Trade Policy and Poverty Reduction in Brazil

Glenn W. Harrison, Thomas F. Rutherford, David G. Tarr and Angelo Gurgel[†]

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Abstract:

Using a multi-region CGE model, we evaluate the regional, multilateral and unilateral trade policy options of MERCOSUR from the perspective of the welfare of all potential partners. In Brazil, we focus on poverty impacts. We find that the poorest households in Brazil experience percentage gains of between 1.5 to 5.5 percent of their consumption, which is about three to four times the average for Brazil. Protection in Brazil favors capital intensive manufacturing relative to unskilled labor intensive agriculture and manufacturing. So trade liberalization raises the return to unskilled labor relative to capital, thereby helping the poor.

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Address correspondence to:
David Tarr
World Bank, Room MC3-323
1818 H. Street NW
Washington DC 20433
E-mail: DTARR@WORLDBANK.ORG Fax: (202) 522-1159

[†] Glenn W. Harrison is Professor of Economics, University of Central Florida; Thomas F. Rutherford is Professor of Economics, University of Colorado; David G. Tarr is Lead Economist, The World Bank; and Dr. Angelo Gurgel is Professor of Economics, UNA–Managerial Sciences School, Brazil. We thank seminar participants at IPEA in Brasilia, BNDES in Rio de Janeiro and at the GTAP conference in Taiwan; numerous agencies of the government of Brazil and Brazilian institutes; and Brazilian scholars including Claudio Fritschak, Francisco Ferreira, Marcelo Neri, Renato Flores, Armando Castelar Pinheiro, Octavio Tourinho, Lia Valls Pereira and William Tyler. We also thank Peter Lanjouw, Johan Mistian, Maurice Schiff, Dominique van der Mensbrugge, Daniel Lederman, Joachim von Amsberg, Alberto Valdes, Mauricio Carrizosa, Claudia Paz Sepulveda, Mark Thomas, Vinod Thomas, Aaditya Mattoo, Carsten Fink, Bernard Hoekman, Sherman Robinson, Mary Burfisher, Paul Gibson and Maria Kasilag for their help and comments. The views expressed are those of the authors, and do not represent official views of the World Bank. Research support under the Bank-Netherlands Partnership Program to examine the impact of trade policy on poverty is gratefully acknowledged.

1. Introduction

Brazil faces several trade policy options. We evaluate those options from the perspective of the welfare of all potential partners. We also track impacts on the poor in Brazil, to determine which trade policy helps most in terms of poverty reduction in Brazil. Our primary policy focus is to see if there is a trade-off between aggregate welfare gains to Brazil from trade liberalization and the welfare gains to the poor. We conclude that there is no such trade-off, and explain why.

As part of the MERCOSUR customs union along with Argentina, Uruguay and Paraguay, Brazil is engaged in negotiations to implement the Free Trade Agreement of the Americas (FTAA). In addition, MERCOSUR is negotiating a potential free trade agreement with the European Union (EU), along with less notable regional arrangements. Moreover, Brazil has supported further multilateral negotiations within the World Trade Organization (WTO).[1]

However, Brazil is concerned that these regional integration initiatives will provide much less market access than agreements that do not constrain exports of partner countries. Notably, significantly improved agricultural access to EU markets will be very difficult to achieve for the usual internal EU political reasons. As a major agricultural exporter, Brazil therefore believes that the best negotiating forum for obtaining freer agricultural markets is the WTO. Moreover, antidumping and stringent rules of origin may limit access to the markets of the main Northern partners in these agreements.

Following the analysis of Harrison, Rutherford and Tarr [2002] for Chile, we assess the impact on Brazil of these key trade policy options. We extend that analysis by evaluating the value of trade policy options to Brazil if the key Northern partner denies access to specific products. In the case of the EU, we focus on agriculture protection and evaluate the impact of exclusion of preferred access to MERCOSUR exporters in the most highly protected agricultural products in the EU. In the case of the FTAA, we determine the impact on Brazil of denial of access to the most highly protected products in the US due to antidumping or restrictive rules of origin.

A major policy concern is the link between trade policy changes and poverty in Brazil. Although interest in the impact of trade policy on poverty has dramatically increased in recent years, general equilibrium modeling with multiple households to examine equity issues dates back to Adelman and Robinson [1978] and Piggot and Whalley [1985]. These studies pioneered one approach, which is to include multiple households within the general equilibrium model. This is

[1] See the *Trade Policy Review for Brazil* by the World Trade Organization [2000].

typically done by aggregating households from a household survey into 5-40 households.[2] In recent years modelers have focused more attention on the impact of trade policy on poverty, and Harrison, Rutherford and Tarr [2003] showed that a concern about equity is not equivalent to a concern about poverty.[3] A second approach is to take price changes from a representative consumer general equilibrium model and feed these into a micro-simulation model of household behavior, such as in Chen and Ravallion [2003] and Bussolo and Lay [2003]. This approach allows examination of the diversity of impacts across households: even if the aggregated poor households gain, many individual poor households could lose. But it comes at the expense of ignoring feedback effects of the quantity changes on the equilibrium outcome in the general equilibrium model, and does not reconcile inconsistent information on household income from the national accounts and the household surveys.[4]

Our analysis is in the tradition of the first approach. We incorporate 20 different types of Brazilian households in our model: ten rural and ten urban, where rural and urban households are further classified according to income levels. We are able to identify clear and crucial links between trade policy changes, factor intensities at the industry level, economy-wide factor returns and poverty – the links suggested by the Hekscher-Ohlin and Stolper-Samuelson models. But we show that it is only as a result of the attention to detail in the empirical estimation of factor shares that we are able to obtain results that can be sensibly used to analyze the poverty dimension of trade policy changes. We also show the importance of agricultural liberalization for the poor.

