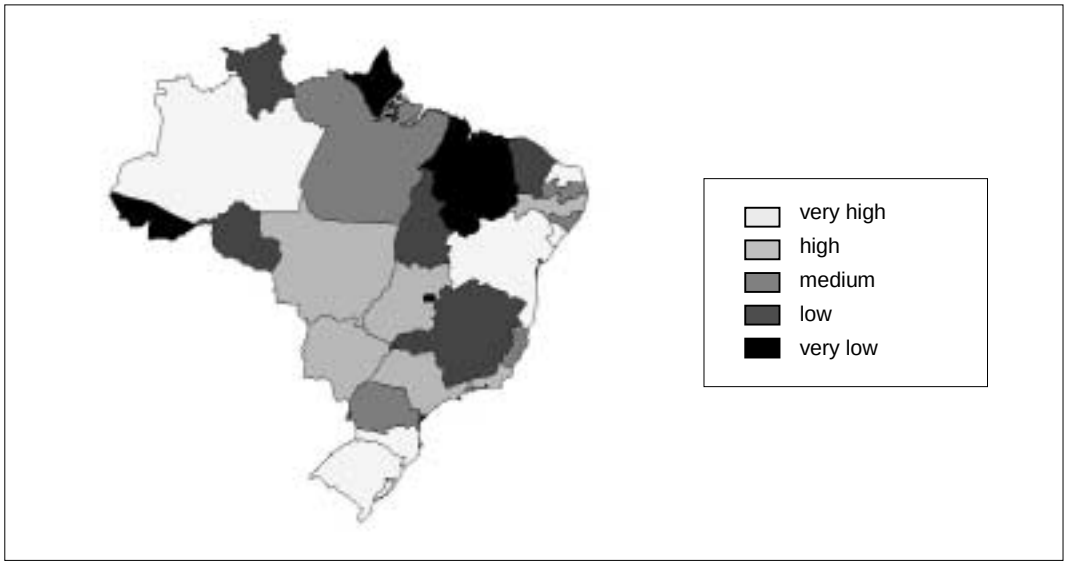


TABLE 14
SUMMARY OF SPATIAL IMPACTS

	Williamson coefficient of variation	Impact on regional inequality
Base year	0.46910	
Reduction in exports	0.46877	"-"
Bilateral liberalization	0.46941	"+"
Liberalization of automotive sector	0.46930	"+"
Exchange-rate depreciation	0.46915	"+"

VIII. FINAL CONSIDERATIONS

This analysis of the short-run regional aspects of Brazilian trade policy, focusing on economic integration and bilateral relations with Argentina, reveals a trend towards concentration of the level of economic activity in the states of the Brazilian south and southeast. The results draw attention to a phenomenon that has permeated the debate on the regional issue, namely the role of trade as an engine of growth.

There are several theories that claim a positive relation between trade and economic development. These stress the direct gains for the country from international specialization, together with additional development impacts acting through a series of multiplier effects internalized by the domestic economy. From the subnational standpoint, the principles of export base theory contain the roots of several regional development models.

Recently, however, given the major importance attached to globalization issues and the implicit assumption that the future of the region is inexorably linked to its capacity to compete in external markets, international trade has been monopolizing the attention of regional analysts. As we saw, in the Brazilian case its importance is making itself felt more intensively in specific areas of the country. Are the other areas destined to maintain an archaic trade structure based on the export of unprocessed products to specific markets? Given that liberalization is intended to intensify trade, is the regional concentration of international trade flows likely to be irreversible?

In our opinion, the answers to both questions are negative. Firstly, one needs to consider the current trend towards expansion of trade agreements involving Brazil, which pursue a gradual reduction in trade barriers extending over increasingly broad geographic areas. This is seen as a complex and dynamic general equilibrium phenomenon whose effects extend into the long run. The regional integration process involves issues relating to technology growth, learning, externalities, political economy and political agreements (Devlin and Ffrench-Davis [1997]), whose subnational repercussions can be channeled by public policies. In the Brazilian economy's current stage of development, market forces tend to concentrate economic activity in the center-south, but there is still potential for government intervention to alleviate the situation. This requires establishing regional planning directives to efficiently exploit the potentials of outlying regions. Comparative advantages will be created over time via the formation of a solid regional economic infrastructure, including efficient systems of transport, energy and communication, together with a policy to promote local labor skill-training. The emphasis on economic, rather than financial incentives increases the degrees of freedom available to regional policymakers, thereby promoting the creation and consolidation of dynamic comparative advantages in the regions.

