Export and Regional Growth: A CGE Approach[1]

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ABSTRACT

The relationship between trade and growth has been a familiar topic of discussion in the development literature. More often, the question posed concerns the effects of international trade on economic growth, and thus focuses on trade as an active "agent" of growth. This active role played by international trade can be found in many different models. Todaro (1994) concludes that trade can be an important stimulus to rapid economic growth, although it might not be a desirable strategy for economic and social development. The contribution to development depends on the nature of the export sector, the distribution of its benefits, and the sector's linkages with the rest of the economy. It seems that, to the extent we are only interested in the effects of international trade on pure economic growth, there is a consensus that trade can provide an important stimulus to growth. At the sub-national level, the export base theory provides the foundations to different models of regional development. Recently, however, given the focus on globalization issues and the implicit assumption that a region's economic future is inextricably tied with its ability to compete in the international export market, international trade has attracted the attention of regional analysts as well. In this paper we address some of these issues. An interstate CGE model is implemented to simulate the likely implications of state export growth on the structure of the Brazilian economic interregional system.

Key-words: *regional development, computable general equilibrium, trade.*

Introduction

In the last few years the Brazilian economy have witnessed a process of adjustment that can be resulting from the impacts of globalization, the trade agreements, the creation of free trade areas, for example, the creation of Mercosur in 1990. More recently, Brazil, as a Mercosur member, is negotiating a trade agreement between Mercosur and European Union. Brazil is also involved in the negotiations for the creation of a Free Trade Area in the Americas (FTAA). Among the various adjustments that have been occurred in the Brazilian economy, it is relevant to highlight the shifts in the behavior of Brazilian trade flows. Another important point to emphasize in the recent context of modifications in the Brazilian economy, is the spatially differentiate impact of the globalization process. These can occur because of

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the existence of regional specificities as the productive structure, the productive factors, the process of technological innovation and the degree of regional integration.

The globalization process and strengthen of trade blocks has implemented modifications in the flows of goods and services among the countries. In other words, the globalization plays an important role in the current changes of trade relationships. Thus, the process of development of periphery economies, as Brazilian economy, is occurring in an environment of continuous integration. In order to sustain this path it is necessary to include, in a competitive way, the Brazilian economy in the dynamic flows of trade and investment.

Thus, the dichotomy that is presented to the regional science research agenda in Brazil is the promotion of regional growth in order to diminish the regional disparities that still occur in Brazil and the necessity to insert the Brazilian economy in the world economy. The inclusion of the Brazilian economy in the international context is based on the increase in the competitivity, the reduction in the costs and modifications in the productive sector. It is important to highlight that this process could improve the regional disparities and create certain difficulties of development in the dynamic areas.

Therefore, based both on the idea of expansion in the trade flows, as an important stimulus to regional growth, and on the spatially heterogeneity in the Brazilian development, we have room to develop analytical instruments that will enables us to exam the effects of integration policies upon the Brazilian macro-regions and states.

The main aim of this paper is contribute to better understand the Brazilian states economic interactions[4]. Perobelli and Haddad (2003a) and Perobelli and Haddad (2003b) analyses the structure of internal interactions among the Brazilian states, for the year 1996. In other words the authors analyses the inter-regional and intra-regional interactions. Perobelli (2004) also analyze the external interactions, which means the insertion of each Brazilian state in the international trade. The papers mentioned earlier examining the spatial heterogeneity of interactions. It is important to

[4] It is relevant to highlight that the interactions in this paper will be treated as the trade among the Brazilian states and between the Brazilian states and the rest of the world.

emphasize that those papers contribute to better understand the structure of interactions of the Brazilian states. But, those papers study the Brazilian states trade independently. In this paper we will implement an integrated analysis. This consists on verify which will be the impact of an increase in the international transactions of a specific sector localized in a specific region upon the internal trade flows of the remainder Brazilian states.

The computable general equilibrium framework enables us to take into consideration the substitution between domestic and imported goods, the variation in the relative prices, the possibility of differentiated substitution for the exports goods and etc. It is also important to underline that to analyze more accurate the interdependence among sectors, regions and households it is central to take into account the price differentiation, the production factors mobility and others factors. Thus, the computable general equilibrium framework can be adequate to deal with the spatial interactions among the Brazilian states.

The treatment in an integrated way of the interactions among the Brazilian states using the computable general equilibrium approach is addressed trough a simulation that represents the increase in the exports. In other words, shifts in the exports demand curve for different trade blocks. This simulation enables us to verify which is the mechanism of transmission of this shock in the structure of interactions among the Brazilian states. Hence, we can verify which will be the impact of an increase in the interactions with the external sector upon the economic structure of the Brazilian states (*i.e* product, trade balance, inter-regional and international trade flows).

It is important to underline that the integrated analysis of the interactions enables us to test the hypothesis that the impacts of different economic policies are spatially differentiated. The shift in the exports demand curve for the five trade blocks (Mercosur, European Union, Nafta, rest of FTAA and rest of the world) can be considered as part of the context of recent modifications of the Brazilian economy. In other words, it represents different strategies of regional integration aiming strengthen the impulses for economic growth. The simulation implemented for each one of the five trade blocks illustrate the recent modifications at the Brazilian trade relations, which are inserted in the context of regionalism.

In order to implement the integrated analysis this paper presents in its second section a brief methodological review. The third section presents the model structure. In section four the main results are discussed and in section five we present the final remarks.

2. The B-MARIA27-IT model

In order to evaluate the short-run effects of alternative trade agreements involving Brazil, as a proxy of an increase in the relationships among the Brazilian states and the external sector, upon the regional structure of interactions (*i.e* inter-state trade), a inter-state computable general equilibrium model was developed and implemented (B-MARIA27-IT). The structure of the model represents an extension of B-MARIA27 model (Haddad *et al*, 2003). The model also takes advantage from the structure of SPARTA model (Domingues, 2002) and EFES-IT model (Haddad *et al*, 2002).

Productive sectors, investors, households, federal government, regional government and external sector form the model. There are 8 sectors responsible for the production of 8 goods in each one of the 27 regions. The external sector is divided in five regions: NAFTA, rest of FTAA, European Union, Mercosur and rest of the world.

The mathematical structure of B-MARIA27-IT is based on the MONASH-MRF model for the Australian economy. It qualifies as a Johansen-type model in that the solutions are obtained by solving the system of linearized equations of the model. A typical result shows the percentage change in the set of endogenous variables, after a policy is carried out, compared to their values in the absence of such policy, in a given environment. The schematic presentation of Johansen solutions for such models is standard in the literature. More details can be found in Dixon, Parmenter, Powell, and Wilcoxen (1992).

2.1 Closure

B-MARIA27-IT contains 706,659 equations and 728,189 variables. Thus, to close the model 21,530 variables have to be set exogenously.[5] In order to capture the first-round effects of an increase in the relationship between the Brazilian states and external

[5] The list of the exogenous variables is presented in Appendix.

sector, the simulations were carried out under a standard short-run closure, which considers, from the supply side, fixed capital stocks and given technology, and, from the demand side, exogenously defined domestic absorption.

2.2 Model structure

The functional forms of the main equation of the model, the principal variables and coefficients are presented in the appendix.

2.3 Calibration

The model was calibrated to the year 1996. To implement this step we use data from the absorption matrix and some parameters from the literature and some estimated.

3. Simulation results[6]

In this section, the main results from the simulations are presented. The basic experiment consisted on the evaluation of five alternative scenarios: a) shift the export demand curve for the industrial sector for Mercosur, b) shift the export demand curve for the industrial sector for European Union, c) shift the export demand curve for the industrial sector for NAFTA, d) shift the export demand curve for the agriculture sector for Mercosur, and e) shift the export demand curve for the agriculture sector for European Union. These simulations can be understood as a *proxy* of an increase in the relationship between the Brazilian states and external sector. This exercise will enable us to verify which will be the impact upon the inter-state trade flows of an increase in the international trade flows of each Brazilian state. In other words, we can verify which will be the distribution of benefits from exports.

3.1 Simulation adjustment mechanism

Thus, the shock implemented in the model consists on changing the exports demand curve. This represents the increase in the trade flows toward the external sector that is possible to occur because of an increase in the income of the Brazilian trade partners. This improvement in the income amplifies the demand for Brazilian exports in 1%, for instance. The shift in the exports demand presents some effects upon the production allocation in the economy (*i.e* intermediate consumption and internal

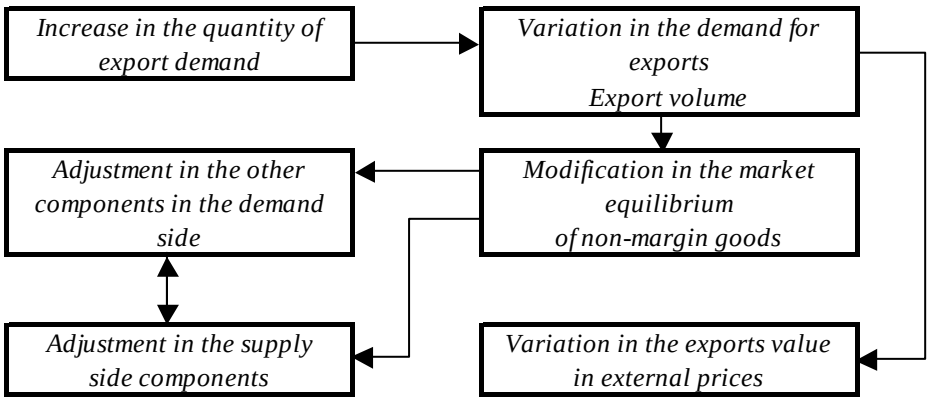
[6] Simulations results were computed using GEMPACK (Harrison and Person, 1994, 1996).

absorption) and upon the gross domestic product (GDP). The immediate consequences can be described as follows:[7]

a) Impact upon the export demand curve. In other words, the impact upon the exports volume. It is important to highlight that the magnitude of the variation in the exports volume also depend on the price of exports products and on the demand elasticity of exports; the price of exports products is affected by the internal costs of production, that are dependent of the relative prices of factors and of the production inputs;
b) The variation in the volume of exports has a direct impact upon the equilibrium between demand and supply in the market of non-margin goods;
c) Adjustment in the non-margin goods by the supply side. The adjustment can be explained as follows: the shift in the demand curve for exports can be understood as an increase in the preference to offer goods in the external markets instead of supply goods in the internal markets. Therefore, it is important to highlight that the reallocation in the sales can be limited by supply restrictions. In other words, by production restrictions, by an increase in the production costs (in the short-run closure the investment and the capital stock are fixed). Thus, it is possible to happen an adjustment in the consumption, investment (only in the long-run), government spending (domestic absorption) and in the inter-regional flows. The adjustment in the inter-regional flows depends on the structure of interactions among the Brazilian states. In other words, sometimes, for a specific region supply the positive variation in the export demand is necessary to buy inputs from other states. So, the intermediate consumption adjustment can be both positive or negative;
d) Upon the inter-regional flows. Another direct impact of the variation in the export volume is the variations in the price of exports.

