Regional integration and the labour market

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Regional integration and the labour market: the Brazilian case

Marta Reis Castilho

Brazil is currently engaged in various trade negotiations. One of the aspects that must be taken into account when appraising these negotiations is their impact on employment. This article estimates the effects on employment of two of the main trade agreements in which Brazil may participate, based on the labour content of its trade, by the workers' skill level. Brazil is a net exporter of labour, especially less skilled labour. Our results show that, in the three alternatives considered here –the agreement between MERCOSUR and the European Union; the Free Trade Area of the Americas (FTAA), and the entry in force of both of them– nearly 230,000 jobs would be generated, representing an increase of 0.4% in Brazilian total employment. In aggregate terms, FTAA is the option which would generate more jobs. The workers benefiting most from these agreements would be those with the lowest levels of skills.

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I

Introduction

Brazil is engaged in negotiations for the expansion of existing agreements (MERCOSUR) or the signing of several new free trade agreements (MERCOSUR-EU FTA, FTAA, MERCOSUR-CAN agreement, among others). The results may differ considerably due not only to the different formats and depth of the agreements being negotiated but also to the composition of Brazil's foreign trade. Thus, for example, whereas Brazil's exports to Latin America show a higher proportion of manufactures and hence a high degree of processing, its exports to Europe are concentrated in primary commodities with little degree of processing. Likewise, there are also differences in the import structure by area of origin, although these are not as marked as in the case of exports.

Sectoral differences and disparities in the degree of processing of products lead to different effects of trade on employment, depending on the labour-intensity of the goods and the level of skills of the workers producing them. The differences in terms of the possible results of trade agreements therefore open up different prospects as regards their impact on the country's labour market.

There is ever-increasing discussion in Brazil on the effect of the different trade agreements, especially in terms of their macroeconomic aspects or their effect on trade flows. It is still rare, however, to come across analyses focusing on their impact on employment. The literature on integration and the labour market in Brazil is limited to Computable General Equilibrium (CGE) Models estimating the macroeconomic and sectoral effects on employment, but seldom is any distinction made between the labour factor categories in terms of their levels of skills. There are, however, an increasing number of studies seeking to evaluate the effects of the multilateral openness process initiated in the early 1990s on the labour market (employment and wages).

At the international level, the debate on integration and employment is usually confused with the discussions on the *effects of trade* on employment in general, without making a distinction between the integration of a country into the world economy and its integration into a particular group of countries (regional integration). This was so, for example, in the case of the North American Free Trade Agreement (NAFTA), which gave rise to a controversy in the United States on the impacts of the integration with a developing country on North American jobs and wages. In fact, this controversy formed part of the heated debate begun in the late 1980s on the influence of trade with developing countries on the developed countries' labour markets. This debate, in turn, was generated by the changes in those labour markets (increases in wage inequality or unemployment) and the concomitant growth of trade with the developing countries. The result was a large number of interesting theoretical and empirical studies on trade and the labour market, which provided analytical instruments for studying the effects of regional integration on employment.

The present article analyses the different effects that the main integration schemes can have on employment in Brazil, considering the skill levels of the workers. The analysis is based upon the calculation of the labour content of Brazil's imports and exports, by trading partners and by workers' years of schooling (as a proxy for their skill levels).

After the present introduction, section II presents the methodological framework and reviews the available empirical works. Section III contains the actual analysis of the Brazilian case, including a brief analysis of Brazil's foreign trade, the results concerning the current labour content of the country's trade and then the simulations on the effects of the free trade agreements on Brazil's employment.[1] Finally, section IV presents the conclusions.

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[1] For the sake of brevity, FTAA and the Mercosur-EU FTA will henceforth be referred to as "agreement with the United States" and "agreement with the European Union".

II

The labour market and trade integration: methodological notes and applications

The literature on the effects of trade on the labour market provides a number of instruments for analysing the particular case of regional integration. At the theoretical level, the literature generally analyses the effects on employment and wages caused by changes in the levels of trade –or in the degree of openness–, without necessarily distinguishing whether the growth in trade is due to regional or multilateral integration. For this reason, the theoretical framework for analysing the effects of trade integration on the labour market is based on the traditional Ricardian and factor models and the critiques of those models.

With regard to the empirical studies on regional integration and the labour market, the methodologies used to evaluate the effects of greater regional and multilateral openness are fundamentally the same. Normally there are three types of methodologies: computable general equilibrium (CGE) models, calculation of the labour content of trade, and econometric estimation of the elasticity of wages and employment with respect to international trade-related variables. This article focuses on studies using the methodology selected here –factor content calculation– in order to investigate their limits and characteristics in greater depth.

1. Methodological notes

The great majority of the available empirical studies which seek to evaluate the effects of regional integration on the labour market deal with the impact of NAFTA on United States workers. These studies, along with the natural fear of United States workers of losing their jobs, have led to the resurgence of the debate on the impact of competition from the developing countries on the developed nations. In reality, this is an ongoing concern of the latter, since they are interested in the effect of trade integration, but with special reference to the developing countries.

In Brazil, there are relatively few studies on regional integration and the labour market, and they are limited above all to CGE models which naturally deal with the evolution of employment, at least at the macroeconomic level. As regards the impact of openness on the labour market, the supply of studies has been larger and growing since Brazil embarked on a process of trade liberalization in the 1990s (Soares, Servo and Arbache, 2001; Raposo and Machado, 2002).

There are basically three methodologies available for evaluating the links between trade, on the one hand, and employment or wages on the other: CGE models; labour demand estimates, which measure the influence of trade on employment or wages, and calculation of the labour content of trade. CGE models are sophisticated models which represent the totality of the economic relations of one or more countries. In order to make them, it is necessary to have a large amount of information and, sometimes, to formulate robust hypotheses on elasticities or other economic phenomena.

Econometric estimates of the links between trade and employment or wage levels, which are frequently used by labour market specialists, involve a very wide range of equations which differ considerably depending on the available data bases, the econometric techniques used and, of course, the specifications adopted. As may be gathered from the various studies summarized in Cortes and Jean (1995), the results are ambiguous and, all in all, do not appear to be conclusive as regards the influence of trade on the labour market.

Factor content calculation is a simple methodology whereby an estimate is made of the amount of labour contained in the goods exported and imported, corresponding to the jobs generated in the export sectors and those lost in the sector competing with imports. The calculation is made on the basis of employment multipliers which are normally estimated from local production (employment/currency unit) and then applied to the trade flows of a given country. The origin of this methodology lies in the techniques for breaking down the factors that explain the variation in employment. Starting from the accounting identities

$$C = Q - X + M \text{ and}$$

$$P = {}^{Q}/_{E},$$

where the variables represent consumption (C), production (P), exports (X), imports (M), productivity

(P) and employment (E), for sector i (not shown), we have:

$$\Delta E = (1/P_0)\,[\Delta C + \Delta X - \Delta M - E_0 \Delta P]$$

In order to evaluate the impact of trade on employment, if we suppose that changes in the external sector do not affect consumption and productivity, then the variation in employment will correspond to the variation in the trade balance multiplied by the employment multiplier (inverse of productivity). This methodology, as we will see below, suffers from various limitations, such as the assumption that there is no interaction between the various terms in the first equation.[2]

The coefficients may be direct or indirect, depending on whether or not the use of intermediate goods is taken into account through the technical coefficients provided by the input-output matrices. The calculation of factor content may or may not take account of two production factors, depending on the objective of the study. Calculation of the relative intensities of factor use (more than one factor) is normally used to verify the Heckscher-Ohlin model, while calculation of the use made of a single factor is employed to analyse the effect of variations in the level of trade on the stock of the factor in question.