Our aggregate policy results are that both the FTAA and the EU-MERCOSUR arrangements are net trade-creating for the countries involved, but that excluded countries almost always lose from the agreements. We estimate that multilateral trade liberalization of 50% in tariffs and export subsidies results in gains to the world more than four times greater than either the FTAA or the EU-MERCOSUR agreement. This shows the continued, potential importance to the world trading community of multilateral negotiations.

A fully implemented agreement with the EU is almost twice as valuable as the FTAA to Brazil due to access to highly protected agricultural markets in the EU. But if agriculture is excluded from the MERCOSUR-EU agreement, the agreement is of very little value to Brazil. Application of

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[2] For recent applications see the papers in the Conference on "Poverty and the International Economy" available at: http://www.worldbank.org/trade.

[3] The trade policy change they evaluated resulted in an increase in aggregate real income, greater equity as measured by the Gini coefficient, but the poorest households were worse off.

[4] See Cockburn [2001] for an attempt to combine the two approaches.

antidumping and restrictive rules of origin by the US against Brazil under the FTAA on the most protected products in the US also reduces the value of the FTAA to Brazil. Nonetheless, the FTAA still has significant value to Brazil since we assume that other markets in the Americas and the less protected sectors in the US remain open to Brazilian exporters.

Most of the trade policy options we evaluate result in a distribution of the gains to the different households that is progressive, such that the poorest households experience the greatest percentage increase in their incomes. Although Brazil has undertaken substantial trade liberalization in the 1990s, there remain vestiges of its import-substitution industrialization strategy of the 1960s. Trade policy reforms in Brazil tend to shift resources from capital intensive manufacturing toward unskilled labor intensive agriculture and less capital intensive manufacturing, thereby inducing an increase in the wage of unskilled labor relative to capital and skilled labor. This results in an increase in the incomes of the poorest households in Brazil relative to the richest. The percentage increase in the incomes of the eight poorest households is several times greater than the percentage increase in the income of the average for the economy as a whole.[5]

Previous work has shown that multilateral agricultural trade liberalization will lead to aggregate gains for agricultural exporting nations. Our results suggest that agricultural trade liberalization, whether multilateral or in a regional arrangement with the EU, is particularly important for the realization of poverty reduction benefits for agricultural exporters such as Brazil.

In Section 2 we describe the model and data, focusing on the data choices relevant to the poverty analysis. In Section 3 we present and explain the aggregate policy results for Brazil and the other countries and regions of our model. Implications for poverty in Brazil are discussed in Section 4, and conclusions provided in Section 5. Several additional simulations, and most of the documentation of the data and model, may be found in the appendices of Harrison, Rutherford, Tarr and Gurgel [2003].[6]

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[5] These results are consistent with two other analyses of the impact of trade liberalization on the poor in Brazil. Barros, Corseuil and Cury [2000] employed a CGE model of Brazil calibrated to 1995 data. They simulated an increase of protection to the levels that prevailed in Brazil in 1985. They find that trade liberalization benefits the economy as a whole, but both the rural and urban poor gain more than proportionately from trade liberalization. The large study of rural poverty in Brazil by the World Bank [2001] concludes that "given that commercial agriculture produces the bulk of Brazil's export crops...a trade policy regime that moves toward relatively low tariffs on importables (of both inputs and final products) could significantly improve the sectors international competitiveness which would in turn lead to greater real wage rates and increased employment opportunities–both farm and downstream processing and transport." (p. iv).

[6] These appendices cover details of the model specification, tables with low elasticity results and detailed sectoral results for Brazil, procedures for updating the input-output tables and estimating factor intensities, calculation of the tariff rates in MERCOSUR, systematic sensitivity analysis, steps involved in incorporating the household survey information, and some additional references.

2. A Multi-Regional Trade Model

A. General Model Features

We develop a comparative static, constant returns to scale (CRTS), multi-regional and multi-sectoral quantitative model to evaluate the impact of trade policy on poverty in Brazil. Table 1 lists the 16 regions included explicitly in the model, as well as the 22 sectors included in each region. The model is relatively detailed in the Americas, with 13 countries or regions from that area. Outside of the Americas we have the European Union 15, Japan, and a residual Rest of the World. In terms of MERCOSUR members, Brazil, Argentina and Uruguay are represented explicitly in our model, while Paraguay is represented as part of the Rest of South America. The general specification of this model follows our earlier multi-regional model of the effects of the Uruguay Round, and even more closely our model of trade policy options for Chile.[7]

Given that the model is described elsewhere, we only briefly summarize the main features here. Production entails the use of intermediate inputs and primary factors (Labor, Capital and Land). Primary factors are mobile across sectors within a region, but are internationally immobile. The total amount of capital and labor available to any economy is fixed. Output is differentiated between domestic output and exports, but exports are not differentiated by country of destination. Except for Brazil, each region has a single representative consumer who maximizes utility, as well as a single government agent. Demand is characterized by a nested Armington structure for each of the 22 goods in Table 1. The Armington aggregate good is a constant elasticity of substitution (CES) composite of domestic production and aggregate imports, and aggregate imports are a CES aggregate of imports from different regions of origin. This structure allows multi-stage budgeting.

Government revenue must remain unchanged in any counterfactual scenario, which implies that it must impose a tax to compensate for lost tariff revenue (we employ a "lum sum". Each country has a balance of trade constraint, so that any change in the value of imports is matched by a change in exports of equal value. The model is "real," in the sense that there are no financial assets in the model. Thus we only have a "real" exchange rate, which is defined for any country as the price of its tradeable goods relative to the price of its non-tradeable goods.