Secondly, the role of interstate trade in state economies needs to be highlighted. Regional interactions need to be studied to gain a better understanding of how regional economies are affected, in international markets and domestic ones, since for the smaller economies, in particular, the performance of the more developed regions is crucial.

The usual view of spatial interaction, which considers the region *vis-à-vis* the rest of the world, conceals two properties that are fundamental for understanding an inter-regional system, namely feedback and hierarchy. Interstate trade can generate potential for propagating feedback effects which could well be quantitatively more important than those generated by international trade.

Nonetheless, the impact of feedback effects will partly be determined by the hierarchical structure of the economy's regional system. In the Brazilian case, one would expect the impact of São Paulo's interstate trade on the national economy to be different from that of other states.

An inspection of table 15, which contains estimates of interstate and international export coefficients for all federal units of the country, reveals several important features of the Brazilian regional system. In all states to a greater or lesser extent, interstate sales outstrip exports abroad. In general, interstate flows are relatively more important for the less developed states.[15]

TABLE 15
INTERSTATE AND INTERNATIONAL EXPORT COEFFICIENTS: BRAZILIAN STATES, 1997
(Percentages)

	Interstate exports/GDP (A)	International exports/GDP (B)
Acre	25.7	0.1
Alagoas	30.8	4.6
Amapá	5.3	3.4
Amazonas	87.7	1.9
Bahia	30.5	4.4
Ceará	28.9	2.1
Dist. Federal	10.4	0.0
Espírito Santo	90.2	5.6
Goiás	52.6	2.3
Maranhão	13.1	8.7
Mato Grosso	76.5	7.9
Mato Gr. Sul	41.6	2.6
Minas Gerais	57.5	7.6
Pará	14.5	14.0
Paraíba	27.5	0.9
Paraná	59.1	7.7
Pernambuco	31.2	1.1
Piauí	13.5	1.2
Rio Gr. Norte	23.8	1.4
Rio Gr. Sul	36.1	7.6
Rio de Janeiro	32.3	1.6
Rondônia	17.6	1.0
Roraima	13.8	0.3
Santa Catarina	61.7	7.9
São Paulo	49.0	5.4
Sergipe	39.1	0.6
Tocantins	20.5	0.6

Source: Confaz, MDIC, IBGE (authors' calculations).

Apart from this, when one considers the Brazilian states' main trading partners, together with the degree of openness (exports plus imports, divided by GDP) *vis-à-vis* specific partners, whether states or countries, the importance of interstate flows, mainly with São Paulo, becomes even clearer

[15] Exceptions include the states of Amapá, Maranhão and Pará, which have transport and communications systems predominately aimed at transporting mining exports.

(Table 16). If Brazil's states were independent countries, willing to grant most favored nation (MFN) status to some of their partners, the "countries" listed in table 16 would probably be the potential beneficiaries. Little attention would be paid to our Mercosur partner except in Espírito Santo and states in the southern region, where Argentina is one of the 10 main trading partners.

These estimates reveal the importance of interstate trade flows in the states' economies. It is therefore necessary to make a more in-depth analysis of trade flows between the Brazilian states, potentially leading to generalizations regarding the type of trade involved, changes in its composition through time as the Brazilian economy develops, and the implications of these structural differences in the coordination and implementation of development policies.

Thus, the future for many regions of Brazil depends more on their linkages with other domestic markets than on their performance in international ones. Here again, there is room for public policy action, through interventions to modernize the country's transport network, improve integration between producer and consumer markets and thereby maximize the effects of Brazil's trade policy strategies. Apart from creating mechanisms to propagate feedback effects, this will also make Brazilian products more competitive on the international market.