Although this methodology has good explanatory power and is supported by a number of economists, it has various limitations.[3] The first of these are related with its static nature. As pointed out by Leamer (1996), it does not take account of trade-induced changes in prices, wages, productivity, trade structure or consumption, so that it disregards the trade benefits obtained through price changes. Nor does it take into account the fact that the mere threat of trade competition can have profound effects on the labour market. According to Borjas, Freeman and Katz (1992 and 1996), this aspect can make the use of this methodology questionable, as shown below. Lastly, as noted by Cortes, Jean and Pisani-Ferry (1996), this methodology assumes that the labour market operates in conditions of perfect competition and that adjustment to outside competition will be effected entirely through the amount. This latter criticism is open to question, however: the calculation of factor content shows what the equivalent amount would be in terms of trade flows, but obviously the actual effect of this variation on employment depends on the conditions prevailing in the labour market (i.e., how much of the adjustment will take place through prices and how much through the amount).

Other limitations concern measurement problems. Wood (1994 and 1995) argues that if an "average" coefficient is used for employment by sectors, this ignores the differences between firms in the same sector. According to this author, competition by the developing countries does not affect all the firms in a given sector, because of the differences in productivity between them; only the least productive firms would be forced out. The employment coefficient used should therefore reflect this fact. As we will see below, Borjas, Freeman and Katz (1992 and 1996) propose the use of a coefficient which reflects the technological gap of the developing countries. According to Cortes, Jean and Pisani-Ferry (1996), this problem reflects an aggregation bias: the indicators are calculated by industry, according to the classification of the input-output matrices, but international competition takes place at the product level.[4] This not only leads to a skew in the estimation of the number of jobs lost, but also takes no account of the movements of labour which may take place within a sector.

Another criticism, made by Hinojosa-Ojeda, Runsten and others (2000), is that it would be wrong to use the same employment multipliers for imports and exports, since it would be a mistake to conclude that trade impacts are symmetrical.[5] We do not agree with this assertion, however, if the aim is to measure how many jobs would be lost in domestic firms through competition from imports. In this case (despite Wood's criticism) it would be reasonable to assume that domestic firms use the same technology.

Lastly, Borjas, Freeman and Katz (1992 and 1996) propose two conditions that must be fulfilled if the factor content methodology is to be "useful" (for analysing the impact of trade). The first of these is that the local determinants must be important in fixing

[2] For a detailed description of the methodology, see Cruz (1996).

[3] For a defence of this methodology, see Davis and Weinstein (2002).

[4] As argued by Wood (1994), in calculating the factor content of trade non-competitive imports (such as East Asian tee shirts) are confused with equivalent products from rich countries (such as high-fashion tee shirts), although there are big differences in their respective contents of labour and labour skills (Cortes, Jean and Pisani-Ferry, 1996, p. 25).

[5] The first reason would be that, if they are not exported, products would not necessarily be produced and, above all, there is no guarantee that, if particular products were not imported, there would be local production that would take their place.

amounts and prices in the labour market; otherwise, if the levelling of factor prices operates perfectly, it would be more reasonable to calculate the international rather than the national coefficients. The second condition is that the observed trade must be effectively reflected in the pressure on the labour market. According to these authors, if the mere threat of foreign competition is enough to alter the amount of labour employed by domestic firms, there will be no changes in the level of trade.

Other criticisms of this methodology are related with its use to validate trade theories. Calculation of the factor content was initially used to verify the validity of the Heckscher-Ohlin theory. Its best-known results are those of Leontief (1953), who questioned the applicability of that theory to the United States economy. According to Leontief, factor content calculation indicates that the United States does not display a form of specialization in line with that theory, according to which that country would import capital-intensive goods and export labour-intensive products, because of its initial factor endowment. Subsequently, however, Leamer (1980) questioned Leontief's criticisms, arguing that the calculation of the relative intensities of factor use should be made on the basis of net exports and not imports and exports separately, and it should even take into account the trade balance of the year studied. As a result of Leamer's criticisms, a wide-ranging debate arose on the validity of the method and the theory itself.[6]

In the present article, however, our aim is not to verify the validity of the Heckscher-Ohlin model in the case of the Brazilian economy –a matter which has been dealt with in various studies–[7] but rather to estimate the amount of employment that would be created or threatened by increases in exports and imports due to trade agreements.[8] We will therefore not examine here the usefulness of this method for validating that method.

2. Empirical works

In spite of the limitations pointed out by various authors, most analysts continue to use this methodology. As Cortes, Jean and Pisani-Ferry (1996, p. 21) rightly say, in spite of all this, we still consider it a good starting-point.

Among the studies in which that methodology is used to evaluate the impact of competition from the developing countries on employment in the developed nations, particular mention may be made of the controversial contributions by Borjas, Freeman and Katz (1992 and 1996) and Sachs and Shatz (1994), as well as the more recent article by Kucera and Milberg (2002).[9] In the following paragraphs, we will refer to some of the contributions made to the debate on the effects of regional integration.

In two articles, Borjas, Freeman and Katz (1992 and 1996) attempt to measure the effects of immigration and trade on the labour market of the United States between 1980 and 1995. Basically, they use the same methodology in both articles: in a first stage they calculate the variations in employment levels on the basis of the labour content of net trade flows with the developing and developed countries, and in a second stage they apply wage elasticity to variations in the amount of labour offered, in order to see what the effect would be on wage differentials. The method for calculating the labour content, taking account of the different educational levels of the workers, is basically the same in both articles. The most important innovation in the second article is that it seeks to reply to the criticisms made by Wood (1994 and 1995) regarding the homogeneity of firms in a given sector, to which we already referred earlier. The authors establish three scenarios in which they apply the labour multipliers of 1970, 1980 and 1995, respectively: that is to say, they consider the technological gap between the developing and developed countries. They conclude that the intermediate scenario –in which the gap for 1995 is 15 years– is the most reasonable; its results indicate a bigger negative impact of trade with the developing countries than that of trade with the developed nations, as well as suggesting that the least educated workers would be most seriously prejudiced by the competition

[6] See, for example, Deardoff (2000) and Davis and Weinstein (2002).

[7] See, for example, Machado and Moreira (2001), Faria and Silva (2003), Ferreira and Machado (2001) and Gonzaga, Terra and Menezes-Filho (2001), although different methodologies are used in these studies.

[8] In the present study, the emphasis is on the "quantity" of labour, and we are therefore not interested by the various articles which evaluate the impact of openness on wages. Analysis of the effects of the exchange rate on the labour market (see Klein, Schuh and Triest, 2002) is also outside the scope of this article.

[9] Gregory, Zissimos and Greenhalgh (2001) and Cortes, Jean and Pisani-Ferry (1996) make similar analyses for the United Kingdom and France, respectively. Behar (1988) applies the method to the Mexican economy in order to analyse the impact of multilateral trade liberalization on the labour market of that country.

of foreign workers through trade or immigration. Moreover, the effects of immigration on employment and wages seem to be greater than the effects of trade.

Sachs and Shatz (1994) calculated the labour content of the net imports of the United States between 1978 and 1990, in order to measure the impact of trade with the developing countries on industrial employment in that country. First, they simulated what the level of trade would be if the penetration of imports in 1990 was the same as in 1978, and they then applied the employment multipliers, distinguishing according to the level of qualifications of the labour force. These authors attributed a 5.9% reduction in employment in the manufacturing sector to the effects of trade; almost all of this reduction (5.7%) was due to trade with the developing countries, whereas trade with the developed nations only caused a reduction of 0.2%. Production workers were most seriously affected by outside competition (a 7.2% reduction in employment), and most of this reduction (6.2%) was due to trade with the developing countries.