[7] Letters a, b, c and d are a simple way to describe the modifications that happens after the shock implementation. They do not mean a sequence of facts because in a general equilibrium framework the modifications occur simultaneously in the different markets and equations.

Figure 3.1 Simulation adjustment mechanisms



3.2 Principal results

- *Behavior of internal adjustments at the state level: inter-regional exports*

As showed in the Figure 3.1, one of the impacts of the shift in the exports demand occurs in the equilibrium structure of non-margin goods. The figure shows that the adjustment can occur both on demand side and on supply side. Thus, the adjustments can be captured though the analysis of intermediate consumption (intra-regional and inter-regional trade flows), investment, household consumption and federal and regional government consumption. In this paper we will emphasize the adjustment in the intra and inter-regional trade flows. This aims to capture the impact of an improvement of the interactions between the Brazilian states and external sector upon the spatial structure of interactions of the Brazilian economy. Actually we want to capture the benefits from international export activity at state level.

Thus, we present the results for the inter-regional exports and its spatial decomposition (Harrison et al, 1999). The spatial decomposition enables us to verify which is the contribution of the remainder states (rest of Brazil) for the global results of inter-regional flows for the Sao Paulo state, for example. In other words, the decomposition can be understood as a *proxy* of linkages for the rest of Brazil or a multiplier of inter-regional trade.

The results on Table 3.1 shows that for all Brazilian states there is a positive variation in the regional exports (*dompq210*), because of the shift in the exports demand curve for the industrial sector for Mercosur. The results in Table 3.1 can be understood as

follows: for Acre state, the first column represents the total variation of inter-regional exports of Acre, in percentage terms, and the remainder columns shows the contribution of each state to the positive result (0.0730). In other words, how much of the total impact is dependent of trade between Acre and the rest of Brazil. Thus, we can verify that Sao Paulo contributes with 54.16% of the positive result of Acre. The same analysis is implemented for the others Brazilian states.

The spatial distribution of the positive variation of inter-regional flows can be explained as follows: a) the contribution of the flows toward Sao Paulo is greater than 50% for all of the 27 Brazilian states, including the intra-regional flow (*i.e* interstate); b) in the North region the inter-regional flows are small. The contribution of the remainder states located at North region for the total inter-regional exports is around 1%; c) in the Northeast the inter-regional flows are also small for every state located there, exception for Bahia state. The contribution of Bahia state is around 5%; d) at the Southeast, it is important to highlight the contribution of Minas Gerais (higher than 8% for the rest of the states located at Southeast); e) the contribution of the states located at the South region to the variation of the inter-regional trade of the South's states is around 5%; f) Center-west region presents the same pattern presented by the region North, which means that the contribution of the states located at the Center-west is smaller than 0.8% and g) in the national context, we can emphasize the results of Sao Paulo, Rio Grande do Sul (between 12% and 13%), Minas Gerais (between 7% and 8%), Parana (between 5% and 6%), Santa Catarina (around 5%) and Bahia (between 4% and 5%).

Table 3.2 also reveals that there is a positive variation in the regional exports for every Brazilian state because of the shift in the exports demand curve for the industrial sector for European Union. The spatial distribution of the contribution of each state to the positive variation of inter-regional flows can be described as follows: a) in the national context Sao Paulo is the state that most contribute to the inter-regional trade results of the remainder states (between 25% and 33%); b) the state contribution have a better spatial distribution. We can call attention to Minas Gerais state (between 14% and 19%), Parana (between 12% and 17%) and Rio Grande do Sul (between 9% and 12%); c) at the North region context the state of Para play an

important role The contribution of Para state to the inter-regional exports of the remainder states located at North region is between 12% and 17%; d) in the macro-region scenario Bahia state play an important role; e) the structure of interaction among the states located at Center-west in the simulation with European Union is greater than the structure of interactions presented by the macro-region in the simulation with Mercosur. The contribution of Goias and Mato Grosso state to the results of the remainder Brazilian states increase.

A comparison between the results of the two simulations enables us to affirm that the Mercosur option concentrate more the flows in the Southeast-South of the country than the European Union option. There is some indication of less concentration in the flows in the second option.

From Table 3.3, it is noticeable that for every Brazilian state there is a positive variation in the regional exports because of a shift in the exports demand curve for industrial sector for Nafta. The spatial distribution of the contribution of each state to the positive variation in the inter-regional flows can be explained as follows: a) the Para state presents the biggest contribution, among the states located at North region, to the inter-regional exports of the remainder states located at North region (between 3% and 5%); b) in the Northeast the contribution of the majority of states is small, exception for Bahia; c) in the Southeast macro-regional context we can emphasize the role played by Minas Gerais and Sao Paulo. These states presents a contribution to the flows of the remainder states located at Southeast between 14% and 17% and between 36% and 42%, respectively; d) Rio Grande do Sul is responsible for 18.17% of the total flows of Parana and 18.69% of the total flows of Santa Catarina; e) in the Center-west region the inter-regional flows are small; f) in the national context the states that most contribute to the inter-regional flows of the remainder states are: Sao Paulo, Rio Grande do Sul and Minas Gerais.

Table 3.4 shows the results of a shift in the exports demand curve for agriculture sector for Mercosul. The main results are: a) the increase of importance of the states of Mato Grosso and Mato Grosso do Sul in the national context; b) the contribution of Parana and Rio Grande do Sul states to the remainder states of the Brazilian economy; c) the lost of importance of the contribution of Sao Paulo in the national context; d) in

the North region the inter-regional flows are incipient. In other words, the contribution of the remainder states located at North region to the total inter-regional exports is lower than 0.05%; e) in the Northeast it is significant to highlight the importance of Bahia, Ceara and Rio Grande do Norte to the flows of the remainder states located at Northeast.

Table 3.5 reveals the results of decomposition of inter-regional flows for the simulation of a shift in the exports demand curve of agriculture sector for European Union. We can emphasize the following results: a) Parana is the state that most contribute, in the national context, to the variation of inter-regional flows of the remainder Brazilian states; b) the contribution of Mato Grosso state to the rest of the Brazilian states; c) the lost of relative importance of the Sao Paulo state in the national context; d) the increase in the relative importance of Bahia, Ceara, Maranhao, Pernambuco and Rio Grande do Norte in the macro-regional context.

Table 3.1 Mercosur (Industry): Regional decomposition of percentage variation of inter-regional exports (%)

(Continue)