Our model does not incorporate increasing returns to scale (IRTS) or endogenous productivity effects of trade policy, despite the fact that are a number of studies by Brazilian

[7] Harrison, Rutherford and Tarr [1997c][2002]. The model is formulated using the GAMS-MPSGE software developed by Rutherford [1999] and solved using the PATH algorithm of Ferris and Munson [2000]. See de Melo and Tarr [1992] for an exposition of the general form of the within-country equations of the model.

researchers that have identified a correlation between the opening of Brazil to external trade in the early 1990s and an increase in productivity in Brazilian manufacturing (Muendler [2001] found a causal relationship). A model that incorporated IRTS and endogenous productivity effects, such as that developed in Rutherford and Tarr [2002], would be expected to produce much larger gains than our CRTS model, with a resulting further reduction in Brazilian poverty compared to our estimates. On the other hand, given that the productivity advances are not likely to be concentrated in the labor intensive sectors, the relative share of the gains at the household level for the poor may be less progressive than we find.[8]

B. Brazilian Households

The most important new feature in this model is the extension to multiple households in Brazil. We identify 10 rural households and 10 urban households, distinguished by income levels as defined in Table 1. The structure of demand for each Brazilian household is a nested Armington structure, based on CES demand functions, similar to representative households in other regions.

Since the CES function is homothetic, changes in the income level of any individual consumer will not change the proportions in which he consumes commodities. Despite the fact that each individual Brazilian consumer has homothetic utility functions, relative prices in Brazil will vary with income levels in our model. This is because the CES demand function parameters that we calibrate for each household necessarily differ across households, since the initial shares of income spent on different commodities vary by households. This implies that the elasticities of demand with respect to prices and income differ across Brazilian households. Hence if income shifts from

[8] In separate simulations we have also evaluated most of the trade policy options in a "comparative steady state" model, similar to our work with a comparative steady state model on the Uruguay Round and EU single market (Harrison, Rutherford and Tarr [1996; 1997b]). Since the rental rate on capital falls in most of our scenarios, the new equilibrium capital stock does not rise and the estimated welfare gains to the economy do not rise as well. In general, the gains do not necessarily have to increase in a comparative steady state model, as explained in Rutherford and Tarr [forthcoming]. Monteagudo and Watanuki [2001] assess MERCOSUR regional trade options in a multi-region CGE model with IRTS. They posit Hicks-neutral technical change as a function of additional exports and additional imports of intermediate or capital goods. They find large gains due to the productivity effects of MERCOSUR's regional arrangements. A similar approach is adopted by Burfisher, Robinson and Theirfelder [2002] to assess the impact of the FTAA. Although this specification for productivity increase from trade will achieve large welfare estimates from trade liberalization, we choose to avoid this specification since it does not have a microeconomic foundation, such as found in the endogenous growth literature regarding technical change.

household A to household B, aggregate demand will shift toward the commodities consumed more intensely by household B.[9]

C. General Data and Elasticities

We employ the "GTAP5 data set," described in Dimaranan and McDougall [2002], for countries other than Brazil. This includes the key protection data, displayed in Table 2. The full GTAP database contains 57 sectors, but we have aggregated to 22 sectors, resulting in a model with approximately 2,500 equations. Nonetheless, we retained the sectors most important to Brazilian trade policy, since we have kept sectors with high protection in either the US, the EU, or MERCOSUR. Aggregating sectors with similar protection should not significantly affect the results.[10]

In our central elasticity scenarios we assume that the lower-level elasticity of substitution between imports from different regions, σ_{MM}, is 30 and that the higher-level elasticity between aggregate imports and domestic production, σ_{DM}, is 15. Despite the fact that these elasticity values are high by the standards of some econometric studies, such as Reinert and Roland-Holst [1992] and Shiells and Reinert [1993], our preferred "central" elasticities are supported by the estimates of Reidel [1988] and Athukorala and Reidel [1994]. Moreover, elasticities would be expected to increase over time, and this model presumes an adjustment of about 10 years, a rather long period in the context of these econometric estimates. We need to employ the higher elasticities in our model

[9] For example, Jensen and Tarr [2003] employed a model with a similar demand structure to ours in their model of Iran. They show that the relative prices of essential commodities in Iran would increase with the conversion of non-tariff barriers to equivalent tariffs because lump sum transfers of tariff revenue increase the income to the poor relative to the rich. Since the poor consume essential commodities in greater proportion than the rich, the relative prices of essential commodities increased. We have also executed our model with the Linear Expenditure System (LES) demand functions at the top level in place of CES for all Brazilian households. We have taken the income elasticities from the GTAP data set (Dimaranan and McDougall [2002]). The prices of agricultural commodities, which are consumed more intensely by the poor, tend to rise slightly more with the LES specification, since the poor gain relative to the rich; similarly, the relative prices of motor vehicles and luxury goods fall by more. However, given that the change in real income is not large in our simulations, the results change very little. For example, the returns to unskilled labor, skilled labor and capital are within three-hundredths of a percentage point of the CES results. We conclude that non-unitary income elasticities are important in models that produce significant income changes, as is typical of multi-period models of inter-generational time frames, but do not change our results.