Kucera and Milberg (2002) calculated the sectoral coefficients of factor content in order to examine the changes in labour content in the trade flows of the Organisation for Economic Cooperation and Development (OECD) countries between 1978 and 1995. The change in labour content was calculated separately for trade among the OECD countries and trade with countries which are not members of that group. These authors concluded that, although the sectors making most intensive use of labour showed the biggest variations in employment and faced the strongest competition from the developing countries, the share of the latter in the OECD countries' imports was only quite small (7% at the most). They also showed that the net loss of employment attributable to non-OECD countries was due to the reduction in exports to those countries rather than an increase in imports from them. In the case of trade with other OECD countries, although some of them registered increases in the number of jobs due to an increase in trade among OECD members, the authors estimate that the overall loss of jobs reflects the phenomenon of the de-industrialization of those countries. They consider that the alleged threat of competition from low-wage countries has been brought up wrongly to account for the effects of the loss of dynamism by the economies affected. During the last period of buoyant growth of the United States economy in the 1990s, the share of imports from the developing countries increased significantly, but competition from low-wage countries was not considered a threat.

With regard to the relation between regional integration and employment, most of the cases where the factor content method was applied concern the North American Free Trade Agreement (NAFTA).

Hufbauer and Schott (1992) made an optimistic (and erroneous) projection of the growth of the United States trade surplus with Mexico and then proceeded to apply the employment multiplier calculated by the United States Department of Commerce. The findings of these authors were optimistic –creation of 130,000 jobs– and at first the Clinton administration used them to defend the agreement. The application of this same methodology on a more realistic basis, however, would change this increase into a significant loss and provide arguments for the opponents of the agreement, as shown by Hinojosa-Ojeda, Runsten and others (2000). There were many criticisms of the above-mentioned study by Hufbauer and Schott, ranging from the projection of the trade balance to the fact of having an aggregate coefficient. In a second version (Hufbauer and Schott, 1993) the increases in employment were calculated sector by sector and indirect multipliers were used. The increase in employment now rose to 170,000, but according to the methodological problems persisted. These authors asserted that there was an error in the interpretation of the sectoral results, because the same multipliers should not be applied to both imports and exports, and that Hufbauer and Schott's calculations did not take account of the indirect effects of exports, although this latter argument is not as sound because in the second version indirect employment coefficients were used. The use of the same multipliers for both imports and exports can also be justified with the hypothesis (although this is questionable) that the technology used by domestic firms is uniform throughout a sector, so that the same technology is used by both import substitution and export firms.

Rothstein and Scott (1997) used a similar methodology but applied the indirect multiplier calculated by the United States Bureau of Labor Statistics. The most significant change, however, was the concept of the trade balance used, since these authors calculated the net exports, deducting the portion of exports produced in other countries[10] and considering only imports for actual consumption. With regard to the growth in the United States trade deficit with its trading partners, the authors identified a loss of almost

[10] These are goods that pass through the United States for re-export to other countries.

400,000 jobs between 1993 and 1996, mostly (57%) attributable to Mexico. They even disaggregated the results by states and by demographic characteristics of the labour market. The results of both studies are controversial, since they arrived at significantly different findings, using different methodologies (see Hinojosa-Ojeda, Runsten and others (2000)).

With regard to European integration, Pugacewicz (2004) calculated the factor content of Poland's trade with the European Union during the 1990s in order to determine the impact of trade openness on the trade structure. He considered 14 production factors, including seven categories of labour –by skills and by sector– and the coefficients used were indirect and took account of inter-sectoral relations. The result in terms of employment was of an overall nature, however, and was not disaggregated by sectors. He found that in 2000 Poland became a net exporter of unskilled labour to the European Union, which represents a change from that country's pattern at the beginning of the period, when it was a net exporter of skilled labour. This study, which was a preliminary version, does not make it clear what input-output matrix was used, whether it was the same for the whole decade, and whether it corresponds specifically to the Polish economy.

In the case of Brazil, there are few examples of the application of the labour content methodology. Barros and others (1996) used this method to evaluate the effect of trade openness on industrial employment in Brazil between 1987 and 1995. The methodology used was quite simple: the direct coefficient (inverse of productivity) was applied to the trade surplus, both overall and by sectors. These authors stress that they only considered the direct effects of openness (on trade flows) and not the effects on productivity, although they could have done so by taking the levels of productivity at the end of the period.[11] After analysing Brazil's trade openness and trade flows, these authors find that there was a loss of 500,000 jobs, of which 390,000 were lost in 1994 and 1995 because of two factors: the poor performance of the Brazilian economy between 1987 and 1993 (1% drop in real GDP) and the very gradual nature of trade liberalization, especially as regards tariffs, which extended from 1991 to 1994. As regards the sectoral results, the authors did not have trade data for 1993 and 1994, and this reduces the interest of the results, because the consequences of trade openness began to be felt as from 1994. Up to 1993 the effects of openness on employment were not significant, but the sectors most affected by job losses were textiles, metal products and machinery and electrical equipment.

One of the authors of that article (Cruz, 1996) used a similar methodology for another period –1980-1993– to analyse the evolution of trade-related employment in the Brazilian economy. For this purpose, he made an extensive analysis of the evolution of trade flows over the period in question, concluding that the growth of trade in the 1980s had a positive effect on employment, while the openness at the end of that decade had a slight impact in the early years of the following decade. On disaggregating the effects on imports and exports, the author highlights the growth in employment associated with exports, due to the increase in the propensity to export displayed by manufacturing in the 13 years studied. This growth offset the loss of employment due to imports, which increased significantly at the end of the period (between 1990 and 1993 the loss of jobs grew by nearly 50%). Methodologically, Cruz's work differs from that of Barros and others, because it uses direct coefficients of labour content (inverse of productivity) for each year, rather than a constant value for the whole period.

[11] The productivity indicator applied to the variation in the trade balance was for 1987.

III

Integration and employment in Brazil

The effects of the various integration schemes of which Brazil is a member depend on the features of the particular scheme and also on the present trade configuration. With regard to the labour market, the sectoral composition of trade implies different amounts of labour (by level of skills) for each trading partner. In this section, we will calculate the labour content of Brazil's foreign trade and then analyse the probable impact on Brazilian employment of the country's entry into an agreement with the United States and into one with the European Union. We will therefore begin by briefly presenting the differences in specialization of the Brazilian economy, according to the trading partner concerned. We will then examine the labour content of trade and the variation in employment due to integration.

1. Sectoral patterns of Brazilian trade with its main trading partners

Brazil's trade structure is quite diversified, both in terms of geographical distribution and of products. Its most important trading partners are the European Union and the United States, each of which accounts for nearly a quarter of its trade. MERCOSUR also has significant weight in Brazil's trade, even considering that the years dealt with in this case (1999 and 2001) were marked by a slackening of intra-regional trade. Among the other trading partners are the other Latin American countries and China, whose share in Brazil's foreign trade is growing.

Brazil's specialization varies considerably depending on the trading partner involved, as may be seen from table 1. There are three different trade patterns: i) the typical North-South pattern, marking Brazil's trade with the European Union; ii) trade in which there is a predominance of manufactures, as in the case of Brazil's trade with the United States, Canada and Mexico, and iii) trade in which Brazil basically exports manufactures and imports primary commodities, as in the case of the country's trade with its partners in MERCOSUR, the Andean Community and Chile.