	domp210 (var %)	*AC*	*AP*	*AM*	*PA*	*RO*	*RR*	*TO*	*AL*	*BA*	*CE*	*MA*	*PB*	*PE*	*PI*	*RN*	*SE*
AC	0.0730	-	0.01	0.49	0.35	0.02	0.00	0.00	0.09	4.71	0.65	0.51	0.05	0.63	0.01	0.05	0.22
AP	0.0810	0.00	-	0.49	0.36	0.02	0.00	0.00	0.09	4.81	0.70	0.52	0.05	0.68	0.01	0.06	0.23
AM	0.0780	0.00	0.01	-	0.34	0.02	0.00	0.00	0.09	5.00	0.74	0.50	0.05	0.65	0.01	0.06	0.23
PA	0.0727	0.00	0.01	0.47	-	0.02	0.00	0.00	0.10	4.94	0.81	0.85	0.05	0.71	0.01	0.06	0.23
RO	0.0733	0.00	0.01	0.48	0.35	-	0.00	0.00	0.09	4.50	0.65	0.50	0.05	0.61	0.01	0.05	0.22
RR	0.0772	0.00	0.01	0.49	0.35	0.02	-	0.00	0.09	4.88	0.68	0.52	0.05	0.73	0.01	0.06	0.23
TO	0.0726	0.00	0.01	0.48	0.55	0.02	0.00	0.00	0.10	4.88	0.89	0.57	0.05	0.77	0.01	0.06	0.24
AL	0.0750	0.00	0.01	0.48	0.39	0.02	0.00	0.00	-	6.68	0.83	0.69	0.06	0.97	0.01	0.06	0.29
BA	0.0703	0.00	0.01	0.52	0.40	0.02	0.00	0.00	0.14	-	0.86	0.61	0.06	0.94	0.01	0.07	0.27
CE	0.0715	0.00	0.02	0.47	0.45	0.02	0.00	0.00	0.11	5.19	-	0.82	0.07	0.88	0.02	0.10	0.25
MA	0.0735	0.00	0.01	0.50	0.71	0.02	0.00	0.00	0.12	5.74	1.03	-	0.06	0.86	0.01	0.06	0.26
PB	0.0746	0.00	0.01	0.48	0.39	0.02	0.00	0.00	0.19	5.36	0.94	0.64	-	1.08	0.01	0.10	0.28
PE	0.0713	0.00	0.01	0.48	0.42	0.02	0.00	0.00	0.20	5.54	0.97	0.68	0.08	-	0.01	0.09	0.28
PI	0.0731	0.00	0.01	0.49	0.63	0.02	0.00	0.00	0.10	5.17	1.06	0.58	0.05	0.79	-	0.06	0.24
RN	0.0722	0.00	0.01	0.51	0.37	0.02	0.00	0.00	0.11	5.54	0.97	0.55	0.06	0.82	0.01	-	0.25
SE	0.0726	0.00	0.01	0.49	0.39	0.02	0.00	0.00	0.19	6.54	0.79	0.60	0.06	0.82	0.01	0.06	-
ES	0.0785	0.00	0.01	0.50	0.38	0.02	0.00	0.00	0.12	5.28	0.73	0.57	0.05	0.72	0.01	0.06	0.25
MG	0.0735	0.00	0.01	0.50	0.40	0.02	0.00	0.00	0.10	5.13	0.73	0.59	0.05	0.71	0.01	0.06	0.24
RJ	0.0751	0.00	0.01	0.49	0.37	0.02	0.00	0.00	0.10	5.14	0.71	0.56	0.05	0.69	0.01	0.06	0.23
SP	0.0724	0.00	0.01	0.48	0.43	0.02	0.00	0.00	0.11	5.31	0.80	0.63	0.06	0.78	0.01	0.06	0.25
PR	0.0732	0.00	0.01	0.50	0.39	0.03	0.00	0.00	0.10	4.91	0.71	0.56	0.05	0.69	0.01	0.06	0.24
SC	0.0716	0.00	0.02	0.51	0.40	0.03	0.00	0.00	0.10	5.19	0.77	0.59	0.05	0.73	0.01	0.06	0.25
RS	0.0708	0.00	0.01	0.55	0.42	0.03	0.00	0.00	0.11	5.52	0.83	0.64	0.06	0.77	0.01	0.07	0.26
DF	0.0767	0.00	0.01	0.48	0.37	0.02	0.00	0.00	0.08	4.54	0.67	0.52	0.05	0.63	0.01	0.05	0.22
GO	0.0741	0.00	0.01	0.47	0.36	0.02	0.00	0.00	0.09	4.62	0.66	0.52	0.04	0.63	0.01	0.06	0.22
MT	0.0749	0.00	0.01	0.47	0.36	0.04	0.00	0.00	0.09	4.58	0.67	0.53	0.05	0.63	0.01	0.05	0.23
MS	0.0727	0.00	0.01	0.51	0.36	0.03	0.00	0.00	0.09	4.69	0.67	0.52	0.05	0.64	0.01	0.06	0.23

Source: Based on the model results

Table 3.1 Mercosur (Industry): Regional decomposition of percentage variation of inter-regional exports (%)

	domp210 (var %)	*ES*	*MG*	*RJ*	*SP*	*PR*	*SC*	*RS*	*DF*	*GO*	*MT*	*MS*
AC	0.0730	1.60	8.31	3.36	54.16	6.56	5.01	12.14	0.00	0.37	0.02	0.70
AP	0.0810	1.58	7.46	3.43	54.80	6.68	5.51	12.41	0.00	0.33	0.01	0.67
AM	0.0780	1.53	7.47	3.22	56.71	6.09	5.04	12.23	0.00	0.32	0.02	0.65
PA	0.0727	1.62	7.52	3.34	54.53	6.68	5.39	12.22	0.00	0.38	0.02	0.66
RO	0.0733	1.55	7.48	3.29	54.46	7.32	5.31	12.27	0.00	0.36	0.03	0.74
RR	0.0772	1.61	7.40	3.42	54.90	6.55	5.25	12.39	0.00	0.35	0.02	0.69
TO	0.0726	1.60	7.03	3.33	54.07	6.68	5.36	12.28	0.00	0.32	0.02	0.66
AL	0.0750	1.51	7.52	3.30	53.76	6.22	5.06	12.06	0.00	0.33	0.01	0.62
BA	0.0703	1.71	7.95	3.46	58.45	6.67	5.44	12.82	0.00	0.36	0.02	0.68
CE	0.0715	1.59	7.72	3.39	54.99	6.44	5.31	12.28	0.00	0.35	0.02	0.65
MA	0.0735	1.69	7.81	3.42	56.61	7.01	5.62	12.86	0.00	0.38	0.02	0.67
PB	0.0746	1.60	7.52	3.26	53.95	6.31	5.20	12.13	0.00	0.34	0.01	0.63
PE	0.0713	1.66	7.69	3.40	54.50	6.43	5.36	12.37	0.00	0.34	0.02	0.64
PI	0.0731	1.55	7.47	3.28	53.87	6.33	5.25	12.25	0.00	0.34	0.02	0.63
RN	0.0722	1.54	7.46	3.27	54.67	6.08	5.08	12.17	0.00	0.33	0.02	0.65
SE	0.0726	1.65	7.70	3.41	54.58	6.30	5.33	12.29	0.00	0.34	0.02	0.64
ES	0.0785	-	8.14	3.50	56.36	6.64	5.38	12.47	0.00	0.37	0.02	0.69
MG	0.0735	1.73	3.56	3.49	56.69	6.78	5.46	12.58	0.00	0.42	0.02	0.70
RJ	0.0751	1.63	8.07	0.78	56.08	6.41	5.14	12.38	0.00	0.36	0.02	0.67
SP	0.0724	1.67	8.41	3.65	50.43	6.84	5.64	13.21	0.00	0.41	0.02	0.78
PR	0.0732	1.65	8.00	3.54	56.99	2.27	5.05	13.01	0.00	0.40	0.02	0.83
SC	0.0716	1.70	8.23	3.55	58.17	7.59	-	13.22	0.00	0.40	0.02	0.75
RS	0.0708	1.79	8.49	3.68	61.32	7.24	5.52	1.48	0.00	0.41	0.02	0.78
DF	0.0767	1.51	7.49	3.53	55.14	6.20	5.29	12.25	0.00	0.27	0.01	0.65
GO	0.0741	1.62	7.62	3.40	54.60	6.73	5.43	12.23	0.00	-	0.02	0.68
MT	0.0749	1.61	7.60	3.36	53.75	6.99	5.40	12.18	0.00	0.58	-	0.82
MS	0.0727	1.63	7.69	3.38	56.31	6.89	5.37	12.51	0.00	0.38	0.02	-

Source: Based on the model results

Table 3.2 European Union (Industry): Regional decomposition of percentage variation of inter-regional exports (%)

(Continue)

	domp210 (var %)	*AC*	*AP*	*AM*	*PA*	*RO*	*RR*	*TO*	*AL*	*BA*	*CE*	*MA*	*PB*	*PE*	*PI*	*RN*	*SE*
AC	0.1227	-	0.13	0.17	7.84	0.00	0.00	0.00	0.13	3.63	0.24	0.86	0.28	0.48	0.20	0.12	0.26
AP	0.1216	0.00	-	0.19	9.11	0.00	0.00	0.00	0.15	4.15	0.28	0.99	0.33	0.58	0.23	0.14	0.29
AM	0.1274	0.00	0.13	-	7.92	0.00	0.00	0.00	0.13	3.96	0.28	0.87	0.31	0.51	0.21	0.13	0.27
PA	0.0954	0.00	0.17	0.21	-	0.00	0.00	0.00	0.19	4.87	0.38	1.83	0.39	0.69	0.39	0.18	0.34
RO	0.1259	0.00	0.12	0.17	7.67	-	0.00	0.00	0.12	3.39	0.23	0.82	0.27	0.45	0.19	0.12	0.24
RR	0.1285	0.00	0.14	0.17	7.95	0.00	-	0.00	0.13	3.80	0.25	0.89	0.30	0.56	0.20	0.13	0.27
TO	0.1253	0.00	0.13	0.17	12.01	0.00	0.00	-	0.13	3.67	0.32	0.94	0.32	0.57	0.23	0.13	0.26
AL	0.1240	0.00	0.14	0.17	9.07	0.00	0.00	0.00	-	5.24	0.30	1.19	0.38	0.75	0.26	0.15	0.33
BA	0.1180	0.00	0.15	0.18	9.05	0.00	0.00	0.00	0.20	-	0.31	1.03	0.39	0.72	0.28	0.16	0.31
CE	0.1229	0.00	0.17	0.16	9.94	0.00	0.00	0.00	0.16	3.92	-	1.35	0.40	0.66	0.48	0.23	0.28
MA	0.1266	0.00	0.14	0.17	15.69	0.00	0.00	0.00	0.17	4.32	0.37	-	0.37	0.64	0.26	0.14	0.29
PB	0.1212	0.00	0.15	0.17	9.20	0.00	0.00	0.00	0.28	4.27	0.35	1.13	-	0.85	0.28	0.24	0.33
PE	0.1207	0.00	0.15	0.17	9.41	0.00	0.00	0.00	0.29	4.25	0.35	1.15	0.50	-	0.28	0.21	0.32
PI	0.1222	0.00	0.13	0.17	14.24	0.00	0.00	0.00	0.14	4.00	0.39	0.99	0.33	0.61	-	0.14	0.27
RN	0.1178	0.00	0.13	0.19	8.51	0.00	0.00	0.00	0.16	4.40	0.36	0.95	0.41	0.64	0.25	-	0.30
SE	0.1202	0.00	0.15	0.18	8.84	0.00	0.00	0.00	0.28	5.12	0.29	1.02	0.36	0.63	0.25	0.14	-
ES	0.1208	0.00	0.16	0.19	9.46	0.00	0.00	0.00	0.19	4.45	0.29	1.05	0.35	0.60	0.24	0.15	0.31
MG	0.1182	0.00	0.15	0.18	9.37	0.00	0.00	0.00	0.15	4.13	0.28	1.05	0.33	0.57	0.24	0.14	0.29
RJ	0.1267	0.00	0.14	0.17	8.43	0.00	0.00	0.00	0.14	3.95	0.26	0.94	0.31	0.52	0.22	0.13	0.27
SP	0.1271	0.00	0.15	0.16	9.21	0.00	0.00	0.00	0.14	3.92	0.28	1.01	0.33	0.57	0.24	0.14	0.27
PR	0.1178	0.00	0.15	0.18	9.14	0.00	0.00	0.00	0.14	3.95	0.27	0.99	0.32	0.55	0.23	0.14	0.28
SC	0.1174	0.00	0.17	0.18	9.28	0.00	0.00	0.00	0.15	4.10	0.29	1.03	0.34	0.57	0.24	0.14	0.29
RS	0.1207	0.00	0.16	0.19	9.42	0.00	0.00	0.00	0.15	4.19	0.30	1.07	0.34	0.57	0.24	0.15	0.30
DF	0.1255	0.00	0.14	0.17	8.52	0.00	0.00	0.00	0.12	3.60	0.25	0.90	0.30	0.49	0.21	0.13	0.26
GO	0.1218	0.00	0.14	0.17	8.21	0.00	0.00	0.00	0.13	3.64	0.25	0.91	0.28	0.49	0.20	0.13	0.26
MT	0.1226	0.00	0.14	0.17	8.38	0.00	0.00	0.00	0.13	3.62	0.25	0.92	0.29	0.49	0.20	0.13	0.27
MS	0.1183	0.00	0.15	0.19	8.33	0.00	0.00	0.00	0.13	3.73	0.25	0.91	0.30	0.50	0.21	0.13	0.27