TABLE 16
BRAZILIAN STATES' MAIN TRADING PARTNERS, 1997
(Highlighting the ranking of Argentina)

AC	AP	AM	PA	RO	RR	TO	AL	BA
SP	SP	SP	SP	SP	SP	SP	SP	SP
MG	RS	USA	MG	PR	MG	GO	PE	MG
RS	MG	RJ	USA	MT	PR	MG	BA	RJ
SC	RJ	RS	RJ	MG	RJ	PA	SE	PE
MT	SC	MG	PR	RS	RS	CE	RJ	SE
19- Argentina	22 -Argentina	21- Argentina	21- Argentina	15- Argentina	37- Argentina	16- Argentina	20- Argentina	13- Argentina

CE	MA	PB	PE	PI	RN	SE	ES	MG
SP	SP	PE	SP	SP	SP	SP	SP	SP
PE	MG	SP	BA	CE	CE	BA	MG	RJ
RN	CE	CE	PB	PA	PE	PR	RJ	ES
MG	PA	MG	MG	PE	MG	PE	USA	GO
RJ	PE	RN	CE	MG	BA	MG	Argentina	PR
18- Argentina	15- Argentina	19- Argentina	19- Argentina	21- Argentina	16- Argentina	15- Argentina		12- Argentina

RJ	SP	PR	SC	RS	DF	GO	MT	MS
SP	MG	SP	SP	SP	SP	SP	SP	SP
MG	RJ	SC	PR	SC	MG	MG	PR	PR
RS	PR	RS	RS	PR	GO	MT	GO	MG
ES	RS	MG	RJ	RJ	RJ	DF	MG	MT
PR	AM	RJ	MG	MG	PR	PR	SC	RJ
13- Argentina	12- Argentina	9- Argentina	9- Argentina	8- Argentina	18- Argentina	20- Argentina	30- Argentina	13- Argentina

Contents

ANNEX 1
STRUCTURE OF THE EFES-ARG MODEL

This annex presents the functional forms of the main equations of the model, and defines its main variables, parameters and coefficients. In terms of notation, capital letters are used for variables measured in level terms, and lower case for their annual growth rates. Superscripts (u), u = 0, 1j, 2j, 3, 4b, 5, refer, respectively, to production (0) and to the five types of users of the products identified in the model: producers in sector j (1j), investors in sector j (2j), families (3), purchasers of goods exported in region b (4b), and government and "other demands" (5). Inputs are identified by two subscripts: the first takes the values 1,...,g, for goods, g + 1, for primary factors, and g + 2, for "other costs" (basically taxes and production subsidies); the second subscript identifies the origins of the input, whether domestic (1) or imported from region b (2b), or provided by labor (1) or capital (2). The symbol (•) is used to indicate summation on a given index.

Equations

(A1) Substitution between goods imported from different origins

$$x^{(u)}_{(i(2b))} = x^{(u)}_{(i(2\bullet))} - \sigma^{(u)}_{(i)}\left(p^{(u)}_{(i(2b))} - \sum_{l\in S^{*}}\left(V(i,2l,(u))/V(i,2\bullet,(u))\left(p^{(u)}_{(i(2l))}\right)\right)\right)$$

i = 1,...,g; b = 1,…,r; (u) = 3 and (kj) for k = 1 and 2 and j = 1,…,h

(A2) Substitution between domestic and imported goods

$$x^{(u)}_{(is)} = x^{(u)}_{(i\bullet)} - \sigma^{(u)}_{(i)}\left(p^{(u)}_{(is)} - \sum_{l=1,2\bullet}\left(V(i,l,(u))/V(i,\bullet,(u))\left(p^{(u)}_{(il)}\right)\right)\right)$$

i = 1,...,g; s = 1 and 2•; (u) = 3 and (kj) for k = 1 and 2 and j = 1,…,h

(A3) Substitution between labor and capital

$$x^{(1j)}_{(g+1,s)} - a^{(1j)}_{(g+1,s)} = x^{(1j)}_{(g+1\bullet)} - \sigma^{(1j)}_{(g+1)}\left\{p^{(1j)}_{(g+1,s)} + a^{(1j)}_{(g+1,s)} - \sum_{l=1,2}\left(V(g+1,l,(1j))/V(g+1,\bullet,(1j))\right)\left(p^{(1j)}_{(g+1,l)} + a^{(1j)}_{(g+1,l)}\right)\right\}$$

j = 1,...,h; s = 1 and 2

(A4) Family demand for composite goods

$$V(i,\bullet,(3))(p^{(3)}_{(i\bullet)} + x^{(3)}_{(i\bullet)}) = \gamma_{(i)} P^{(3)}_{(i\bullet)} Q(p^{(3)}_{(i\bullet)} + x^{(3)}_{(i\bullet)}) + \beta_{(i)}(C - \sum_{j\in G} \gamma_{(j)} P^{(3)}_{(i\bullet)} Q(p^{(3)}_{(i\bullet)} + x^{(3)}_{(i\bullet)}))$$