[10] That is, we aggregated sectors which are not important in trade or which have low rates of protection. It is known that aggregation may significantly change the results in applied trade policy analysis, but that this type of aggregation results in quite small aggregation bias in trade policy analysis. We acknowledge, however, that services are not treated seriously in this model. But the reader interested in the role of services in regional agreements of Brazil may consult Mattoo et al. [2002].

in order to produce results for terms of trade changes that are closer to the results of Chang and Winters [2002] (CW).[11]

We also perform our policy simulations with lower elasticities values of $\sigma_{MM} = 8$ and $\sigma_{DM} = 4$.[12] Lower elasticities typically lower welfare gains for the countries that gain from the regional arrangements, and reduce losses for countries excluded from the regional arrangements, but they rarely change the qualitative results in the scenarios we examine.[13] Similarly, results at the household level in Brazil are muted with lower elasticities, but the relative gains to the poor in Brazil remain several multiples of the overall gain.

The elasticity of transformation between exports and domestic production is assumed to be 5 for each sector. Elasticities of substitution between primary factors of production is unity. We assume fixed coefficients between all intermediates and value added.

D. Protection Data

All distortions are represented as *ad valorem* price-wedges. Border protection estimates combine tariff protection and the tariff equivalents of non-tariff barriers into one number we call the tariff rate.

Trade in goods within MERCOSUR was tariff free by 2000. Each member country of MERCOSUR is allowed a list of exceptions to the common external tariff (CET), but the CET is

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[11] We find that our welfare calculations are broadly consistent with those of CW, who employed a differentiated product model with Bertrand competition among exporters in Brazil to assess terms of trade effects of MERCOSUR. They find that the preferential access provided to Argentinian firms that export to Brazil resulted in a reduction in the price of exports to Brazil from suppliers in the US, Japan, Chile, Germany and Korea. Schiff and Chang [2002] extended this result, finding that, as long as Argentina exported the product (even if not to Brazil), exports from the US fall in price in Brazil. Our model is one of perfect competition, but if export supply curves from foreign countries to Brazil slope up, the decline in demand by Brazil for products from countries excluded from MERCOSUR would produce an adverse terms of trade effect for excluded countries in our model. Larger elasticities (since they result in a greater decline in demand against excluded countries exports to Brazil) result in larger terms of trade effects. Since even our highest elasticities do not produce terms of trade effects in Brazil as large as found by CW for the US or Japan, the larger elasticities produce estimated changes in the terms of trade closer to the results of CW. They have also calculated the terms of trade effects of MERCOSUR as an indication of the welfare effects of MERCOUR on excluded countries, noting that since their calculations ignore various important effects in a welfare calculation, such as quantity changes, their estimates are only indicative. In order to compare our welfare estimates to those of CW, we have simulated the breakup of MERCOSUR and find that our welfare calculations are broadly consistent despite significant methodological differences. In particular, for the three regions which are the same in our data sets, we estimate that the losses from MERCOSUR are as follows: US, $490 million; Chile, $180 million; and Japan, $160 million. CW find the losses are: US, $545-$624 million; Chile, $17-$40 million; and Japan, $59-$71 million. For the US the results are rather close. For Chile we find larger welfare losses, which may be due to the fact that Chile, as a small country, has a supply curves of exports to Brazil that slopes up more steeply, and therefore has larger terms of trade losses in our model.

[12] The results for low elasticities reported in Harrison, Rutherford, Tarr and Gurgel [2003] were erroneously reported as being based on $\sigma_{MM} = 8$ and $\sigma_{DM} = 4$; in fact, they were based on $\sigma_{MM} = 16$ and $\sigma_{DM} = 8$.

[13] The impact of unilateral trade liberalization on Argentina is one exception for reasons explained below.

being phased in for the exceptions and all members are obligated to fully converge to it by 2006 (WTO [2000; p. 20]). Given that changes in the protection data are crucial to the results and that data on protection rates are usually available for a period of time more recent than input output tables, we typically employ protection data that is more recent than the input output tables available.[14] Similarly, we assume that there are zero tariffs on the imports of goods between Argentina, Brazil and Uruguay. Since the CET is approximately in place in 2003, and is scheduled to be fully implemented by 2006, we further assume that Brazil, Argentina and Uruguay all apply it.

In addition to MERCOSUR, we assume that NAFTA operates as an effective free trade area, with zero tariffs among the U.S., Canada and Mexico, but with each country maintaining its own external tariff. Although there are many other regional preferential trading arrangements in the Americas that are implemented at different levels of effectiveness, our data does not incorporate these preferential tariff rates.

In Table 2 we show the (trade weighted) average protection rates by product category across all countries. Although we impose the CET of Brazil for the external tariff of Argentina and Uruguay, the trade weighted average tariff across all countries is not precisely equal in all cases for the three countries because of product mix differences across sources of imports.

D. Brazilian Data for Poverty Analysis

We have independently constructed most of the data for Brazil, all of which is crucial to doing effective trade and poverty analysis. In addition to the protection data mentioned above, the most important steps were to: (i) update to the 1996 input-output table of the Brazilian economy from the 1985 based table in the GTAP data set; (ii) independently estimate factor shares in Brazilian industries; and (iii) use the household expenditure survey for Brazil to construct information on household expenditure patterns and household sources of income in Brazil.