At a more disaggregated level, Brazil imports large amounts of electrical and electronic equipment, transport equipment and chemical products from the European Union and the United States. It also imports a considerable volume of transport equipment (especially automobiles) from MERCOSUR, together with agricultural products and petroleum. With regard to its exports, Brazil's specialization in its trade with the European Union differs considerably from its trade with the United States and MERCOSUR. Almost half of Brazil's exports to the European Union correspond to agricultural and food products, whereas in the case of the two last-named partners these products account for less than 10%. On the other hand, manufactures such as transport equipment, electrical and electronic equipment and iron and steel account for a much higher proportion of Brazil's exports to the United States and MERCOSUR.

The different forms of specialization have different repercussions on employment in the export sectors and those competing with imports. In other words, an increase in trade with a trading partner who mainly imports products which make intensive use of labour – some manufactures, for example– can have positive consequences for employment, depending obviously on the patterns of imports.

2. Employment and foreign trade in Brazil

In this subsection we will show the calculation of the labour content of Brazil's exports to and imports from its main trading partners, according to the level of schooling of the workers. In this calculation of the labour content we will take into account not only sales and purchases of final goods but also the use made of intermediate goods. The labour content of trade which takes account of such use can be calculated in two ways, however, which give results that are the same at the aggregate level but differ in sectoral terms.

The first way consists of calculating the "indirect coefficient" of labour and then applying it to the trade flows of final goods, in the following manner:

$$E^1_j = N'_{jxj} * X_{jx1}$$

where E^1 is the amount of labour contained in the trade flow according to the first calculation formula; N' is a

TABLE 1

Brazil: Composition of foreign trade, by trading partners, 1999-2001
(As a percentage of total for each partner)

Sector code	Description	Imports			Exports		
		European Union	United States	MERCOSUR	European Union	United States	MERCOSUR
1	Agriculture and stock-raising	0.4	0.6	18.7	12.0	1.4	1.0
25	Food products	2.9	0.8	14.0	31.4	8.0	8.8
2	Mining	0.2	0.2	0.4	9.2	2.3	1.9
3	Oil and gas extraction	0.0	1.7	9.0	0.4	0.2	0.5
4	Non-metallic minerals	1.2	0.6	0.1	0.6	1.0	2.2
5	Iron and steel and metal products	5.9	4.6	2.2	9.1	14.9	8.7
8	Machinery and tractors	21.2	10.1	3.0	2.4	3.9	6.8
10	Electrical and electronic equipment	16.4	31.4	1.6	1.9	10.5	12.4
12	Transport equipment	17.0	13.4	22.2	12.0	24.7	19.4
14	Wood and furniture	0.6	0.2	0.5	4.8	5.0	2.3
15	Paper and printing	2.1	2.4	1.7	4.8	3.7	5.4
16	Rubber industry	1.5	1.1	1.2	0.5	1.6	2.4
17	Chemical industry	10.0	10.6	3.6	2.6	2.0	6.7
18	Oil refining	5.0	8.7	11.1	1.6	6.9	7.4
20	Pharmaceuticals and perfumery	8.2	4.4	1.9	0.3	0.2	2.7
21	Plastic products	1.4	1.7	1.2	0.1	0.2	0.8
22	Textile industry	1.2	1.2	4.2	1.1	1.6	5.1
23	Clothing	0.2	0.1	0.3	0.1	0.3	0.5
24	Footwear	0.1	0.1	1.6	4.0	9.0	2.6
32	Miscellaneous manufacturing	4.3	6.2	1.5	1.1	2.7	2.5
	Total	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*

Source: Secretariat of Foreign Trade of Brazil.

diagonal matrix in which the terms of the main diagonal correspond to the terms of the vector resulting from the multiplication of A by n, A being the Leontief matrix of technical coefficients for j sectors and n is the vector of the direct employment coefficient calculated from the sectoral production and employment (amount of labour per unit produced, N/Q); I is the identity matrix which allows us to multiply n by X; and X is the vector of exports (the same calculation can be made for the flows of imports and/or net imports).

The results obtained in this way will give us the employment generated by the export sector. In other words, each line of the final vector represents the sum of the jobs generated (in all sectors) by the exports of the sector in question (here the sector corresponds to exports and not to employment).[12]

The second way consists of first calculating the total amount effectively exported (or imported) by each sector, taking into account the inputs used, and then applying the direct employment coefficient. The calculation is as follows:

$$E_j^2 = N_{jxj} * [A_{jxj} \cdot X_{jx1}]$$

where the terms correspond to the definitions of the previous equation, except for N, which is a diagonal matrix in which the terms of the main diagonal correspond to the direct employment coefficients contained in n. We thus obtain the employment for each sector generated by the overall exports (of the various sectors), i.e., each line of the final vector represents the employment generated in each sector by the exports of the various sectors.[13] In this case the sector corresponds to employment and not to exports. This is the calculation which was made in this study.

The total number of jobs generated in the economy is obviously the same for both forms of calculation,

[12] For example, the jobs found in the first line of the final vector correspond to those generated in all sectors of the economy as a result of the output of the agricultural sector.

[13] The first line of the final vector represents the employment generated in agriculture thanks to the exports of the 32 sectors which indirectly use agricultural products. It should be noted that the classification of the national household survey is different from that of the input-output matrix, but if the second form of calculation is used it is possible to multiply the direct labour coefficients (32 sectors) by the "effective" exports (originally with 43 sectors).

only the sectoral results being different. The data used were the following:

i) the Leontief matrix corresponding to 1996, which was the last year provided by the Brazilian Geographical and Statistical Institute (IBGE);

ii) for calculating foreign trade by trading partner, the breakdown obtained from information provided by the Secretariat of Foreign Trade for 1999 and 2001, based on export and import data supplied by the Department of National Accounts of IBGE, at 1996 prices and in millions of reales;

iii) the coefficient *n* corresponding to the quantity of labour per unit produced (N/Q), where N is employment, by bracket of skills of the workers. This coefficient was obtained by applying the weight (share in total employment) of each bracket of skills (IBGE National Household Survey, 1999 and 2001) to the figure for total employment supplied by the Department of National Accounts of IBGE (average for 1999 and 2001). Q corresponds to the total output at current 1996 values, in millions of reales.

a) *Employment and labour-intensity coefficients*

The following tables show the intensity of labour use in the various sectors of the economy, that is to say, the amount of workers per million reales produced, and the total number and skills (years of schooling) of the workers. These indicators are calculated from the most recent available employment data (from the IBGE National Household Surveys for 1999 and 2001 and the Department of National Accounts), but the production data are for 1996. As it was impossible to obtain all the data for the same year, and in order to give preference to recent employment statistics, it was decided to use the production data –above all the value of production and the technical coefficients– for the same year (1996), since these were data of the same nature.