Source: Based on the model results

Table 3.2 European Union (Industry): Regional decomposition of percentage variation of inter-regional exports (%)

	domp210 (var%)	*ES*	*MG*	*RJ*	*SP*	*PR*	*SC*	*RS*	*DF*	*GO*	*MT*	*MS*
AC	0.1227	4.76	16.60	1.32	25.82	13.34	6.96	9.91	0.00	2.13	3.44	1.51
AP	0.1216	5.25	16.69	1.50	29.25	15.22	8.57	11.34	0.00	2.16	3.18	1.60
AM	0.1274	4.67	15.36	1.30	27.81	12.74	7.20	10.27	0.00	1.90	2.96	1.43
PA	0.0954	6.16	19.25	1.67	33.29	17.41	9.58	12.78	0.00	2.83	3.83	1.80
RO	0.1259	4.51	14.63	1.26	25.42	14.58	7.22	9.80	0.00	2.05	5.17	1.55
RR	0.1285	4.83	14.94	1.35	26.45	13.46	7.36	10.22	0.00	2.04	3.07	1.49
TO	0.1253	4.64	13.69	1.27	25.13	13.23	7.26	9.77	0.00	1.83	3.03	1.38
AL	0.1240	4.56	15.28	1.32	26.06	12.87	7.15	10.01	0.00	1.94	2.78	1.34
BA	0.1180	5.07	15.91	1.36	27.90	13.59	7.56	10.48	0.00	2.06	2.97	1.46
CE	0.1229	4.60	15.10	1.30	25.65	12.82	7.22	9.81	0.00	1.98	2.81	1.35
MA	0.1266	4.90	15.24	1.31	26.36	13.93	7.63	10.26	0.00	2.14	3.33	1.41
PB	0.1212	4.92	15.54	1.32	26.62	13.29	7.47	10.25	0.00	2.02	2.86	1.39
PE	0.1207	4.89	15.26	1.32	25.81	13.00	7.39	10.03	0.00	1.98	2.80	1.35
PI	0.1222	4.63	15.00	1.29	25.82	12.95	7.33	10.05	0.00	1.96	2.85	1.35
RN	0.1178	4.73	15.36	1.32	26.87	12.75	7.28	10.24	0.00	1.94	2.93	1.42
SE	0.1202	4.99	15.62	1.36	26.42	13.01	7.51	10.19	0.00	2.02	2.85	1.38
ES	0.1208	-	17.76	1.50	29.34	14.76	8.15	11.12	0.00	2.37	3.36	1.61
MG	0.1182	5.38	7.43	1.43	28.25	14.41	7.92	10.74	0.00	2.54	3.45	1.57
RJ	0.1267	4.83	16.07	0.30	26.65	13.00	7.12	10.08	0.00	2.10	2.94	1.43
SP	0.1271	4.74	16.07	1.37	23.01	13.33	7.49	10.32	0.00	2.30	3.33	1.60
PR	0.1178	5.12	16.68	1.45	28.37	4.83	7.33	11.09	0.00	2.41	4.53	1.85
SC	0.1174	5.17	16.86	1.43	28.44	15.85	-	11.07	0.00	2.36	3.71	1.65
RS	0.1207	5.22	16.72	1.42	28.80	14.51	7.55	1.19	0.00	2.34	3.50	1.65
DF	0.1255	4.61	15.37	1.42	27.01	12.95	7.55	10.28	0.00	1.61	2.68	1.44
GO	0.1218	4.91	15.56	1.36	26.61	14.00	7.71	10.20	0.00	-	3.64	1.49
MT	0.1226	4.91	15.60	1.35	26.32	14.61	7.71	10.21	0.00	3.47	-	1.79
MS	0.1183	5.01	15.87	1.37	27.73	14.47	7.70	10.55	0.00	2.29	4.42	-

Source: Based on the model results

Table 3.3 NAFTA (Industry): Regional decomposition of percentage variation of inter-regional exports (%)

(Continue)

	domp210 (var %)	*AC*	*AP*	*AM*	*PA*	*RO*	*RR*	*TO*	*AL*	*BA*	*CE*	*MA*	*PB*	*PE*	*PI*	*RN*	*SE*
AC	0.1006	-	0.05	0.34	3.83	0.06	0.01	0.00	0.83	5.26	0.62	0.75	0.20	0.81	0.13	0.17	0.09
AP	0.1079	0.01	-	0.36	4.11	0.06	0.01	0.00	0.87	5.56	0.69	0.80	0.22	0.90	0.14	0.18	0.09
AM	0.1068	0.01	0.05	-	3.78	0.06	0.01	0.00	0.86	5.63	0.71	0.74	0.22	0.83	0.14	0.17	0.09
PA	0.0905	0.01	0.06	0.36	-	0.07	0.01	0.00	1.06	6.11	0.85	1.38	0.24	1.01	0.23	0.21	0.10
RO	0.0997	0.01	0.05	0.34	3.87	-	0.01	0.00	0.81	5.10	0.63	0.74	0.20	0.79	0.13	0.17	0.09
RR	0.1049	0.01	0.05	0.35	3.90	0.06	-	0.00	0.87	5.53	0.66	0.77	0.22	0.95	0.14	0.18	0.09
TO	0.1018	0.01	0.05	0.33	5.92	0.06	0.01	0.00	0.89	5.37	0.84	0.82	0.23	0.97	0.16	0.18	0.09
AL	0.0957	0.01	0.06	0.36	4.70	0.06	0.01	0.00	-	8.07	0.85	1.10	0.29	1.35	0.19	0.22	0.12
BA	0.0966	0.01	0.06	0.36	4.42	0.06	0.01	0.00	1.32	-	0.82	0.89	0.28	1.21	0.19	0.22	0.11
CE	0.1003	0.01	0.07	0.32	4.88	0.06	0.01	0.00	1.03	5.71	-	1.18	0.29	1.11	0.33	0.32	0.10
MA	0.1024	0.01	0.05	0.35	7.77	0.06	0.01	0.00	1.09	6.36	0.98	-	0.27	1.08	0.17	0.20	0.10
PB	0.1028	0.01	0.06	0.34	4.34	0.06	0.01	0.00	1.73	5.99	0.90	0.95	-	1.38	0.18	0.32	0.11
PE	0.1000	0.01	0.06	0.33	4.54	0.05	0.00	0.00	1.83	6.09	0.91	0.99	0.35	-	0.19	0.29	0.11
PI	0.1006	0.01	0.05	0.35	6.93	0.06	0.01	0.00	0.93	5.79	1.02	0.86	0.24	1.01	-	0.19	0.09
RN	0.0986	0.01	0.05	0.36	4.07	0.05	0.01	0.00	1.02	6.26	0.94	0.81	0.29	1.06	0.16	-	0.10
SE	0.1033	0.01	0.05	0.33	4.11	0.05	0.01	0.00	1.71	7.08	0.73	0.85	0.25	1.02	0.16	0.19	-
ES	0.0933	0.01	0.06	0.41	4.90	0.07	0.01	0.00	1.33	6.85	0.81	0.97	0.27	1.07	0.17	0.22	0.11
MG	0.0982	0.01	0.06	0.36	4.51	0.06	0.01	0.00	0.96	5.92	0.72	0.90	0.23	0.94	0.16	0.19	0.10
RJ	0.1042	0.01	0.05	0.34	4.10	0.06	0.01	0.00	0.89	5.71	0.68	0.82	0.22	0.87	0.15	0.18	0.09
SP	0.1032	0.01	0.06	0.33	4.54	0.06	0.01	0.00	0.94	5.74	0.74	0.89	0.24	0.96	0.16	0.19	0.10
PR	0.1028	0.01	0.05	0.34	4.19	0.07	0.01	0.00	0.87	5.38	0.67	0.81	0.22	0.86	0.14	0.18	0.09
SC	0.0995	0.01	0.06	0.35	4.38	0.07	0.01	0.00	0.95	5.76	0.73	0.87	0.24	0.93	0.16	0.19	0.10
RS	0.0927	0.01	0.07	0.41	4.91	0.07	0.01	0.00	1.06	6.49	0.83	0.99	0.27	1.03	0.18	0.21	0.11
DF	0.1051	0.01	0.05	0.34	4.07	0.05	0.00	0.00	0.79	5.11	0.64	0.77	0.21	0.81	0.14	0.17	0.09
GO	0.1019	0.01	0.05	0.33	3.93	0.06	0.01	0.00	0.81	5.18	0.64	0.77	0.20	0.81	0.13	0.17	0.09
MT	0.1030	0.01	0.05	0.33	3.99	0.10	0.01	0.00	0.82	5.13	0.64	0.78	0.20	0.80	0.13	0.17	0.09
MS	0.1024	0.01	0.05	0.35	3.85	0.07	0.01	0.00	0.81	5.13	0.63	0.75	0.20	0.80	0.13	0.17	0.09