$i = 1,...,g$

(A5) Prices of composite goods for families

$$p^{(3)}_{(i\bullet)} = \sum_{l=1,2\bullet} (V(i,l,(3))/V(i,\bullet,(3)))p^{(3)}_{(il)}$$

$i = 1,...,g$

(A6) Demand for composite, intermediate and investment goods, primary factors and other costs

$$\tilde{n}^{Eì\,iF}_{Eá\bullet F} = \grave{o}^{Eì\,iF} + \sim^{Eì\,iF}_{EáF} ====$$

$u = (kj)$ for $k = 1, 2$ and $j = 1,\ldots,h$

if $u = (1j)$ then $i = 1,..., g + 2$

if $u = (2j)$ then $i = 1,\ldots,g$

(A7) Demand for exports

$$(x^{(4b)}_{(is)} - f^{4qb}_{(is)}) = \eta_{(is)}(p^{(4b)}_{(is)} - e - f^{4\,pb}_{(is)})$$

$i = 1,...,g$; $s = 1, 2b$ for $b = 1,\ldots,r$

(A8) Other demands

$$x^{(5)}_{(is)} = f^{(5)}_{(is)} + f^{(5)}$$

$i = 1,...,g$; $s = 1, 2b$ for $b = 1,\ldots,r$

(A9) Demand for margins for domestic goods

$$x_{(m1)}^{(is)(u)} = x_{(is)}^{(u)}$$

m, i = 1,...,g;
(u) = (3), (4b) for b = 1,...,r, (5) and (kj) for k = 1, 2;
j = 1,…,h; s = 1, 2b for b = 1,…,r

(A10) Sectoral composition of production

$$x_{(i1)}^{(0\,j)} = z^{(1\,j)} + \sigma^{(0\,j)}(p_{(i1)}^{(0)} - \sum_{t\in G}(Y(t,\,j)/Y(\bullet,\,j))\,p_{(t1)}^{(0)})$$

j = 1,...,h; i = 1,...,g

(A11) Demand for domestic goods equals supply

$$\sum_{j\in H} Y(l,\,j)x_{(l1)}^{(0\,j)} = \sum_{u\in U} B(l,1,(u))x_{(l1)}^{(u)} + \sum_{i\in G}\sum_{s\in S}\sum_{u\in U} M(l,i,s,(u))x_{(l1)}^{(is)(u)}$$

l = 1,...,g

(A12) Revenue equals costs for sectors

$$\sum_{l\in G} Y(l,\,j)(p_{(l1)}^{(0)} + a_{(l1)}^{(0)}) = \sum_{l\in G^*}\sum_{s\in S} V(l,s,(1\,j))(p_{(ls)}^{(1\,j)})$$

j = 1,...,h

(A13) Basic price of imported goods

$$p_{(i(2b))}^{(0)} = p_{(i(2b))}^{(w)} - e + t_{(i(2b))}^{(0)}$$

i = 1,...,g; b = 1,…,r

(A14) Purchase prices related to basic prices, margins and taxes

$$V(i,s,(u))\,p^{(u)}_{(is)} = (B(i,s,(u) + \sum_{\tau \in T} T(\tau,i,s,(u)))(p^{(0)}_{(is)} + t(\tau,i,s,u)) + \sum_{m \in G} M(m,i,s,(u))\,p^{(0)}_{(m1)}$$

$i = 1,...,g$; $(u) = (3), (4b)$ for $b = 1,...,r$, (5)
and (kj) for $k = 1, 2$ and $j = 1,\ldots,h$; $s = 1, 2b$ for $b = 1,\ldots,r$

(A15) Investment

$$x^{(1j)}_{(g+1,2)}(1) - x^{(1j)}_{(g+1,2)} = f_{(k)} + f^{(j)}_{(k)} + \alpha_{(j)}(P^{(1j)}_{(g+1,2)}/(P^{(1j)}_{(g+1,2)} + (1-\delta_{(j)})P^{(1j)}_{(k)})(p^{(1j)}_{(g+1,2)} - p^{(1j)}_{(k)})$$