The labour coefficient (or multiplier) for the economy as a whole (table 2) –including the services sector– is 45 workers for each million reales produced. This value is lower in the primary and secondary sectors (agriculture, mining and manufacturing): 38 workers per million reales produced.[14]

TABLE 2

Brazil: Direct employment coefficients (total), 1996 and 1999-2001

Sector	Description	Direct employment coefficient (workers per million reales produced, 1996)	Exports 1999-2001 (% of total)	Imports 1999-2001 (% of total)	Value of output, 1996 (% of total)
23	Clothing	160.3	0.2	0.3	1.7
1	Agriculture and stock-raising	154.0	5.5	3.4	15.6
14	Wood and furniture	65.6	3.6	0.4	2.3
24	Footwear	59.2	4.2	0.4	1.0
4	Non-metallic minerals	28.4	1.4	0.7	2.6
2	Mining	27.6	6.2	0.8	1.3
32	Miscellaneous manufactures	22.6	1.8	4.1	1.8
21	Plastic products	18.5	0.5	1.2	1.7
8	Machinery and tractors	18.1	3.5	10.0	4.0
15	Paper and printing	17.0	4.2	1.9	4.3
5	Iron and steel and metal products	13.7	10.9	4.9	9.7
22	Textile industry	13.6	2.0	2.5	3.1
25	Food products	13.4	24.0	4.1	19.1
20	Pharmaceuticals and perfumery	10.5	0.8	4.9	2.1
10	Electrical and electronic equipment	8.8	6.3	20.0	5.0
16	Rubber industry	7.8	1.2	1.4	1.2
17	Chemical industry	7.4	6.2	16.0	5.4
12	Transport equipment	7.2	15.3	12.7	7.0
3	Oil and gas extraction	4.1	0.7	5.7	1.1
18	Oil refining	1.1	1.5	4.7	10.0
	Subtotal (sectors 1 to 32)	38.2	100.0	100.0	100.0
	Total (sectors 1 to 43)	45.2	–	–	–

Source: Prepared by the author on the basis of data from the National Household Surveys and the Department of National Accounts of the Brazilian Geographical and Statistical Institute (IBGE).

[14] Tables 2 and 3 only show the coefficients for the goods-producing sectors, for which detailed trade statistics are available. Since these sectors use various kinds of services, however, in the appendix, which is broken down by sectors, we added the employment of the services sectors at the end.

The coefficients are classified in descending order, showing first the sectors that use most labour.[15] The sectors with the highest coefficients are clothing and agriculture and stock-raising. In these sectors, the amount of labour needed to produce one million reales is over 150. Of the total of 31 sectors analysed, only four exceed the average for the economy: the two cited above, plus wood and furniture and footwear. At the other extreme, with the lowest labour requirements, are the sectors making intensive use of capital, such as petroleum extraction and refining, transport equipment and chemical products.

The other information given in table 2 is designed to provide some data on the specialization of the Brazilian economy. Brazil does not appear to form part of the group of countries whose comparative advantages are based on the labour factor: products which make more intensive use of labour do not have much weight in Brazil's export structure. With regard to the value of production, the agricultural sector continues to account for 15% of the total, while the share of clothing is quite small. Of the three sectors with most weight in the export structure, two –food products and iron and steel and metalworking– have intermediate coefficients, while the third –transport equipment– has a very low coefficient. With regard to imports, there is heavy concentration in products of low labour content: 60% of imports are in sectors with an employment coefficient of less than 10.

According to table 3, the employment coefficient goes down significantly with a rise in the level of skills of the labour force. For the economy as a whole, the intermediate skills segment has a relatively high coefficient, while in agriculture and stock-raising, as well as industry, the difference between the unskilled and intermediate-level labour coefficients is quite marked. Furthermore, industry is the sector which generates least employment, as we can see from the coefficients for all skill levels.

TABLE 3

Brazil: Direct employment coefficient/output, 1996 and 1999-2001[a]
(Workers per million dollars produced)

Sector	Description	Level of skill of workers (years of schooling)						
		Up to 7		8 – 11		12 or more		Total
23	Clothing	93.0	(2)	62.1	(1)	5.3	(1)	160.3
1	Agriculture and stock-raising	140.7	(1)	11.8	(4)	1.6	(8)	154.0
14	Wood and furniture	44.1	(3)	19.5	(3)	2.0	(5)	65.6
24	Footwear	35.5	(4)	21.7	(2)	1.9	(6)	59.2
4	Non-metallic minerals	18.9	(6)	8.4	(9)	1.1	(12)	28.4
2	Mining	22.5	(5)	4.2	(15)	1.0	(14)	27.6
32	Miscellaneous manufactures	9.8	(7)	11.2	(5)	1.6	(9)	22.6
21	Plastic products	6.7	(11)	10.4	(6)	1.3	(10)	18.5
8	Machinery and tractors	6.8	(10)	8.7	(8)	2.5	(3)	18.1
15	Paper and printing	4.8	(13)	9.6	(7)	2.5	(4)	17.0
5	Iron and steel and metal products	6.0	(12)	6.7	(10)	1.0	(15)	13.7
22	Textile industry	7.0	(9)	5.8	(11)	0.7	(18)	13.6
25	Food products	7.3	(8)	5.4	(13)	0.7	(17)	13.4
20	Pharmaceuticals and perfumery	2.4	(16)	5.4	(12)	2.7	(2)	10.5
10	Electrical and electronic equipment	2.0	(18)	5.1	(14)	1.7	(7)	8.8
16	Rubber industry	3.2	(15)	4.1	(17)	0.6	(19)	7.8
17	Chemical industry	3.2	(14)	3.0	(18)	1.2	(11)	7.4
12	Transport equipment	2.0	(17)	4.1	(16)	1.0	(13)	7.2
3	Oil and gas extraction	1.1	(19)	2.1	(19)	0.9	(16)	4.1
18	Oil refining	0.3	(20)	0.5	(20)	0.3	(20)	1.1
	Subtotal (sectors 2 to 32)	8.6		7.0		1.2		16.8
	Total (sectors 1 to 43)	*26.8*		*14.7*		*3.7*		*45.2*

Source: National Household Surveys and the Department of National Accounts of the IBGE (1999 and 2001).

[a] Numbers in brackets indicate the order in terms of labour-intensity.

[15] The order of the sectors by direct labour coefficient calculated by Behar (1988, p. 195, table 10.7) for the Mexican economy is similar to that found here for Brazil.

Generally speaking, the sectors making the most intensive use of labour are also those that make most use of the two least qualified categories (the correlation coefficient between the two vectors is 0.62). The clothing sector is also the sector that makes the most intensive use of more highly skilled labour. This sector and that of wood and furniture are an exception, however, since the other sectors which make most use of "highly qualified" labour –the pharmaceutical and perfumery industry, machinery and tractors, and pulp and paper– generally do not make intensive use of labour.

On the other hand, the sectors which make least use of labour generally maintain this behaviour in the case of all levels of skills (in absolute terms). The correlation between the coefficient for the labour force as a whole and that for the most highly skilled labour is –0.52. In terms of the relative intensity of use of labour from the three main categories, the sectors which make least use of labour generally use a relatively high proportion of the most highly skilled labour. This is so in the petroleum extraction and refining industry and, to a lesser extent, the transport equipment, chemical, electrical and electronic equipment and pharmaceutical and perfumery industries.

In the case of labour with an intermediate level of skills, the degree of correlation with the total amount of labour per sector is –0.57, which indicates that more use is made of this category in the sectors making least use of labour.

b) *Labour content of Brazil's trade*

After applying the labour content coefficients to the trade flows, we obtain the amount of labour incorporated in Brazilian exports and imports. Table 4 shows the results for Brazil's trade with its three main trading partners.[16]

The amount of labour contained in the country's total exports is greater than that contained in its imports; in this respect, Brazil is a net exporter of labour, according to our calculations. The labour content of the country's total exports is equivalent to 7.1 million jobs, or 11.9% of total employment in Brazil in 1999 and 2001, while the labour content of imports is equivalent to 4.3 million jobs, or 7.1% of total employment. In other words, there is a positive balance of labour incorporated in the country's total foreign trade, corresponding to 4.8% of the total employment of Brazil.