Source: Based on the model results

Table 3.3 NAFTA (Industry): Regional decomposition of percentage variation of inter-regional exports (%)

	domp210 (var%)	*ES*	*MG*	*RJ*	*SP*	*PR*	*SC*	*RS*	*DF*	*GO*	*MT*	*MS*
AC	0.1006	7.47	15.28	2.95	35.24	3.94	4.59	17.31	0.00	0.45	0.17	0.01
AP	0.1079	7.61	14.19	3.11	36.87	4.15	5.22	18.29	0.00	0.42	0.15	0.01
AM	0.1068	7.17	13.83	2.85	37.13	3.68	4.65	17.55	0.00	0.39	0.15	0.01
PA	0.0905	8.35	15.31	3.24	39.25	4.44	5.46	19.28	0.00	0.51	0.17	0.01
RO	0.0997	7.32	13.93	2.92	35.90	4.45	4.93	17.72	0.00	0.45	0.27	0.01
RR	0.1049	7.61	13.81	3.04	36.23	3.99	4.88	17.91	0.00	0.43	0.16	0.01
TO	0.1018	7.35	12.72	2.87	34.59	3.94	4.83	17.22	0.00	0.39	0.15	0.01
AL	0.0957	7.60	14.94	3.13	37.76	4.03	5.01	18.56	0.00	0.43	0.15	0.01
BA	0.0966	7.96	14.66	3.04	38.11	4.01	4.99	18.32	0.00	0.43	0.15	0.01
CE	0.1003	7.26	13.96	2.92	35.16	3.80	4.79	17.21	0.00	0.42	0.14	0.01
MA	0.1024	7.80	14.22	2.97	36.46	4.17	5.10	18.15	0.00	0.46	0.17	0.01
PB	0.1028	7.46	13.83	2.86	35.12	3.79	4.77	17.29	0.00	0.41	0.14	0.01
PE	0.1000	7.59	13.89	2.93	34.84	3.79	4.82	17.32	0.00	0.41	0.14	0.01
PI	0.1006	7.24	13.75	2.88	35.08	3.81	4.82	17.48	0.00	0.41	0.14	0.01
RN	0.0986	7.27	13.84	2.89	35.90	3.69	4.70	17.51	0.00	0.40	0.14	0.01
SE	0.1033	7.46	13.70	2.89	34.36	3.66	4.72	16.96	0.00	0.41	0.14	0.01
ES	0.0933	-	17.35	3.56	42.50	4.62	5.71	20.60	0.00	0.53	0.18	0.01
MG	0.0982	8.34	6.75	3.16	38.05	4.20	5.16	18.50	0.00	0.53	0.17	0.01
RJ	0.1042	7.55	14.74	0.68	36.23	3.82	4.68	17.53	0.00	0.44	0.15	0.01
SP	0.1032	7.51	14.93	3.09	31.69	3.97	4.99	18.18	0.00	0.49	0.17	0.01
PR	0.1028	7.54	14.41	3.04	36.35	1.34	4.54	18.17	0.00	0.48	0.21	0.01
SC	0.0995	7.85	15.00	3.09	37.52	4.52	-	18.69	0.00	0.48	0.18	0.01
RS	0.0927	8.75	16.43	3.40	41.95	4.57	5.32	2.22	0.00	0.53	0.19	0.01
DF	0.1051	7.08	13.84	3.11	36.07	3.74	4.87	17.56	0.00	0.33	0.13	0.01
GO	0.1019	7.56	14.04	2.99	35.59	4.05	4.99	17.46	0.00	-	0.18	0.01
MT	0.1030	7.51	14.00	2.95	35.04	4.21	4.96	17.39	0.00	0.71	-	0.01
MS	0.1024	7.44	13.83	2.90	35.83	4.04	4.81	17.44	0.00	0.46	0.21	-

Source: Based on the model results

Table 3.4 Mercosur (Agriculture): Regional decomposition of percentage variation of inter-regional exports (%)

(Continue)

	domp210 (var %)	*AC*	*AP*	*AM*	*PA*	*RO*	*RR*	*TO*	*AL*	*BA*	*CE*	*MA*	*PB*	*PE*	*PI*	*RN*	*SE*
AC	0.0019	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	2.26	2.53	0.00	0.11	0.05	0.00	1.56	0.16
AP	0.0021	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	2.14	2.38	0.00	0.10	0.05	0.00	1.52	0.14
AM	0.0014	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.14	2.14	0.00	0.07	0.07	0.00	1.62	0.15
PA	0.0023	0.00	0.00	0.04	-	0.00	0.00	0.00	0.00	2.19	2.32	0.00	0.09	0.04	0.00	1.67	0.13
RO	0.0017	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	2.22	2.52	0.00	0.12	0.06	0.00	1.56	0.12
RR	0.0022	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	2.20	2.46	0.00	0.09	0.04	0.00	1.52	0.13
TO	0.0023	0.00	0.00	0.04	0.00	0.00	0.00	-	0.00	2.20	1.98	0.00	0.09	0.04	0.00	1.45	0.18
AL	0.0016	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	2.00	2.32	0.00	0.06	0.06	0.00	1.61	0.06
BA	0.0016	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	2.28	0.00	0.12	0.06	0.00	1.66	0.12
CE	0.0015	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	2.27	-	0.00	0.07	0.07	0.00	2.34	0.14
MA	0.0022	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	2.13	1.99	0.00	0.09	0.05	0.00	1.48	0.14
PB	0.0016	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	2.19	2.19	0.00	-	0.06	0.00	2.55	0.12
PE	0.0015	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	2.15	2.15	0.00	0.07	-	0.00	2.28	0.13
PI	0.0016	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	2.23	1.68	0.00	0.12	0.06	0.00	1.55	0.19
RN	0.0013	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	2.27	1.09	0.00	0.08	0.08	0.00	-	0.16
SE	0.0015	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	2.14	2.40	0.00	0.13	0.06	0.00	1.69	-
ES	0.0018	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	2.14	2.42	0.00	0.11	0.06	0.00	1.57	0.11
MG	0.0017	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	2.21	2.44	0.00	0.12	0.06	0.00	1.63	0.12
RJ	0.0015	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	2.15	2.47	0.00	0.13	0.07	0.00	1.56	0.13
SP	0.0015	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	2.15	2.48	0.00	0.13	0.07	0.00	1.57	0.13
PR	0.0016	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	2.42	2.74	0.00	0.13	0.06	0.00	1.78	0.13
SC	0.0017	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	2.23	2.47	0.00	0.12	0.06	0.00	1.63	0.12
RS	0.0019	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	2.24	2.45	0.00	0.11	0.05	0.00	1.65	0.16
DF	0.0016	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	2.21	2.76	0.00	0.12	0.06	0.00	1.66	0.12
GO	0.0021	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	2.26	2.50	0.00	0.09	0.05	0.00	1.56	0.14
MT	0.0018	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	2.51	2.90	0.00	0.11	0.06	0.00	1.78	0.17
MS	0.0011	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	4.01	4.47	0.00	0.18	0.09	0.00	2.83	0.27