$j = 1,...,h$

(A16) Capital accumulation

$$X^{(1j)}_{(g+1,2)}(1)x^{(1j)}_{(g+1,2)}(1) = X^{(1j)}_{(g+1,2)}(1-\delta_j)x^{(1j)}_{(g+1,2)} + Z^{(2j)}_{(k)}z^{(2j)}_{(k)}$$

$j = 1,...,h$

(A17) Cost of capital

$$V(\bullet,\bullet,(2j))(p^{(1j)}_{(k)} - a^{(1j)}_{(k)}) = \sum_{i \in G}\sum_{s \in S} V(i,s,(2j))(p^{(2j)}_{(is)} + a^{(2j)}_{(is)})$$

$j = 1,...,h$

(A18) Wage determination

$$p^{(1j)}_{(g+1,1)} = ipc + f^{(1j)}_{(g+1,1)} + f_{(g+1,1)}$$

$j = 1,...,h$

(A19) Consumer price index

$$ipc = \sum_{i \in G} \sum_{s=1,2\bullet} \left(\overline{V}(i,s,(3)) / \overline{V}(\bullet,\bullet,(3)) \right) p_{(is)}^{(3)}$$

(A20) Taxes on sales to users

$$t(\tau,i,s,(u)) = f_{(\tau)} + f_{(i\tau)} + f_{(i)}^{(u)}$$

$i = 1,...,g$; $s = 1, 2b$ for $b = 1,...,r$; $\tau = 1, 2, 3$

$(u) = (3), (4b)$ for $b = 1,...,r$ (5) and (kj) for $k = 1, 2$; $j = 1,\ldots,h$

(A21) Relation between investment and consumption (real)

$$i_R = c_R + fic$$

(A22) Relation between short-term investment and rates of return

$$-\alpha_{(j)}^{SR}(x_{(g+1,2)}^{(1j)}(1) - x_{(g+1,2)}^{(1j)}) + r_{(j)} = \omega + f_{(2j)}$$

$j = 1,...,h$

Other definitions include: Aggregate employment, real aggregates, nominal aggregates, price indices, trade balance, other equilibrium conditions, specific aggregations by sectors or products.

Variables

Variable	Indices	Description

$x_{(is)}^{(u)}$	(u) = (3), (4b)
	for b = 1,…,r, (5) and
	(kj) for k = 1, 2 and
	j = 1,…,h;
	s = 1, 2b for b = 1,…,r;
	if (u) = (1j)
	then i = 1,…,g + 1;
	if (u) ≠ (1j) then i = 1,…,g
		Demand by user (u) for primary factor is

Variable	Indices	Description

$p_{(is)}^{(u)}$	(u) = (3), (4b)
	for b = 1,…,r, (5) and
	(kj) for k = 1, 2 and
	j = 1,…,h;
	s = 1, 2b for b = 1,…,r;
	if (u) = (1j)
	then i = 1,…,g + 1;
	if (u) ≠ (1j) then i = 1,…,g
		Price paid by user (u) for good is

$x_{(i(2\bullet))}^{(u)}$	(u) = (3) and (kj)
	for k = 1, 2 and j = 1,…,h
	if (u) = (1j)
	then i = 1,…,g + 1;
	if (u) ≠ (1j) then i = 1,…,g
		Demand for composite good or primary factor i by user (u)

$a_{(g+1,s)}^{(1j)}$	j = 1,…,h and s = 1, 2	Technological change: use of primary factors
$a_{(i)}^{(u)}$	i = 1,...,g, (u) = (3) and (kj) for k = 1, 2 and j = 1,...,h	Technological change related to use of good i by user (u)
c		Total family expenditure
q		Number of families
$p_{(i\bullet)}^{(3)}$	i = 1,…,g	Prices of composite goods consumed by families
$z^{(u)}$	(u) = (kj) for k = 1, 2 and j = 1,…,h	Activity levels: current production (k = 1) and investment (k = 2) by industry
$f_{(is)}^{4qb}$	i = 1,…,g; s = 1, 2b for b = 1,…,r	Shift term in the export demand curve, for quantities
$f_{(is)}^{4pb}$	i = 1,…,g; s = 1, 2b for b = 1,…,r	Shift term in the export demand curve, for prices
e		Exchange rate, R$/US$
$x_{(m1)}^{(is)(u)}$	m, i = 1,…,g; s = 1, 2b for b = 1,…,r (u) = (3), (4b) for b = 1,…,r, (5) and (kj) for k = 1, 2 and j = 1,…,h	Demand for good r1 used as margin to facilitate flow of is for (u)
$x_{(i1)}^{(0j)}$	i = 1,…,g; j = 1,…,h	Production of domestic good i by industry j
$p_{(is)}^{(0)}$	i = 1,…,g; s = 1, 2b for b = 1,…,r	Basic price of good i from origin s
$p_{(i(2b))}^{(w)}$	i = 1,…,g, b = 1,…,r	C.I.F. price of imported good i in US$
$t_{(i(2b))}^{(0)}$	i = 1,…,g, b = 1,…,r	Tariff power on imports of i (tariff power is defined as 1 plus the tariff rate)
$t(\tau,i,s,(u))$	i = 1,…,g; τ = 1, 2, 3; s = 1, 2b for b = 1,…,r (u) = (3), (4b) for b = 1,…,r, (5) and (kj) for k = 1, 2 and j = 1,…,h	Power of tax τ on sales of good is for user (u) (tax power is defined as 1 plus the tax rate)