Brazil is a net exporter of labour at all skill levels, but the most important category is that of less skilled labour. The balances for the other categories in the overall total are 13% for labour of intermediate skill levels, and 0.5% for the most highly skilled labour. This reflects two aspects which have already been addressed: first, the specialization of the Brazilian economy, and second, the fact that the sectors using the most highly skilled labour are normally those displaying a low level of labour intensity.

Of the three trading partners analysed, the North-South trade pattern mentioned earlier is most clearly seen in Brazil's trade with the European Union. In this trade, Brazil exports less-skilled labour and imports more highly-skilled labour. Out of the total positive balance that Brazil maintains with its trading partners as a whole, almost half comes from its trade with the European Union. In its trade with the United States, although Brazil exports more less-skilled labour than the other categories, this pattern is not so pronounced and the balance is a good deal smaller than that generated in trade with the European Union. In the case of MERCOSUR, Brazil exports to its partners in the bloc labour which is relatively more skilled than that which it imports from them, which is not surprising if we analyse the composition of trade in the Southern Cone. As may be seen from table 4, in its trade with MERCOSUR Brazil has a deficit in the less-skilled category and a surplus in the more skilled category: the opposite to the situation observed in its trade with the European Union.

In terms of its share in the "exports" and "imports" of labour, the European Union figures as Brazil's most important trading partner, since the trade with that bloc, because of its composition, makes more intensive use of labour than trade with the country's other partners. The share of the United States in such exports and imports is around 19%, while that of MERCOSUR is much greater in the case of imports (24%) than exports (10%).

These results are explained by the situation at the sectoral level.[17] The sectors in which exports generate most employment are agriculture, commerce, food products, iron and steel and metal products, and

[16] Although no simulation is made for MERCOSUR, it seems interesting to present the results for that bloc for comparison with those for the other blocs.

[17] To see the corresponding results in detail, readers may view the web page http://www.ipea.gov.br/pub/td/2004/td_1028.pdf or contact the author.

TABLE 4

Brazil: Labour content of its foreign trade, by trading partner, 1996 and 1999-2001
(In thousands of jobs)

Skill category of labour, by years of schooling	European Union	United States	MERCOSUR	Others	Total
			Total exports		
0-7	1 884	813	404	1 841	4 942
8-11	528	433	225	641	1 827
12 or more	98	84	48	128	357
Total	2 509	1 330	677	2 610	7 127
Percentage of each trading partner	*35.2*	*18.7*	*9.5*	*36.6*	*100.0*
			Total imports		
0-7	574	426	762	697	2 459
8-11	419	336	214	479	1 448
12 or more	100	82	44	118	344
Total	1 094	844	1 020	1 294	4 252
Percentage of each trading partner	*25.7*	*19.8*	*24.0*	*30.5*	*100.0*
			Balance		
0-7	1 309	388	-358	1 144	2 483
8-11	108	97	11	163	379
12 or more	-2	2	4	10	13
Total	1 415	487	-343	1 316	2 875
Percentage of each trading partner	*49.2*	*16.9*	*-11.9*	*45.8*	*100.0*

Source: Prepared by the author.

footwear. With regard to imports, the sectors whose amount of employment would be most seriously affected would be agriculture, commerce, food products, iron and steel and metal products, and machinery and tractors. In terms of the number of jobs generated, the sectors which would benefit most from trade are agriculture, food products, wood and furniture, and footwear. In contrast, the competition of imports is most clearly reflected in the jobs "lost" in the machinery and tractors and electrical and electronic equipment sectors. These results obviously vary according to the level of skills of the labour involved and the trading partner in question.

With regard to less-skilled labour, the largest amount is exported to the European Union, because of the weight of agriculture. In the case of imports, the content of such labour is relatively similar for the United States and the European Union, but is higher in the case of MERCOSUR (table 4). This is because both the developed trading partners have similar import structures, while agriculture carries considerable weight in the imports from MERCOSUR.

For the intermediate level of skills (8 to 11 years' schooling), the sectors accounting for the largest amount of labour traded (in both directions) are agriculture, petrochemicals and petroleum refining, and miscellaneous manufacturing. In terms of exports, the footwear and food industries generate the largest number of jobs, the main factor being trade with the United States in the first case and trade with the European Union in the second. With regard to imports, the labour content is quite high in the machinery and tractors sectors –especially in the case of imports from Europe– and in electrical and electronic equipment, due in this case to imports from the United States. In this category, Brazil registers a deficit in its trade with all three of its main trading partners: the lowest deficit is with MERCOSUR and the highest with the European Union.

In the case of workers with the largest number of years of schooling, Brazil has an overall surplus in terms of the labour content of its trade. Some sectors, however, show heavy deficits: machinery and tractors, electrical and electronic equipment, and the pharmaceutical and perfumery industry. In these sectors, Brazil has a negative labour balance with its developed partners (the United States and the European Union) and a positive balance with its partners in MERCOSUR, which is in keeping with the sectoral and geographical pattern of Brazil's foreign trade. The largest surpluses are in agriculture and the food industry.

As the use of intermediate goods was duly considered in the labour content calculations, the amount of labour in the services sector is taken into account. The balance in terms of labour is positive for this sector, with the major part corresponding to the European Union. In all cases, the most significant balance is that of less-skilled workers (up to 11 years' schooling).

c) *Effects of trade integration with the United States and the European Union on employment in Brazil*

In order to calculate the effects of trade agreements with the United States and the European Union on employment in Brazil, we used the growth rates of imports and exports simulated by Tourinho and Kume (2002) in a for a country with three alternatives: suppression of tariffs and other non-tariff barriers by the United States (in the event of the realization of the Free Trade Area of the Americas (FTAA)), elimination of trade barriers by the European Union (in the event of an agreement by MERCOSUR with that bloc, and lastly, the entry into force of both agreements at the same time. The simulation of these three alternatives is particularly interesting for the debate on Brazil's foreign policy options: in some cases, the two agreements (with the European Union and with the United States under FTAA) are considered as competing with each other, although in the parallel holding of the negotiations it was stated that they are basically complementary (which justifies the simultaneous evaluation of both of them).[18]

The simulations give variations in GDP of nearly 4.5% and of trade flows (always with a trend towards a deficit) of between 7% and 8%. The results of the simultaneous entry into force of both agreements on the trade balance are naturally higher, but the growth rates are not cumulative.[19]

Naturally, the results in terms of labour content and generation of employment will depend on the alternative involved, and the deeper the trade liberalization, the higher the growth rates of exports will be. In this sense, the alternative chosen conditions our results, providing us, in some ways, with a yardstick for analysing the impact on employment due to trade integration with Brazil's two main trading partners.

Table 5 shows the labour content of Brazil's total imports and exports for each of the three alternatives (columns), by level of skill of the labour force (rows). The last column refers to the situation observed in 1999-2001, taken as a comparison parameter. In the column headed "Net generation of jobs" of each of the alternatives, the variation in employment for the corresponding situation is shown with respect to the average for 1999-2001.

Because of the greater volume of trade resulting from the simultaneous entry into force of both agreements, the content of labour "exported" by Brazil would be greater than in the previous two alternatives. This increase is not significantly greater than the growth generated by the liberalization processes taken separately, however: whereas the simultaneous entry into force of both agreements would create 694,000 jobs, FTAA would create nearly 577,000, while the agreement with the European Union would create nearly 539,000. The growth is strongest in the case of less-skilled labour, and is more marked in the case of FTAA. The simultaneous application of both agreements would give rise to more marked growth in the less-skilled category –507,000 jobs, corresponding to 10.3% of the 1999-2001 level– followed by the intermediate category (8.6%) and slightly smaller growth of the most highly skilled category (8.3%).