Source: Based on the model results

Table 3.4 Mercosur (Agriculture): Regional decomposition of percentage variation of inter-regional exports (%)

	domp210 (var%)	*ES*	*MG*	*RJ*	*SP*	*PR*	*SC*	*RS*	*DF*	*GO*	*MT*	*MS*
AC	0.0019	0.32	5.64	0.05	24.18	19.88	5.05	11.34	0.00	0.81	9.35	16.66
AP	0.0021	0.33	6.04	0.05	24.01	19.88	5.37	11.32	0.00	0.67	9.13	16.83
AM	0.0014	0.37	6.04	0.00	23.71	20.25	5.23	10.68	0.00	0.66	9.28	17.53
PA	0.0023	0.34	6.18	0.04	24.12	19.40	5.15	11.76	0.00	0.77	9.44	16.31
RO	0.0017	0.36	6.01	0.06	24.08	19.94	5.23	10.99	0.00	0.66	9.31	16.82
RR	0.0022	0.36	6.05	0.04	24.15	19.22	5.11	11.60	0.00	0.76	9.41	16.89
TO	0.0023	0.35	5.72	0.04	23.95	19.59	5.11	11.62	0.00	0.79	10.39	16.47
AL	0.0016	0.32	6.05	0.06	23.95	19.77	5.22	10.88	0.00	0.64	9.59	17.32
BA	0.0016	0.37	6.15	0.06	24.72	20.36	5.35	11.13	0.00	0.68	9.53	17.47
CE	0.0015	0.34	6.19	0.00	24.62	20.63	5.43	11.28	0.00	0.69	9.90	18.09
MA	0.0022	0.37	5.88	0.05	24.18	19.92	5.23	11.81	0.00	0.74	9.50	16.35
PB	0.0016	0.36	5.90	0.06	23.53	19.76	5.17	11.12	0.00	0.73	9.54	16.96
PE	0.0015	0.33	5.92	0.00	23.73	19.77	5.27	10.79	0.00	0.65	9.49	17.36
PI	0.0016	0.37	5.96	0.06	23.71	19.93	5.28	11.42	0.00	0.74	9.50	17.19
RN	0.0013	0.39	6.49	0.00	25.96	21.58	5.63	11.57	0.00	0.70	10.09	18.84
SE	0.0015	0.32	5.98	0.06	24.04	19.62	5.33	11.05	0.00	0.65	9.68	17.67
ES	0.0018	-	6.13	0.06	25.01	20.29	5.34	10.51	0.00	0.62	8.99	16.64
MG	0.0017	0.35	4.48	0.06	24.53	20.35	5.35	11.10	0.00	0.64	9.36	17.15
RJ	0.0015	0.33	6.05	0.00	24.25	20.03	5.20	10.53	0.00	0.59	9.17	17.30
SP	0.0015	0.33	5.94	0.07	23.35	19.90	5.28	10.89	0.00	0.65	9.52	17.48
PR	0.0016	0.38	6.62	0.06	26.73	12.60	5.54	11.78	0.00	0.70	10.18	18.20
SC	0.0017	0.36	6.33	0.06	25.30	20.78	1.99	11.08	0.00	0.66	9.58	17.11
RS	0.0019	0.37	6.34	0.05	25.32	20.42	5.28	7.78	0.00	0.75	9.81	17.22
DF	0.0016	0.31	5.77	0.06	23.25	19.69	5.21	10.74	0.00	0.49	8.90	18.65
GO	0.0021	0.33	5.89	0.05	24.33	19.94	5.23	11.60	0.00	0.00	9.29	16.74
MT	0.0018	0.39	6.97	0.06	28.11	22.48	6.08	12.99	0.00	0.84	-	19.13
MS	0.0011	0.64	11.41	0.09	45.89	36.50	9.76	21.17	0.00	1.28	17.70	-

Source: Based on the model results

Table 3.5 European Union (Agriculture): Regional decomposition of percentage variation of inter-regional exports (%)

(Continue)

	domp210 (var%)	*AC*	*AP*	*AM*	*PA*	*RO*	*RR*	*TO*	*AL*	*BA*	*CE*	*MA*	*PB*	*PE*	*PI*	*RN*	*SE*
AC	0.0332	-	0.00	0.21	0.85	0.00	0.00	0.07	0.00	2.36	1.85	3.53	0.06	1.40	0.26	2.26	0.00
AP	0.0373	0.01	0.00	0.21	0.82	0.00	0.00	0.06	0.00	2.26	1.75	3.47	0.06	1.35	0.25	2.23	0.00
AM	0.0243	0.01	0.00	0.11	0.84	0.00	0.00	0.07	0.00	2.24	1.55	3.80	0.06	1.45	0.27	2.32	0.00
PA	0.0397	0.01	0.00	0.22	-	0.00	0.00	0.07	0.00	2.40	1.77	2.28	0.06	1.38	0.18	2.52	0.00
RO	0.0297	0.01	0.00	0.21	0.81	0.00	0.00	0.06	0.00	2.29	1.83	3.52	0.06	1.43	0.26	2.26	0.00
RR	0.0393	0.01	0.00	0.22	0.86	0.00	0.00	0.07	0.00	2.33	1.82	3.38	0.06	1.28	0.25	2.23	0.00
TO	0.0398	0.01	0.00	0.21	0.33	0.00	0.00	-	0.00	2.34	1.46	3.24	0.06	1.30	0.24	2.17	0.00
AL	0.0274	0.01	0.00	0.23	0.77	0.00	0.00	0.07	0.00	2.12	1.71	3.07	0.05	1.13	0.23	2.34	0.00
BA	0.0288	0.01	0.00	0.22	0.80	0.00	0.00	0.07	0.00	-	1.69	3.39	0.06	1.28	0.22	2.41	0.00
CE	0.0260	0.01	0.00	0.22	0.77	0.00	0.00	0.07	0.00	2.38	-	2.89	0.06	1.47	0.06	3.38	0.00
MA	0.0310	0.02	0.00	0.26	0.55	0.00	0.00	0.08	0.00	2.79	1.81	-	0.07	1.59	0.29	2.67	0.00
PB	0.0293	0.01	0.00	0.21	0.78	0.00	0.00	0.07	0.00	2.30	1.58	3.16	-	1.17	0.23	3.70	0.00
PE	0.0267	0.01	0.00	0.22	0.77	0.00	0.00	0.07	0.00	2.30	1.59	3.24	0.03	-	0.22	3.36	0.00
PI	0.0279	0.01	0.00	0.21	0.41	0.00	0.00	0.07	0.00	2.38	1.28	3.69	0.06	1.41	-	2.32	0.00
RN	0.0221	0.01	0.00	0.23	0.91	0.00	0.00	0.07	0.00	2.45	0.85	4.15	0.05	1.23	0.29	-	0.00
SE	0.0275	0.01	0.00	0.21	0.82	0.00	0.00	0.07	0.00	2.21	1.73	3.55	0.06	1.44	0.25	2.40	0.00
ES	0.0317	0.01	0.00	0.22	0.76	0.00	0.00	0.06	0.00	2.25	1.75	3.37	0.06	1.42	0.25	2.31	0.00
MG	0.0308	0.01	0.00	0.21	0.76	0.00	0.00	0.06	0.00	2.27	1.78	3.29	0.06	1.42	0.24	2.33	0.00
RJ	0.0274	0.01	0.00	0.21	0.80	0.00	0.00	0.06	0.00	2.24	1.79	3.51	0.06	1.46	0.26	2.31	0.00
SP	0.0272	0.01	0.00	0.21	0.76	0.00	0.00	0.07	0.00	2.29	1.80	3.45	0.06	1.44	0.25	2.29	0.00
PR	0.0257	0.01	0.00	0.25	0.94	0.00	0.00	0.07	0.00	2.73	2.17	4.19	0.07	1.73	0.31	2.77	0.00
SC	0.0300	0.01	0.00	0.23	0.78	0.00	0.00	0.06	0.00	2.30	1.78	3.39	0.06	1.43	0.24	2.35	0.00
RS	0.0341	0.01	0.00	0.22	0.80	0.00	0.00	0.06	0.00	2.32	1.75	3.19	0.06	1.41	0.23	2.34	0.00
DF	0.0288	0.01	0.00	0.20	0.88	0.00	0.00	0.07	0.00	2.31	2.03	4.28	0.07	1.62	0.31	2.38	0.00
GO	0.0372	0.01	0.00	0.22	0.76	0.00	0.00	0.07	0.00	2.39	1.85	3.20	0.06	1.43	0.26	2.31	0.00
MT	0.0302	0.02	0.00	0.28	0.98	0.00	0.00	0.08	0.00	2.80	2.26	4.01	0.07	1.76	0.29	2.73	0.00
MS	0.0331	0.01	0.00	0.24	0.86	0.00	0.00	0.07	0.00	2.50	1.95	3.49	0.06	1.51	0.26	2.43	0.00

Source: Based on the model results

Table 3.5 European Union (Agriculture): Regional decomposition of percentage variation of inter-regional exports (%)

	domp210 (var %)	*ES*	*MG*	*RJ*	*SP*	*PR*	*SC*	*RS*	*DF*	*GO*	*MT*	*MS*
AC	0.0332	0.44	2.38	0.12	19.95	38.51	3.15	4.31	1.20	2.03	12.16	3.08
AP	0.0373	0.44	2.57	0.13	19.97	38.80	3.35	4.32	1.13	1.70	11.96	3.14
AM	0.0243	0.44	2.55	0.12	19.54	39.23	3.26	4.05	1.19	1.63	11.99	3.25
PA	0.0397	0.45	2.75	0.13	20.85	39.37	3.36	4.67	1.18	2.10	12.85	3.16
RO	0.0297	0.44	2.54	0.12	19.90	38.69	3.24	4.18	1.14	1.74	12.13	3.12
RR	0.0393	0.44	2.59	0.13	20.25	37.74	3.21	4.47	1.17	1.95	12.37	3.18
TO	0.0398	0.43	2.48	0.12	20.16	38.67	3.23	4.50	1.18	2.13	13.75	3.11
AL	0.0274	0.44	2.60	0.13	20.05	38.88	3.29	4.19	1.17	1.68	12.59	3.25
BA	0.0288	0.46	2.62	0.13	20.58	39.72	3.35	4.27	1.21	1.77	12.49	3.26
CE	0.0260	0.45	2.63	0.13	20.35	39.95	3.38	4.29	1.23	1.76	12.82	3.35
MA	0.0310	0.54	3.11	0.16	24.88	48.01	4.06	5.59	1.41	2.47	15.35	3.78
PB	0.0293	0.43	2.51	0.12	19.48	38.33	3.22	4.24	1.17	1.87	12.40	3.15
PE	0.0267	0.45	2.59	0.13	20.17	39.48	3.35	4.21	1.23	1.72	12.69	3.32
PI	0.0279	0.45	2.60	0.13	20.17	39.75	3.37	4.47	1.19	1.98	12.67	3.28
RN	0.0221	0.50	2.83	0.14	22.17	43.19	3.62	4.56	1.32	1.86	13.51	3.61
SE	0.0275	0.44	2.54	0.12	19.87	38.02	3.29	4.20	1.20	1.76	12.52	3.28
ES	0.0317	-	2.61	0.14	20.68	39.34	3.32	4.01	1.22	1.60	11.67	3.09
MG	0.0308	0.45	1.88	0.13	20.20	39.23	3.31	4.19	1.23	1.65	12.12	3.17
RJ	0.0274	0.44	2.56	0.06	20.09	38.88	3.23	4.01	1.25	1.60	11.94	3.22
SP	0.0272	0.43	2.53	0.12	19.41	38.71	3.31	4.15	1.32	1.68	12.44	3.26
PR	0.0257	0.54	3.07	0.16	24.14	26.64	3.75	4.89	1.46	2.00	14.42	3.69
SC	0.0300	0.47	2.64	0.13	20.67	39.75	1.21	4.17	1.22	1.71	12.27	3.14
RS	0.0341	0.46	2.64	0.13	20.58	38.91	3.23	2.91	1.21	1.86	12.53	3.13
DF	0.0288	0.42	2.46	0.12	19.46	38.55	3.28	4.11	0.93	1.35	11.64	3.50
GO	0.0372	0.45	2.54	0.13	20.47	39.34	3.31	4.49	1.32	-	12.30	3.16
MT	0.0302	0.53	3.13	0.15	24.59	46.07	3.99	5.24	1.44	2.23	-	3.76
MS	0.0331	0.49	2.86	0.14	22.41	41.77	3.59	4.75	1.26	1.99	13.55	-