Variable	Indices	Description
$f_{(k)}^{(j)}$	j = 1,…,h	Shift term for growth in capital stock in industry j
$f_{(k)}$		Shift term for total capital stock
$x_{(g+1,2)}^{(1j)}(1)$	j = 1,…,h	Capital stock in industry j at year end; i.e. capital stock available for use in the following period
$p_{(k)}^{(1j)}$	j = 1,…,h	Cost of construction of a unit of capital for industry j
$f_{(g+1,1)}^{(1j)}$	j = 1,…,h	Shift term for real wage in industry j
$f_{(g+1,1)}$		Shift term for real wage in the economy
ipc		Consumer price index
$f_{(\tau)}$	τ = 1, 2, 3	Shift term for uniform percentage variation in tax power τ
$f_{(i\tau)}$	i = 1,…,g; τ = 1, 2, 3	Shift term for uniform percentage variation in tax power τ on good i
$f_{(i)}^{(u)}$	(u) = (3), (4b) for b = 1,…,r, (5) and (kj) for k = 1, 2 and j = 1,…,h	Shift term for uniform percentage variation in tax power τ on user (u)
i_R		Real aggregate investment
c_R		Real aggregate consumption
fic		Relation between real investment and real consumption
$f_{(is)}^{(5)}$	i = 1,…,g; s = 1, 2b for b = 1,…,r	Shift term for expenditure on "other demands"
$f^{(5)}$		Generic shift term for expenditure on "other demands"
ω		Expected rate of return on capital
$r_{(j)}$	j = 1,...,h	Sectoral rate of return on capital
$z_{(k)}^{(2j)}$	j = 1,...,h	Sectoral investment
$f_{(2j)}$	j = 1,...,h	Shift term for sectoral investment
$trend_{(j)}$	j = 1,...,h	Long-term sectoral rate of return on capital
Others		Relating to model definition
Exogenous variables: q, $a_{(i)}^{(u)}$, $f_{(\tau)}$, $f_{(i\tau)}$, $f_{(i)}^{(u)}$, $f_{(is)}^{4pb}$, $f_{(is)}^{(5)}$, $x_{(\bullet\bullet)}^{(5)}$, $t_{(i(2b))}^{(0)}$, $p_{(i(2b))}^{(w)}$, c_R, $a_{(g+1,s)}^{(1j)}$, e, $x_{(g+1,2)}^{(1j)}$, fic, $f_{(k)}$, $f_{(2j)}$, $f_{(is)}^{4qb}$		