On the import side, the increase in the labour content in the event of the simultaneous application of both agreements is also greater than for liberalization separately: the two agreements together would produce an increase of 465,000 "imported" jobs, compared with

[18] As this is a static model, there is no variation in installed capacity, but the authors did in fact use a stylized means of modelling one of the dynamic effects of integration: the increase in foreign direct investment, which would lead to an increase in installed capacity.

[19] These simulations were chosen for two reasons. First, the magnitude of the growth rates found by Tourinho and Kume (2002) is quite plausible when compared with other studies. In Castilho (2002), a considerable number of texts (including several general or partial equilibrium models) on the analysis of these agreements were analysed, and their results display considerable variations. In this respect, the growth rates of trade and GDP in the study by Tourinho and Kume are in the middle range: they are in between the growth rates of exports found by Monteagudo and Watanuki (2003), for example, which amount to as much as 36% in the case of the FTAA + European Union case, and the less optimistic figures calculated with a partial equilibrium model by De Negri and Arbache (2003) and De Negri, Arbache and Silva (2003) for the European Union and the United States (4.6% and 4.3%, respectively). Second, the situations simulated correspond perfectly with the objectives of the present study –simulation of the effects for Brazil (and not for MERCOSUR) caused by the agreement with the European Union and the liberalization of the North American market (FTAA)– as well as using the same classification of goods. This point is important because of the use of the input-output matrix to calculate the indirect labour content coefficient.

TABLE 5

Brazil: Labour content of its foreign trade, by destination/origin of trade and skill level of labour, for three integration alternatives
(In thousands of jobs)

Category of labour, by years of schooling	Free Trade Area of the Americas (FTAA)		European Union (EU)		FTAA + EU		1999-2001
	Total	Net generation of employment[a]	Total	Net generation of employment[a]	Total	Net generation of employment[a]	Total
Total exports							
0-7	5 357	415	5 334	392	5 449	507	4 942
8-11	1 964	137	1 949	122	1 985	157	1 827
12 or more	383	26	382	25	387	30	357
Total	*7 704*	*577*	*7 665*	*539*	*7 821*	*694*	*7 127*
Growth (%)[b]		8.1		7.6		9.7	
Total imports							
0-7	2 661	202	2 639	180	2 735	275	2 459
8-11	1 559	110	1 557	109	1 603	155	1 448
12 or more	369	25	369	25	379	35	344
Total	*4 589*	*338*	*4 566*	*314*	*4 717*	*465*	*4 252*
Growth (%)[b]		7.9		7.4		10.9	
Balance							
0-7	2 695	212	2 695	212	2 715	232	2 483
8-11	405	25	392	12	382	2	380
12 or more	14	1	13	0	8	-5	13
Total	*3 115*	*240*	*3 100*	*225*	*3 104*	*229*	*2 875*

Source: Prepared by the author on the basis of the hypothesis of Tourinho and Kume (2002).

[a] Difference with respect to the base years 1999-2001.
[b] Growth rate with respect to the base years 1999-2001.

338,000 for FTAA alone and 314,000 for the European Union agreement alone. In the case of the FTAA alternative and the simultaneous application of both agreements, imports making intensive use of less-skilled labour would be those which grow most (in terms of the net generation of employment compared with the base years), while in the case of the agreement between MERCOSUR and the European Union the greatest variation would be in the intermediate skills category.

Thus, there is net generation of labour in Brazil in all the alternatives considered: FTAA would give an increase of 240,000 jobs, the agreement between MERCOSUR and the European Union would give 225,000, and both together would give an increase of 229,000 jobs. The evolution of the individual categories is different, however. For less-skilled labour, the increase is similar in the cases of FTAA and the agreement between MERCOSUR and the European Union, and a little greater in the case of both agreements together. In the intermediate skills category, the increase is much greater in the case of FTAA than in the European Union agreement. Finally, there is a positive variation in the most highly skilled jobs in the case of FTAA, but no variation in that of the agreement between MERCOSUR and the European Union.

It should be noted that in terms of the percentage of the total employed population of the country (1999 and 2001 data), the variations are not very representative. Thus, there is an increase of 0.4% in total employment, due entirely to the increase in the less-skilled category. In other words, even with quite substantial growth rates of trade of around 7%, the effects in terms of employment are not very significant and mainly affect only a single category of labour: the less-skilled workers.

These results are not uniform in all sectors or all skill categories. Appendix A shows the sectoral results.

For the sectors which benefit from the agreements in terms of total employment, the application of both agreements together is clearly not always the best

option. For some sectors –all with a low level of processing– the agreement with the European Union is the best option. This is so in the case of wood and furniture, mining, and iron and steel and metal products. For the sectors which obtain more jobs, FTAA is the best option only in the case of non-metallic minerals, whose contribution to total employment is only small, and the services included in the goods sold. The simultaneous application of both agreements is the best option, however, for the three sectors which gain most jobs: agriculture, food products, and footwear.

For all the sectors which already had a negative balance in terms of the labour incorporated in their trade in 1999-2001, the situation becomes even worse. In general, these sectors are those of the most highly-processed manufactures, where Brazil usually shows a deficit compared with the European Union and the United States. Thus, the negative balance becomes even greater in all three cases, but especially in the case of the simultaneous application of both agreements. The sectors in which the loss of jobs is most marked are those of machinery and tractors and electrical and electronic equipment.

These results illustrate the diversity of interests of the agents involved and the complexity of trade negotiations, as well as the fact that foreign policy decisions determine the gains and losses of the various agents affected.

IV

Conclusions

At present, Brazil is a net exporter of labour: the balance of labour incorporated in exports and imports corresponds to 4.8% of total employment in the Brazilian economy. According to our calculations, the labour content of exports corresponds to 11.9% of total employment, and to 7.1% in the case of imports. Among all labour categories, the most significant contribution to total employment balance is from the less-skilled workers (up to seven years' schooling). The contribution of the intermediate skill category is relatively small, while that of the most highly-skilled category is almost nil (the balances in terms of the labour incorporated in net exports amount to 2% and 0.2% of the total employment in each category, respectively).

These results refer to Brazil's total imports and exports, but the sectoral differences in the trade flows according to partner naturally lead to disparities in the amount and type of labour incorporated in bilateral trade flows. Trade with the European Union, for example, follows a typical North-South pattern, so that Brazil is a net exporter of less-skilled labour (due mainly to agriculture) and a net importer of more highly-skilled labour. In the case of the United States, although Brazil has a larger positive balance for the less-skilled categories, the disparities among categories are less evident, since the North-South trade pattern is not so pronounced. In the case of MERCOSUR, the results are quite different: Brazil is a net importer of labour (especially of low levels of skills), due largely to agricultural imports and its own exports of manufactured goods.

To estimate the impact of the free trade agreements on employment, one must take into account not only current trade patterns but also the possible outcomes of trade negotiations. To assess the possible outcomes for the FTAA and the MERCOSUR-European Union FTA, we used the growth rates for Brazilian trade flows simulated by the CGE model of Tourinho and Kume (2002). In all scenarios, the growth of Brazilian exports and imports was between 7.3% and 10.9%, even in the case of simultaneous entry in force of both agreements and the increase in imports was systematically higher than that of exports. Moreover, there are significant differences between sectors.