Source: Based on the model results

Final Remarks

The previous analysis provides important insights into the debate on regional inequality in a developing country. The simulations implemented enable us to verify that some of the strategies of improvement in the interaction with the rest of the world will probably augment regional inequality in the country. As Todaro (1994) concludes, trade can be an important stimulus to rapid economic growth, although it might not be a desirable strategy for economic and social development. Indeed, the contribution to development depends on the nature of the export sector, the distribution of its benefits, and the sector's linkages with the rest of the economy.

Thus, the results presented in this paper can address some of the points earlier pointed out. We can understand the spatial decomposition of the variation in exports as a *proxy* to measure the distribution of benefits from the export sector and the linkages among the states. We can conclude that among the industrial alternatives, Mercosur presented the highest degree of concentration. This can be corroborated by the contribution of Sao Paulo to the exports of the rest of the Brazilian states. Sao Paulo state contributes more than 50% for the percentage variation of the exports of the rest of the Brazilian states. On the other hand, we can verify that the European Union alternative promotes less concentration. We can verify that Sao Paulo, Minas Gerais, Parana and Rio Grande do Sul play an important role in the national context and we can also point out the importance of Para, Bahia and Santa Catarina state in the national context.

It is relevant to underline the results for agriculture. For Mercosur the direction of linkages changes a little bit. We can verify that Sao Paulo state loss relative importance.

On the other hand, Mato Grosso and Mato Grosso do Sul state increase their share in the contribution for the variation in the exports of the rest of the Brazilian states.

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Appendix

The functional forms of the main groups of equations of the interstate CGE core are presented in this Appendix together with the definition of the main groups of variables, parameters and coefficients.

The notational convention uses uppercase letters to represent the levels of the variables and lowercase for their percentage-change representation. Superscripts *(u)*, *u = 0, 1j, 2j, 3, 4, 5, 6*, refer, respectively, to output *(0)* and to the six different regional-specific users of the products identified in the model: producers in sector *j (1j)*, investors in sector *j (2j)*, households *(3)*, purchasers of exports *(4)*, regional governments *(5)* and the Federal government *(6)*; the second superscript identifies the domestic region where the user is located. Inputs are identified by two subscripts: the first takes the values *1, ..., g*, for commodities, *g + 1*, for primary factors, and *g + 2*, for "other costs" (basically, taxes and subsidies on production); the second subscript identifies the source of the input, being it from domestic region *b (1b)* or imported *(2)*, or coming from labor *(1)*, capital *(2)* or land *(3)*. The symbol (•) is employed to indicate a sum over an index.

Equations

(A1) Substitution between products from different regional domestic sources

$$x_{(i(1b))}^{(u)r} = x_{(i(1\bullet))}^{(u)r} - \sigma_{(i)}^{(u)r}\left(p_{(i(1b))}^{(u)r} - \sum_{l\in S^*}\left(V(i,1l,(u),r)/V(i,1\bullet,(u),r)\left(p_{(i(1l))}^{(u)r}\right)\right)\right)$$

$$i = 1,...,g;\ b = 1,...,q;\ (u) = 3 \text{ and } (kj) \text{ for } k = 1 \text{ and } 2 \text{ and } j = 1,...,h;\ r = 1,...,R$$

(A2) Substitution between domestic and imported products

$$x_{(is)}^{(u)r} = x_{(i\bullet)}^{(u)r} - \sigma_{(i)}^{(u)r}\left(p_{(is)}^{(u)r} - \sum_{l=1\bullet,2}\left(V(i,l,(u),r)/V(i,\bullet,(u),r)\left(p_{(il)}^{(u)r}\right)\right)\right)$$

$$i = 1,...,g;\ s = 1\bullet \text{ and } 2;\ (u) = 3 \text{ and } (kj) \text{ for } k = 1 \text{ e } 2 \text{ and } j = 1,...,h;\ r = 1,...,R$$

(A3) Substitution between labor, capital and land

$$x^{(1j)r}_{(g+1,s)} - a^{(1j)r}_{(g+1,s)} = \alpha^{(1j)r}_{(g+1,s)} x^{(1j)r}_{(g+1\bullet)} - \sigma^{(1j)r}_{(g+1)} \{ p^{(1j)r}_{(g+1,s)} + a^{(1j)r}_{(g+1,s)} - \sum_{l=1,2,3} (V(g+1,l,(1j),r)/V(g+1,\bullet,(1j),r))(p^{(1j)r}_{(g+1,l)} + a^{(1j)r}_{(g+1,l)}) \}$$

$j = 1,...,h; \quad s = 1, 2 \text{ and } 3; r = 1,...,R$

(A4) Intermediate and investment demands for composites commodities and primary factors

$$x^{(u)r}_{(i\bullet)} = \mu^{(u)r}_{(i\bullet)} z^{(u)r} + a^{(u)r}_{(i)}$$

$u = (kj)$ for $k = 1, 2$ and $j = 1,...,h$
if $u = (1j)$ then $i = 1,...,g+2$
if $u = (2j)$ then $i = 1,...,g;$
$r = 1,...,R$

(A5) Household demands for composite commodities

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

$i = 1,\ldots,g; r = 1,...,R$

(A6) Composition of output by industries

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

$j = 1,...,h; \quad \text{i} = 1,...,\text{g}; r = 1,...,R$

(A7) Indirect tax rates

$$t(\tau,i,s,(u)r) = f_{(\tau)} + f_{(\pi)} + f^{(u)}_{(\pi)} + f^{(u)r}_{(\pi)}, \quad i = 1,...,g; \quad s = 1b,2 \text{ for } b = 1,...,q; \quad \tau = 1,...,t$$

$(u) = (3), (4), (5), (6) \text{ and } (kj) \text{ for } k = 1, 2; \; j = 1,...,h$
$r = 1,...,R$

(A8) Purchasers' prices related to basic prices, margins (transportation costs) and taxes

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

$i = 1,\ldots,g;\ (u) = (3),(4),(5),(6)$

and (kj) for $k = 1, 2$ and $j = 1,\ldots,h;\ s = 1b, 2$ for $b = 1,\ldots,q$

$r = 1,\ldots,R$

(A9) Foreign demands (exports) for domestic goods

$$(x_{(is)}^{(4)r} - fq_{(is)}^{(4)r}) = \eta_{(is)}^{r}(p_{(is)}^{(4)r} - e - fp_{(is)}^{(4)r}), \qquad i = 1,\ldots,g;\ s = 1b, 2 \text{ for } b = 1,\ldots,q; r = 1,\ldots,R$$

(A10) Regional governments demands

$$x_{(is)}^{(5)r} = x_{(\bullet\bullet)}^{(3)r} + f_{(is)}^{(5)r} + f^{(5)r} + f^{(5)} \qquad i = 1,\ldots,g;\ s = 1b,2 \text{ for } b = 1,\ldots,q; \text{r} = 1,\ldots,\text{R}$$

(A11) Regional governments demands

$$x_{(is)}^{(6)r} = x_{(\bullet\bullet)}^{(3)\bullet} + f_{(is)}^{(6)r} + f^{(6)r} + f^{(6)} \qquad i = 1,\ldots,g;\ s = 1b,2 \text{ for } b = 1,\ldots,q; \text{r} = 1,\ldots,\text{R}$$

(A12) Margins demands for domestic goods

$$x_{(m1)}^{(is)(u)r} = \theta_{(is)}^{(u)r} x_{(is)}^{(u)r} + a_{(m1)}^{(is)(u)r}$$

$m, i = 1,\ldots,g;$

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

$j = 1,\ldots,h;\ s = 1b, 2$ for $b = 1,\ldots,r;$

$r = 1,\ldots,R$

(A13) Demand equals supply for regional domestic commodities

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

(A14) Regional industry revenue equals industry costs

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

(A15) Basic price of imported commodities

$$p_{(i(2))}^{(0)} = p_{(i(2))}^{(w)} - e + t_{(i(2))}^{(0)}, \qquad i = 1,..., g$$

(A16) Cost of constructing units of capital for regional industries

$$V(\bullet,\bullet,(2j), r)(p_{(k)}^{(1j)r} - a_{(k)}^{(1j)r}) = \sum_{i\in G}\sum_{s\in S} V(i, s, (2j), r)(p_{(is)}^{(2j)r} + a_{(is)}^{(2j)r}), \quad j = 1,..., h; r = 1,..., R$$

(A17) Investment behavior

$$z^{(2j)r} = x_{(g+1,2)}^{(1j)r} + 100\, f_{(k)}^{(2j)r}, \qquad j = 1,..., h; r = 1,..., R$$

(A18) Capital stock in period T+1 – comparative statics

$$x_{(g+1,2)}^{(1j)r}(1) = x_{(g+1,2)}^{(1j)r} \qquad j = 1,..., h; r = 1,..., R$$

(A19) Definition of rates of return to capital

$$r_{(j)}^{r} = Q_{(j)}^{r}(p_{(g+1,2)}^{(1j)r} - p_{(k)}^{(1j)r}), \qquad j = 1,..., h; r = 1,..., R$$

(A20) Relation between capital growth and rates of return

$$r_{(j)}^{r} - \omega = \varepsilon_{(j)}^{r}(x_{(g+1,2)}^{(1j)r} - x_{(g+1,2)}^{(\bullet)r}) + f_{(k)}^{r}, \qquad j = 1,..., h; r = 1,..., R$$

Other definitions in the CGE core include: revenue from indirect taxes, import volume of commodities, components of regional/national GDP, regional/national price indices, wage settings, definitions of factor prices, and employment aggregates.