Parameters, Coefficients and Sets

Symbol	Description
$\sigma_{(i)}^{(u)}$	Parameter: Elasticity of substitution for user (u) between alternative origins of good or factor I
$\sigma^{(0\,j)}$	Parameter: Elasticity of substitution in the production of different goods in industry j
$V(i,l,(u))$	Input-output flow: value of purchases of good or factor i from origin l used by user (u)
$V(i,\bullet,(u))$	Input-output flow: *V* (*i*,*s*,(*u*)) summed for s
$V(\bullet,\bullet,(u))$	Input-output flow: *V* (*i*,*s*,(*u*)) summed for s and I
$V(i,2l,(u))$	Input-output flow: value of purchases of good or factor i from import origin 2*l* used by user (u)
$V(i,2\bullet,(u))$	Input-output flow: *V* (*i*,2*l*,(*u*)) summed over import origins
$\gamma_{(i)}$	Parameter: subsistence parameter in linear expenditure system
$\beta_{(i)}$	Parameter: marginal budgetary share of good i in linear expenditure system
$\eta_{(is)}$	Parameter: elasticity of demand for exports of good I
$Y(l,\,j)$	Input-output flow: basic value of production of good l by sector j
$Y(\bullet,\,j)$	Input-output flow: sum of *Y* (*l*, *j*) on j; i.e., basic value of production of sector j
$B(l,s,(u))$	Input-output flow: basic value of ls for user (u)
$M(l,i,s,(u))$	Input-output flow: Basic value of domestic good l used as margin to facilitate flow of is for (u)
$T(\tau,i,s,(u))$	Input-output flow: set of taxes τ on sales of is for (u)
$\delta_{(j)}$	Parameter: rate of depreciation in industry j
$\alpha_{(j)}$	Parameter: sensitivity of growth of capital stock to rates of return in industry j
$\overline{V}(i,s,(3))$	Parameter: initial values of *V* (*i*,*s*,(3))
$\overline{V}(\bullet,\bullet,(3))$	Parameter: initial values of *V* (•,•,(3))
G	Set: {1,2,...,g}, g = number of composite goods
G*	Set: {1,2,...,g + 1}, g + 1 = number of composite goods and primary factors
H	Set: {1,2,...,h}, h = number of industries
U	Set: {(3), (4), (5), (kj) for k = 1, 2 and j = 1,...,h}
U*	Set: {(3), (kj) for k = 1, 2 and j = 1,...,h}
S	Set: {1, 2,…,r + 1}, r + 1 = number of regions (including domestic)
*S**	Set: {1, 2,…,r}, r = number of foreign regions

Contents

ANNEX 2
TARIFF PROTECTION IN THE EFES-ARG MODEL: EXAMPLE BASED ON BRAZIL-ARGENTINA TRADE FLOWS

The trade liberalization simulations performed with the EFES-ARG model used estimates of trade barriers (import tariffs) in bilateral Brazil-Argentina trade. This information was obtained from the database of the GTAP model (Hertel [1997]). A problem in using data on import tariffs concerns the base year of the information. Version 4 of GTAP uses the tariffs in force in 1995, while the EFES-ARG model database refers to 1996. A comparison of import tariffs in Brazil for that year, with those obtained with GTAP figures, show that the Brazilian data indicate a lower level of domestic market protection in most sectors.[16] To maintain consistency in the databank, GTAP data were used for the spatial distribution (by external market) of the sectoral import tax. This makes import duties in each sector consistent with aggregate national data; and their distribution by external market is consistent with GTAP information.

The adjustment described above to reconcile Brazilian import duties obtained from GTAP with aggregate data on Brazil, served as a benchmark for re-scaling foreign tariffs on Brazilian exports. The implicit hypothesis in this procedure is one of reciprocity: the alterations (reduction) in Brazilian import tariffs between 1995 and 1996 also correspond to alterations in import duties charged on Brazilian exports in foreign markets.[17] Table A1 shows import duties on bilateral Brazil-Argentina trade estimated for this paper.

TABLE A1
IMPORT TARIFFS IN BILATERAL BRAZIL-ARGENTINA TRADE
(% *ad-valorem*, 1996)

	Product	Origin-Destination	
		Argentina-Brazil	Brazil-Argentina
1	Coffee beans	0.000	4.555
2	Sugar cane	0.000	18.200
3	Rice in the husk	0.000	0.000
4	Wheat in grain	0.000	0.000
5	Soybean	0.000	0.000
6	Cotton in the husk	5.433	4.075
7	Maize in grain	1.720	0.000
8	Bovine or swine animals	0.000	1.102
9	Fresh milk	0.000	0.000
10	Live birds	0.055	0.136
11	Other agricultural products	2.270	6.756
12	Iron ore	3.751	14.514
13	Other minerals	0.692	0.258

[16] This finding is consistent with the tariff reductions agreed in the Uruguay Round. See Finger, *et al* [1996] and Yang, *et al* [1997].

[17] This tariff concession mechanism is in line with measures agreed in the Uruguay Round, as described by Finger, *et al* [1999], and Finger and Schuknecht [1999].

TABLE A1 (CONT.)