Our simulations suggest that the impact of the agreements on employment is extremely small: in all scenarios, trade agreements generate nearly 230,000 jobs, which represents an increase of only 0.4% in the country's total workforce. FTAA would create 15,000 more jobs than the agreement with the European Union and 11,000 more jobs than the simultaneous entry into effect of both agreements. We must stress that simultaneous accomplishment of both agreements does not lead to cumulative results in terms of trade and employment generated.

All the agreements generate more jobs for the least-skilled workers: the growth in employment in this category accounts for almost the whole of the overall

increase in employment. In the case of FTAA, jobs increase for all categories, with the major gains for the less-skilled workers, followed by highly-skilled workers. The net generation of skilled employment is quite insignificant, however: close on 1,000 jobs. In the other scenarios, there is a clear change in the employment pattern, depending on the skill level of the labour concerned. An agreement with the European Union would keep the number of skilled jobs exactly the same, while the simultaneous accomplishment of both agreements would lead to a reduction of almost 40% in highly skilled jobs. Briefly, all the agreements would mainly benefit the least-skilled workers.

The present exercise aims to contribute to a better understanding of the possible effects on employment in Brazil of the MERCOSUR-European Union agreement and of the FTAA. Our calculations used a methodology which, although simple and widely used, suffers from the limitations mentioned earlier. Nevertheless, even though the results not be interpreted in absolute terms, they give an idea of the direction of the changes and the differences in outcomes according to the trading partner involved.

This paper also illustrates the complexity of the negotiations for a trade agreement as it generates gains and losses for different sectors. As we have seen, workers in a given skill category, but employed in different sectors, may have different preferences regarding foreign policy priorities. The dilemma is obviously made even more complex by the existence of other factors of production and their owners, who have distinct interests.

Finally, the numbers reflect a well-known finding of international trade theory, according to which liberalization generates gains which differ depending on the agents involved, so that economic policy-makers must act as arbiters between the winners and losers, perhaps by creating transfer mechanisms to compensate for losses. As results on total employments are quite small, if this issue is taken into account in trade policy decisions, policy makers will have to decide which type of employment they want to promote or protect.

(Original: Portuguese)

APPENDIX

Brazil: Employment associated with the trade balance, by skill levels of the labour force and by sector, for three integration alternatives[a]

(Number of jobs)

	Years of schooling: 0-7				Years of schooling: 8-11				Years of schooling: 12 or more				TOTAL			
	FTAA	EU	FTAA + EU	1999-2001	FTAA	EU	FTAA + EU	1999-2001	FTAA	EU	FTAA + EU	1999-2001	FTAA	EU	FTAA + EU	1999-2001
Agriculture and stock-raising	2 106 466	2 131 242	2 148 173	1 925 048	175 988	178 058	179 472	160 831	23 529	23 805	23 995	21 502	2 305 982	2 333 105	2 351 639	2 107 381
Mining	126 481	127 664	125 661	122 721	23 556	23 777	23 403	22 856	5 582	5 634	5 545	5 416	155 619	157 074	154 609	150 993
Oil and gas extraction	(6 648)	(6 598)	(6 687)	(6 357)	(12 622)	(12 527)	(12 695)	(12 068)	(5 654)	(5 611)	(5 687)	(5 406)	(24 924)	(24 736)	(25 069)	(23 830)
Non-metallic minerals	12 083	10 262	10 712	10 084	5 337	4 533	4 731	4 454	728	619	646	608	18 148	15 413	16 089	15 146
Iron and steel and metal products	37 118	37 403	34 874	35 826	41 801	42 122	39 273	40 345	5 974	6 020	5 613	5 766	84 894	85 545	79 760	81 937
Machinery and tractors	(42 216)	(43 209)	(46 099)	(40 935)	(53 811)	(55 077)	(58 760)	(52 178)	(15 679)	(16 048)	(17 122)	(15 203)	(111 706)	(114 335)	(121 981)	(108 316)
Electrical and electronic equipment	(28 748)	(28 343)	(29 146)	(27 297)	(75 638)	(74 573)	(76 685)	(71 820)	(24 560)	(24 215)	(24 900)	(23 320)	(128 946)	(127 131)	(130 732)	(122 437)
Transport equipment	6 218	6 702	5 490	5 457	12 591	13 570	11 116	11 050	3 082	3 321	2 721	2 705	21 891	23 593	19 327	19 211
Wood and furniture	142 012	145 579	140 126	142 894	62 776	64 352	61 941	63 165	6 413	6 574	6 327	6 452	211 200	216 504	208 394	212 512
Paper and printing	11 547	11 880	11 188	13 159	23 241	23 909	22 517	26 485	6 121	6 298	5 931	6 976	40 909	42 086	39 637	46 621
Rubber industry	115	45	(176)	527	147	57	(224)	669	21	8	(32)	96	283	109	(432)	1 292
Chemical industry	(14 072)	(13 806)	(14 811)	(14 111)	(13 028)	(12 781)	(13 713)	(13 064)	(5 157)	(5 059)	(5 427)	(5 171)	(32 257)	(31 646)	(33 951)	(32 345)
Oil refining	(2 457)	(2 429)	(2 503)	(2 333)	(4 633)	(4 580)	(4 720)	(4 399)	(3 096)	(3 060)	(3 154)	(2 940)	(10 186)	(10 069)	(10 376)	(9 672)
Pharmaceuticals and perfumery	(9 675)	(9 720)	(10 019)	(8 910)	(21 807)	(21 906)	(22 580)	(20 081)	(10 795)	(10 844)	(11 178)	(9 941)	(42 277)	(42 470)	(43 776)	(38 932)
Plastic products	(5 876)	(5 477)	(6 174)	(5 215)	(9 118)	(8 499)	(9 581)	(8 092)	(1 144)	(1 067)	(1 203)	(1 016)	(16 138)	(15 043)	(16 957)	(14 323)
Textile industry	(1 785)	(3 807)	(3 290)	(1 625)	(1 469)	(3 133)	(2 707)	(1 338)	(189)	402	(347)	(172)	(3 443)	(7 342)	(6 344)	(3 135)
Clothing	(10 478)	(12 131)	(11 117)	(8 711)	(6 990)	(8 092)	(7 416)	(5 811)	(593)	687	(629)	(493)	(18 061)	(20 910)	(19 162)	(15 015)
Footwear	155 955	136 369	158 099	143 002	95 145	83 196	96 453	87 243	8 449	7 388	8 565	7 747	259 549	226 953	263 117	237 992
Food products	184 194	178 793	186 711	163 859	137 121	133 100	138 995	121 982	18 869	18 316	19 127	16 786	340 184	330 209	344 833	302 627
Miscellaneous manufactures	(26 284)	(24 635)	(30 060)	(19 983)	(30 007)	(28 125)	(34 319)	(22 814)	(4 189)	(3 926)	(4 790)	(3 185)	(60 480)	(56 687)	(69 169)	(45 981)
Services	61 478	59 061	53 204	55 655	56 711	54 524	47 292	51 776	6 388	6 096	3 707	6 159	124 577	119 681	104 204	113 590
Total	*2 695 429*	*2 694 844*	*2 714 155*	*2 482 757*	*405 290*	*391 903*	*381 796*	*379 193*	*14 100*	*13 159*	*7 707*	*13 367*	*3 114 819*	*3 099 905*	*3 103 658*	*2 875 317*

Source: Prepared by the author.

[a] Figures in brackets denote negative values.
FTAA = Free Trade Area of the Americas.
EU = European Union.

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