The share of value added attributed to capital in input-output tables is notoriously overestimated in agriculture and services, and is poorly represented in many manufacturing sectors. The convention of input-output authorities is to take capital's share as the residual from revenue after payments to intermediates, labor and taxes. For agriculture, the lack of official reported wage

[14] We examined several sources of protection data and decided that the data in the GTAP data set was the best source. Our trade flow data are also from the GTAP dataset, and both are for the year 1999. In order to create a balanced Social Accounting Matrix (SAM), we establish a procedure that minimizes the square of the difference between the data in the reconciled SAM and the original data.

payments leads the input-output authorities to often report these sectors as the most capital intensive sectors in the economy.[15] Similar, but less severe, problems prevail in services. In manufactures, unprofitable sectors (that often do not export) have a low share of capital in the input-output tables, while profitable sectors (that may more often export) have a high share of capital. The result is that in developing countries, where labor intensive sectors may in fact be the most profitable and export-oriented, are likely to be reported as the capital intensive sectors in the economy. Harrison, Rutherford and Tarr [2003] show this problem can lead to perverse results. Consequently, we independently estimated factor shares in Brazilian industries. The impact of this re-estimation was to raise labor's share significantly in agriculture and to a lesser extent in services. In the case of manufactures in Barzil, we did not find very significant differences between our estimates and the input-output table. We demonstrate in Table 8 that this adjustment is fundamental to the results of the relative impact on the poor.

Household expenditure and income patterns were extracted from the Living Standards Measurement Survey (LSMS) for Brazil. This survey was designed and conducted by Instituto Brasileiro de Geografia e Estatística (IBGE). The LSMS survey is a stratified sample, where each household samples represents a share of the total population in the area sampled. The LSMS focused on the eastern part of Brazil, but it is estimated to represent 103.6 million people in this region, consisting of 22.3 million rural people and 81.3 million urban people. This constitutes about 63% of the total population. Although much of the country is not sampled in the LSMS, experts who have worked with the poverty data in Brazil believe the poor are represented proportionally in the sample, and at least are not under-represented.[16] We calculate the Gini coefficient for the entire survey sample at 0.585.

We aggregated the approximately 5000 Brazilian households in the survey into twenty households on the following basis. First, all households in the sample were ranked from poorest to richest, based on per capita income. We choose to rank households based on per capita income rather than household income so that we could make comparisons with the standard per capita poverty measures of the World Bank (World Bank [1990; 2000]) and of Ferreira, Lanjouw and Neri [1999] for Brazil. Based on this per capita ranking, we then divided the sample into deciles, with an

[15] Researchers at the International Food Research Institute and the Economic Research Service of the US Department of Agriculture have noted and adjusted for this problem. See Arndt et al. [1998], Thomas and Bautista [1999], Hausner [1999] and Burfisher et al. [1992].

[16] We thank Marcelo Neri, Peter Lanjouw and Francisco Ferreira for helpful conversations on several aspects of assessing poverty in Brazil.

equal number of households in each decile (except for the richest decile which has more households because we wanted to place less emphasis in the analysis on the rich). We then partitioned each of these ten deciles into two representative households: one rural and one urban. With this partition we know that the i-th representative rural household and the i-th representative urban household have approximately the same per capita income. While the i-th representative rural and the i-th representative urban household do not have an equal number of households or individuals, the sum of the households they represent is equal, and the sum of individuals they represent is approximately equal. As a result there are roughly 1,800 individuals in each household group, apart from the richest household type which has just over 3,000 individuals. Key characteristics of the households in the LSMS survey are listed in Table 1.

The share of income each household spent on each commodity group was extracted from the LSMS, as well as the shares of income each household obtained from capital, rent on land, unskilled wages and skilled wages. We have two sources of data for factor incomes: data from National Accounts and data from the Brazilian LSMS. We must reconcile those differences before implementing the model.[17] For reasons explained below, we took the *total* payments to factors from the National Accounts as true, and adjusted factor shares of each representative *household* in the model.[18] This reconciliation minimized aggregate deviations of household factor shares and expenditure shares from the values that we from obtained from the LSMS prior to rebalancing, with the shares weighted by the value of household income and expenditure. The results are reported in Table 3 and explained in Appendix D.

This reconciliation of the two sets of data significantly increased the share of capital owned by wealthy households, particularly wealthy urban households. Income estimates from LSMS surveys are known to be less than income estimates from National Accounts (see Ravallion [forthcoming] and Deaton [2003]). Although there are biases in collection of both data sets, so that neither source is clearly correct, Deaton [2003] explains that one of the most likely explanations of the difference is that households fail to respond to the survey, and that the probability of non-response plausibly increases monotonically with income. It also appears to be the case that capital's *share* of income from the LSMS surveys is less than capital's *share* of income from the National

[17] A two-stage process, in which price changes from a general equilibrium model are fed into a second stage micro-simulation model, can ignore this reconciliation. Of course, inconsistencies then arise if one then wants to allow for feedback from the second stage to the first stage after some policy shock.

[18] This re-balancing also required that we adjust expenditure shares of households for broad categories of goods, to ensure consistency with the broad patterns of consumer expenditure in the National Accounts.

Accounts. Vanos [2003] mapped income from the LSMS surveys in 14 countries into factor shares and compared factor shares with the GTAP data set. Capital's share from the LSMS surveys was 21% of household income, but it was 52% of household income based on National Account information in the GTAP data set. This presumed pattern of non-response to the household survey would also help explain this difference in capital's share, since the rich are likely to have more capital than the poor.[19]

What percentage of the households are poor, based on the LSMS? Poverty lines are defined in several ways. Two well known measures are $1 per day per person or $2 per day per person at a purchasing power parity exchange rate. Based on the LSMS data, we calculate that 7.3% of the population lives on $1 per day or less, and 17.8% of the population lives on $2 per day or less. In order to calculate poverty in Brazil, Ferreira, Lanjouw and Neri [1999] developed a measure of poverty that equals the "minimum food basket" in the reference region, metropolitan Sao Paulo, that would generate the FAO minimum coloric intake of 2,288 calories per day. They also developed indices that allow them to define "equivalent" income levels across the individual households in different regions of the LSMS. We estimate that this measure amounts to $1.50 per capita per day, using our purchasing power parity adjustments for 1996.[20] Using the poverty headcounts for each region in Brazil, reported in Ferreira, Lanjouw and Neri [1999; Table 3], and sample weights for the individuals in each of the regions of the LSMS in Brazil, their measure implies a national poverty index of 13.03% for Brazil using the LSMS.[21]