	Product	Origin-Destination	
		Argentina-Brazil	Brazil-Argentina
14	Oil and gas	0.000	0.000
15	Coal and other	0.000	14.000
16	Non-metallic mineral products	7.331	2.728
17	Basic iron and steel products	0.930	0.954
18	Steel sheet	12.408	13.672
19	Non-ferrous metallurgical products	6.700	7.383
20	Other metallurgical products	10.973	11.546
21	Manufacture and maintenance of machinery and equipment	5.838	2.718
22	Tractors and leveling machines	11.260	5.242
23	Electrical material	7.995	2.058
24	Electronic equipment	4.570	1.176
25	Automobiles, trucks and buses	19.968	12.406
26	Other vehicles and autoparts	5.050	2.954
27	Wood and furniture	9.883	7.319
28	Paper, cellulose, cardboard and articles thereof	2.797	3.685
29	Articles made from rubber	7.461	3.957
30	Non-petrochemical chemical elements	4.075	2.161
31	Alcohol obtained from sugar cane and cereals	0.961	0.509
32	Pure gasoline	8.963	3.310
33	Fuel oils	8.562	3.162
34	Other refinery products	10.793	3.986
35	Basic petrochemical products	6.159	2.275
36	Resins	9.435	3.484
37	Gas-alcohol	0.000	1.817
38	Fertilizers	1.137	0.603
39	Paints	10.626	5.636
40	Other chemical products	9.368	4.969
41	Pharmaceutical and perfume products	5.185	2.750
42	Plastic products	11.256	5.970
43	Natural textile fibers	2.131	2.139
44	Natural fabrics	12.637	12.686
45	Man-made textile fibers	14.034	14.089
46	Man-made fabrics	19.075	19.150
47	Other textile products	25.695	25.796
48	Items of apparel	24.049	27.268
49	Leather and footwear products	16.734	14.963
50	Coffee products	12.892	11.054
51	Refined rice	1.102	0.000
52	Wheat flour	0.139	0.119
53	Other refined vegetable products	8.053	6.905
54	Meat of bovine animals	0.000	4.246
55	Meat of slaughtered birds	4.045	0.867
56	Processed milk	9.428	15.974
57	Other dairy products	7.683	15.974
58	Sugar	20.525	20.525
59	Crude vegetable oils	1.972	1.969
60	Refined vegetable oils	6.369	6.361
61	Other food products, including animal feed	8.532	7.316
62	Beverages	19.515	21.233
63	Miscellaneous products	7.861	10.323

Source: GTAP and IBGE (authors' calculations).

The elimination of import duties in Brazil on products from Argentina is introduced directly by abolishing the import tax on the respective import flow. The EFES-ARG model uses the "tax power" form in modeling import tariffs. If tm^r_j is the percentage *ad-valorem* tariff charged in Brazil on imports of product *j* from external market *r* (Table A1), then the tariff power is given by $TM^r_j = (1+ tm^r_j/100)$. The percentage shock that eliminates the specific tariff means raising the tariff power to1, thus:

$$\Delta TM^r_j = -100\frac{TM^r_j - 1}{TM^r_j} \qquad \text{(A1)}$$

The elimination of tariffs on Brazilian exports to Argentina is approximated via "equivalent export subsidies", using the rates shown in table A1. The value of the subsidy is calculated so as to cancel out the effect of import tariffs in external markets. If t^r_j is the percentage *ad-valorem* tariff in external market *r* for product *j* (Table A1), and p^d_j the (domestic) export price of good *j*, then the price of the exported good in external market *r*, p^r_j, is given by:

$$p^r_j = p^d_j(1+\frac{t^r_j}{100}) \qquad \text{(A2)}$$

The percentage *ad-valorem* subsidy s^r that cancels the effect of the import tariff in the external market is such that:

$$p^r_j = p^d_j(1+\frac{t^r_j}{100})(1-\frac{s^r_j}{100}) \qquad \text{(A3)}$$

$$p^r_j = p^d_j \qquad \text{(A4)}$$

Substituting (A3) in (A4) gives:

$$s^r_j = 100\left[1-(1-\frac{t^r_j}{100})^{-1}\right] \qquad \text{(A5)}$$

Equation (A5) determines the export subsidy on good *j* for market *r* that cancels the effect of the respective import duty. In the simulation, this subsidy is applied on Brazilian exports to Argentina.

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