Variables

Variable	Index ranges	Description
$x_{(is)}^{(u)r}$	(u) = (3), (4), (5), (6) and (kj) for k = 1, 2 and j = 1,…,h; if (u) = (1j) then i = 1,…,g + 2; if (u) ≠ (1j) then i = 1,…,g; s = 1b, 2 for b = 1,…,q; and i = 1,…,g and s = 1, 2, 3 for i = g+1 r = 1,…,R	Demand by user (u) in region r for good or primary factor (is)
$p_{(is)}^{(u)r}$	(u) = (3), (4), (5), (6) and (kj) for k = 1, 2 and j = 1,…,h; if (u) = (1j) then i = 1,…,g + 2; if (u) ≠ (1j) then i = 1,…,g; s = 1b, 2 for b = 1,…,q; and i = 1,…,g and s = 1, 2, 3 for i = g+1 r = 1,…,R	Price paid by user (u) in region r for good or primary factor (is)
$x_{(i\bullet)}^{(u)r}$	(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 r = 1,…,R	Demand for composite good or primary factor i by user (u) in region r
$a_{(g+1,s)}^{(1j)r}$	j = 1, …,h and s = 1, 2, 3 r = 1,…,R	Primary factor saving technological change in region r
$a_{(i)}^{(u)r}$	i = 1,...,g, (u) = (3) and (kj) for k = 1, 2 and j = 1,..., h r = 1,…,R	Technical change related to the use of good i by user (u) in region r
C^r		Total expenditure by regional household in region r
Q^r		Number of households
$z^{(u)r}$	(u) = (kj) for k = 1, 2 and j = 1, …,h r = 1,…,R	Activity levels: current production and investment by industry in region r
$fq_{(is)}^{(4)r}$	i = 1, …,g; s = 1b, 2 for b = 1, …,q r = 1,…,R	Shift (quantity) in foreign demand curves for regional exports
$fp_{(is)}^{(4)r}$	i = 1, …,g; s = 1b, 2 for b = 1, …,q	Shift (price) in foreign demand curves for regional exports

Variable	Index ranges	Description
	r = 1,…,R	
e		Exchange rate
$x_{(m1)}^{(is)(u)r}$	m, i = 1,…,g; s = 1b, 2 for b = 1,…,q (u) = (3), (4), (5), (6) and (kj) for k = 1, 2 and j = 1, …,h r = 1,…,R	Demand for commodity (m1) to be used as a margin to facilitate the flow of (is) to (u) in region r
$a_{(m1)}^{(is)(u)r}$	m, i = 1,…,g; s = 1b, 2 for b = 1,…,q (u) = (3), (4), (5), (6) and (kj) for k = 1, 2 and j = 1, …,h r = 1,…,R	Technical change related to the demand for commodity (m1) to be used as a margin to facilitate the flow of (is) to (u) in region r
$x_{(i1)}^{(0\,j)r}$	i = 1,…,g; j = 1,…,h r = 1,...,R	Output of domestic good i by industry j
$p_{(is)}^{(0)r}$	i = 1,…,g; s = 1b, 2 for b = 1,…,q r = 1,...,R	Basic price of good i in region r from source s
$p_{(i(2))}^{(w)}$	i = 1,…,g	USD c.i.f. price of imported commodity i
$t_{(i(2))}^{(0)}$	i = 1,…,g	Power of the tariff on imports of i
$t(\tau,i,s,(u)r)$	i = 1,…,g; τ = 1,…,t; s = 1b, 2 for b = 1,…,q (u) = (3), (4), (5), (6) and (kj) for k = 1, 2 and j = 1,…,h r = 1,...,R	Power of the tax τ on sales of commodity (is) to user (u) in region r
$f_{(k)}^{(2\,j)r}$	j = 1,…,h r = 1,...,R	Regional-industry-specific capital shift terms
$f_{(k)}^{r}$	r = 1,...,R	Capital shift term in region r
$x_{(g+1,2)}^{(1\,j)r}(1)$	j = 1,…, h r = 1,...,R	Capital stock in industry j in region r at the end of the year, i.e., capital stock available for use in the next year
$p_{(k)}^{(1\,j)r}$	j = 1,…, h r = 1,...,R	Cost of constructing a unit of capital for industry j in region r
$f_{(\tau)}$	τ = 1,…,t	Shift term allowing uniform percentage changes in the power of tax τ
$f_{(\tau i)}$	τ = 1,…,t; i = 1, …,g	Shift term allowing uniform percentage changes in the power of tax τ on commodity i

Variable	Index ranges	Description
$f^{(u)}_{(\tau i)}$	τ = 1,…,t; (u) = (3), (4), (5), (6) and (kj) for k = 1, 2 and j = 1, …, h	Shift term allowing uniform percentage changes in the power of tax τ of commodity i on user (u)
$f^{(u)r}_{(\tau i)}$	τ = 1,…,t; (u) = (3), (4), (5), (6) and (kj) for k = 1, 2 and j = 1, …, h r = 1,…,R	Shift term allowing uniform percentage changes in the power of tax τ of commodity i on user (u) in region r
$f^{(5)r}_{(is)}$	i = 1, …,g; s = 1b, 2 for b = 1,…,q r = 1,…,R	Commodity and source-specific shift term for regional government expenditures in region r
$f^{(5)r}$	r = 1,…,R	Shift term for regional government expenditures in region r
$f^{(5)}$		Shift term for regional government expenditures
$f^{(6)r}_{(is)}$	i = 1, …,g; s = 1b, 2 for b = 1,…,q r = 1,…,R	Commodity and source-specific shift term for Federal government expenditures in region r
$f^{(6)r}$	r = 1,…,R	Shift term for Federal government expenditures in region r
$f^{(6)}$		Shift term for Federal government expenditures
ω		Overall rate of return on capital (short-run)
$r^{r}_{(j)}$	j = 1,...,h r = 1,…,R	Regional-industry-specific rate of return

Parameters, Coefficients and Sets

Symbol	Description
$\sigma_{(i)}^{(u)r}$	Parameter: elasticity of substitution between alternative sources of commodity or factor i for user (u) in region r
$\sigma^{(0\,j)r}$	Parameter: elasticity of transformation between outputs of different commodities in industry j in region r
$\alpha_{(g+1,s)}^{(1\,j)r}$	Parameter: returns to scale to individual primary factors in industry j in region r
$\beta_{(i)}^{r}$	Parameter: marginal budget shares in linear expenditure system for commodity i in region r
$\gamma_{(i)}^{r}$	Parameter: subsistence parameter in linear expenditure system for commodity i in region r
$\varepsilon_{(j)}^{r}$	Parameter: sensitivity of capital growth to rates of return of industry j in region r
$\eta_{(is)}^{r}$	Parameter: foreign elasticity of demand for commodity i from region r
$\theta_{(is)}^{(u)r}$	Parameter: scale economies to transportation of commodity (i) produced in region r shipped to user (u) in region r
$\mu_{(i\bullet)}^{(u)r}$	Parameter: returns to scale to primary factors (i = g+1 and u = 1j); otherwise, $\mu_{(i\bullet)}^{(u)r} = 1$
$B(i,s,(u),r)$	Input-output flow: basic value of (is) used by (u) in region r
$M(m,i,s,(u),r$	Input-output flow: basic value of domestic good m used as a margin to facilitate the flow of (is) to (u) in region r
$T(\tau,i,s,(u),r)$	Input-output flow: collection of tax τ on the sale of (is) to (u) in region r
$V(i,s,(u),r)$	Input-output flow: purchasers' value of good or factor i from source s used by user (u) in region r
$Y(i,j,r)$	Input-output flow: basic value of output of domestic good i by industry j from region r
$Q_{(j)}^{r}$	Coefficient: ratio, gross to net rate of return
	Set: {1,2, …, g}, g is the number of composite goods
	Set: {1,2, …, g+1}, g+1 is the number of composite goods and primary factors
H	Set: {1,2, …, h}, h is the number of industries
U	Set: {(3), (4), (5), (6), (k j) for k = 1, 2 and j = 1, …, h}
U*	Set: {(3), (k j) for k = 1, 2 and j = 1, …, h}
	Set: {1, 2, …, r+1}, r+1 is the number of regions (including foreign)
	Set: {1, 2, …,r}, r is the number of domestic regions
	Set: {1, …, t}, t is the number of indirect taxes