Based on the Ferreira, Lanjouw and Neri [1999] measure of poverty incidence and using the full LSMS data set, we calculate that 82% of the households in our poorest two households, Uhhd1

[19] In the case of Brazil, capital's share of factor income from the input-output tables is between 52% and 54% between 1995 and 1997. From the Brazilian Survey of Industry for 1998, capital's share of factor income is 54%; and from the Brazilian Census of Agriculture, capital's share of factor income is 76%. We have re-estimated factor shares in production to correct for biases in agriculture and services, so we have capital's share of income at 50% based on the National Account level. But Vanos [2003] estimates capital's share in Brazil at 22% based on the LSMS, and from our mapping of LSMS data, capital's share is about 10%.

[20] Specifically, they report an indigence poverty level of 65.07 Reals per month. This is divided by 30.417, the average number of days in a month, and then divided further by 1.44 to get the PPP-equivalent in U.S. dollars. This is $1.48656, which we round to $1.50 for ease of recollection.

[21] They also report comparable numbers from an alternative survey, known as the PPD, which imply a national poverty index of 24.7% using comparable income measures. Ferreira, Lanjouw and Neri [1999; p.13] note some important differences which could account for the higher poverty index derived from the PPD. Unlike the LSMS, it only asks about one aggregate non-wage source of income, using a single question, despite the considerable heterogeneity of non-wage sources of income. They also note that there may be measurement errors associated with the way in which the wage income question is asked, particularly since the same form of the question is applied to employees of firms and self-employed individuals.

and Rhhd1, fall below this poverty line. The poorer households, however, are more populous; we calculate that this amounts to 13% of the individuals in Brazil who are below the poverty line.[22]

3. Results at the Country Level

In Tables 4, 5 and 6 we calculate how Brazil and all other countries in our model will be impacted at the aggregate level from the trade policy options facing Brazil. We report the change in welfare, measured by "Hicksian equivalent variation," as a percent of consumption[23] and in 1996 US dollars. Our aggregate estimate for the change in welfare is the weighted sum of the welfare changes for the twenty individual households in our model. We present our central elasticity results explicitly, but mention where there are important differences with low elasticities. Key macro variables that are important for the interpretation of the household results are presented in Table 6.

A. Regional Arrangements

As part of MERCOSUR, Brazil is negotiating participation in the FTAA as well as a MERCOSUR-European Union free trade agreement. In principle, Brazil would like both agreements to be implemented. We estimate that Brazil will gain from the FTAA by about six-tenths of a percent of Brazilian personal consumption (or from Table 5, about US $3 billion). The gains to Brazil from a MERCOSUR agreement with the EU are about 1.5 times the gains from a FTAA.

Both the FTAA and the MERCOSUR-EU agreement result in very large economic areas, including one large "Northern participant." The large partner countries have export supply capacity that is large relative to the demand from smaller partners. For a given absolute change in demand resulting from a regional agreement, the larger capacity of larger countries allows them to supply their partners with relatively elastic supply curves. This prevents the supply price for imports from large partner countries from rising significantly. Finally, large countries offer improved market access, as emphasized in Harrison, Rutherford and Tarr [2002]. Although we have found several cases where preferential arrangements among small countries can be welfare reducing,[24] for the

[22] We calculate that the average number of people in Rhh1 is 5.8, and the average number of people in Uhh1 is 5.0. This compares with and average household size for the entire survey of 3.9. The average household size of the households below the poverty line is 5.4.

[23] Welfare as a percent of GDP is roughly 70% of our estimate of welfare as a percent of consumption.

[24] Harrison, Rutherford and Tarr [2002] estimate that Chile will lose from a free trade area with MERCOSUR with an 11% external tariff. Bakoup and Tarr [2000] estimate that Cameroon will lose from the preferential trade aspects of its participation in CEMAC. We estimate that Uruguay loses from its participation in MERCOSUR. We also find that Uruguay loses from participation in MERCOSUR.

reasons just mentioned we estimate that Brazil and most countries in the Americas will gain from a FTAA and that MERCOSUR countries will gain from a free trade agreement with the EU.

The one exception to this pattern in the Americas is Argentina, which we estimate to lose slightly from the FTAA. Prior to the FTAA, it enjoys preferential access to the markets of the other MERCOSUR countries. The FTAA provides equivalent access to the other countries in the Americas to the MERCOSUR markets, thereby eroding the preferential access of Argentina. The loss of preferential access for Argentina, combined with trade diversion effects, are larger than the trade creation effects.[25]

The gains to Brazil, Argentina and Uruguay are about 50% larger with a MERCOSUR-EU agreement than with the FTAA. Table 2 provides the information to explain this outcome: the EU has several agricultural and food products with very high tariffs. *If* Brazil, Argentina and Uruguay could obtain tariff free access to these EU markets, while the EU continues to apply these tariffs on other countries, their ability to export under this tariff umbrella would result in a large terms of trade gain for them in EU markets In the case of the relatively small economy of Uruguay, its ability to export under this tariff umbrella would result in gains of between 6% (with low elasticities) and 44% (with our central elasticities).[26]

On the other hand, countries excluded from the agreements typically lose. The EU, Japan and Rest of the World all lose as a result of the FTAA. Their combined loss is $8.4 billion. The reason is that the excluded countries suffer a decline in demand for their exports to the Americas as importers in the Americas shift demand toward suppliers from the Americas. Hence there is both a terms of trade loss on sales that continue, and an efficiency loss of having to shift to alternate markets or products. The EU is estimated to lose $2.6 billion, slightly more than the $2.3 billion the US is estimated to gain. One exception is Japan and the EU-MERCOSUR agreement. Japan obtains a small terms of trade improvement in the markets of the Rest of the World as countries included in

[25] Pereira [1999] and Teixera [2002] find the same result for Argentina in the FTAA.

[26] The gains to Uruguay come primarily from the meat sector. Attracted by a tariff umbrella of 95 percent tariffs in the large EU market, we estimate that Uruguay will, in the long run, dramatically expand meat output and exports of meat to the EU. The share of meat exports in total Uruguayan exports rises from about ten percent to about 94 percent, and the value of meat production increases 16 fold.. We evaluate below a more likely scenario in which the EU does not provide unrestricted preferential access to only MERCOSUR.

In Uruguay, the meat sector is about 8 percent of GDP (as opposed to 2 and 3 percent in Brazil and Argentina) and about 30 percent of its output is exported (as opposed to 2 and 8 percent in Brazil and Argentina.) Thus, since meat exports are much more significant as a percent of Uruguayan GDP, the welfare gain from an improvement in the export price in the EU in this sector can be expected to result in a larger welfare gain than in Brazil or Argentina.

that agreement shift toward the markets of each other. The gains to Japan, however, are very small, and round to zero at the nearest one-tenth of a percent of Japan's consumption.

Our results indicate that the benefits to Brazil from these two agreements together exceed the sum of the benefits for each of the agreements separately. This is because the combined economic area of the Americas plus the EU is vast, and Brazil is the less likely to face adverse terms of trade effects as a result of consuming a large share of any exporter's supply. Lost tariff revenue from diverting trade to partner countries that are part of either agreement taken separately are reduced by combining the two agreements. Thus, the strategy of negotiating an agreement with the EU in addition to the FTAA appears to be a useful strategy that is likely to increase the welfare gains to Brazil.[27]

B. Limitations on Market Access: The Impact of Antidumping, Rules of Origin and EU Agriculture Exclusions

Although preferential trade arrangements with large Northern markets offer the promise to developing countries of increased market access to a large Northern market, in practice there are limitations to the improved access that significantly reduce the benefits. Most notable among these limitations are the limited improvements in market access to agricultural markets in agreements with the EU, and limits on access due to antidumping actions and restrictive rules of origin.

The EU has steadfastly refused to grant tariff free access in its highly protected agricultural products in its Association Agreements with the Central and Eastern European countries, in its customs union agreement with Turkey, and in its free trade area agreements with various Mediterranean countries such as Morocco and Tunisia. Hence it is *a priori* unlikely to offer concessions to MERCOSUR that it has refused to offer to other countries for which it might be viewed as having more to gain geo-politically.

With the decline of tariff and non-tariff barriers in world trade, the use of antidumping as a protectionist device has risen significantly (Finger [1993]). Moreover, Messerlin and Reed [1995] have shown that the antidumping authorities in the US and EU appear to have converged in their policies as protection has declined over time. This involves increased assessed antidumping duties, as well as a focus on antidumping on four "sensitive" sectors: chemicals, metals, non-electrical

[27] These results are similar to the results Harrison, Rutherford and Tarr [2002] found for Chile when they found that the "additive regionalism" strategy of Chile resulted in significantly larger benefits than the agreements taken separately.

machinery, and electrical equipment. Despite a proposal by Chile to limit the use of antidumping actions as part of the FTAA, the US has strongly resisted efforts to limit the use of antidumping actions as part of the FTAA. Thus, Brazilian authorities have expressed the fear that the benefits of *nominally* improved access to the markets of the US will be denied *de facto* by antidumping actions.

Finally, free trade agreements involve rules of origin, which are requirements that exporters source a share of inputs from within the preferential area. Evidence is now accumulating that these rules of origin significantly limit the improved market access of preferential tariff concessions. For example, the Africa Growth and Opportunity Act provided preferential access for African exports to the markets of the US. Mattoo et al. [2002] found that, while the preferential access should increase African non-oil exports to the US by about 10%, African non-oil exports to the US would increase by about 50% without the stringent rules of origin. Estevadeordal [2000] has found that improved access by Mexico to the US under NAFTA has been limited by restrictive rules of origin. And Brenton and Manchin [2003] argue that preferential trade agreements of the EU have been ineffective in delivering improved market access to the EU, most likely due to the restrictive rules of origin the EU imposes, coupled with the costs of proving compliance with the rules.

Although the range of potential denial of access is broad, we perform two simulations to illustrate the how these limitations of market access by the EU and the US would affect the potential gains.

Excluded Agricultural Products in the EU-MERCOSUR Agreement. In this scenario we assume that the EU fails to provide improved market access to its most highly protected products. These products are all agricultural products and the tariff rates in the EU in our data set are as follows: paddy rice (65%), cereal grains (44%), processed rice (86%), other food products (28%), bovine meat products (95%), dairy products (90%), other meat products (61%) and sugar (76%). What is the impact, especially to Brazil, Uruguay and Argentina, of denial of full market access in a MERCOSUR-EU agreement to these key agricultural products?

The central elasticity results are presented column 4 of Tables 4 and 5. For Brazil we see that the value of the EU-MERCOSUR agreement is reduced to one-tenth of a percent of consumption from nine-tenths of a percent if the EU fails to provide full market access. That is, the constrained agreement contains very little value. The estimated gains for Uruguay are also reduced dramatically. The highly protected agriculture and food product markets in the EU are products in which the MERCOSUR countries have a comparative advantage. Consequently, if the free trade agreement

between the EU and MERCOSUR excludes these products, the expected benefits would be significantly reduced. In addition, the gains to the EU are reduced from 0.5% of its consumption to 0.1%, reflecting the importance of agriculture liberalization in the EU for EU consumers to reap gains.

Antidumping and Rules of Origin in the FTAA. Limitations on market access to the US market are more likely to come from restrictive rules of origin and antidumping, rather than explicit exclusion of certain products from the FTAA. The Brazilian authorities have expressed the fear that the benefits of improved access to the markets of the US will be denied by antidumping actions, such as in the steel sector. In this scenario we provide an estimate of the costs to Brazil of continued US protection of its most protected markets, even if a FTAA is implemented. We focus on the most highly protected products in the US market: oil seeds (18%), other crops (14%),[28] dairy products (42%) and sugar (53%). For these sectors, we assume that the US employs antidumping duties or stringent rules of origin to neutralize the impact of the FTAA on the exports of Brazil. That is, the US tariff applied on exports from Brazil of these products does not change in the counterfactual when we implement the FTAA with excluded products in the US.[29]

The results are presented in column 2 of Tables 4 and 5. The impact of excluded products in the US is to reduce the benefits to Brazil to about two-thirds of the gains Brazil would receive with full market access in a FTAA. The reduction in benefits from denied market access in the US is not as severe as the impact of excluded products with the EU agreement. There are two major reasons why denial of market access is more important in the agreement with the EU. First, the tariff peaks in the US market are not as high as the tariff peaks in the EU. The large impacts tend to be driven by the tariff peaks, so the impact of excluding the tariff peak products in the EU is relatively large. Second, there are other markets in the Americas that open up to Brazil as part of the FTAA. If the US fails to provide preferential access to its highly protected products, Brazil may sell these products

[28] Our category "other crops" is an aggregate of the following sectors from the full GTAP data set: wheat, vegetables and fruits, fiber based plants, wool, forestry, fishing, and the category other crops. We have also performed simulations with wheat as part of grains rather than other crops. Argentina gains more from the EU-MERCOSUR agreement, but otherwise most of the results change by very small amounts.

[29] This is not a full treatment of the potential use of antidumping or rules of origin within the FTAA or of the impact on Brazil. Such a treatment would have to account for antidumping duties and stringent rules of origin by the US against other products and partners in the Americas as well, and the use of antidumping and stringent rules of origin by countries other than the US. Moreover, antidumping in other sectors that we do not restrain in our simulation, such as steel, limits Brazilian access. But this scenario should provide an assessment of the *potential* costs to Brazil of US antidumping.

in the other markets of the Americas since, in the FTAA, Brazil obtains preferential access to these markets compared to countries outside the Americas. On the other hand, if the EU denies preferential access as part of a free trade agreement between Brazil and the EU, there are no alternate markets in which Brazil has preferential access for these products as part of the agreement.

FTAA with no change in the external tariffs of MERCOSUR. To identify the source of gains, especially at the household level, we also evaluate the impact of the FTAA in which no improved access to the markets of MERCOSUR is offered. That is, in this scenario we assume that the countries in the Americas outside of MERCOSUR lower their tariffs preferentially to all countries in the Americas (so Brazil obtains improved market access), but the countries in MERCOSUR do not lower MERCOSUR tariffs against the partner countries in the Americas (so Brazil does not offer any improved market access). The purpose of this scenario is to assess how much of the gains to Brazil will come from improved market access to the markets of the Americas and how much is due to lowering the tariffs of MERCOSUR, thereby achieving improved resource allocation in Brazil. One could imagine active use of antidumping policy and rules of origin in Brazil and Argentina that denies improved access to the countries of the Americas.

In column 8 of Table 4 we see that the gains to Brazil are reduced to 0.4% of consumption, so that about two-thirds of the gains remain. This shows that improved market access is responsible for about two-thirds of the gain to Brazil from the FTAA, and that the remaining one-third of the gain comes from the preferential lowering of the MERCOSUR tariff.

C. Tariff Cuts and Uniformity by MERCOSUR and Multilateral Liberalization

Unilateral Trade Liberalization by 50 Percent and Tariff Uniformity. In column 6 of Tables 4 and 5 we estimate that a 50% cut in the tariffs of MERCOSUR will result in an increase in welfare by about 0.4% of Brazilian consumption, or about $1.9 billion per year. Thus, the gains from the FTAA with excluded access to the US market on selected products results in approximately the same gains as a unilateral tariff cut by MERCOSUR of 50%. With low elasticities, however, the gains are only $0.4 billion for Brazil and the impact on Argentina is actually negative.[30] The gains from a

[30] Harrison, Rutherford and Tarr [1997c; Appendix C] show that the optimal tariff t , in any sector in our model, is bounded below by $t^* = \{[\sigma_{MM}/(\sigma_{MM}-1)] - 1\}$. Thus, even in our central elasticity case with $\sigma_{MM} = 30$, the optimal tariff is over 3%; but in our low elasticity scenarios, with $\sigma_{MM} = 8$, the optimal tariff is over 14%. Given the existence of an average import tariff for MERCOSUR of 12 %, the optimum uniform tariff is lower than the existing average tariff in our central elasticity scenarios. The small gains that remain are due to lowering the tariff peaks.

50% cut in tariffs with low elasticities are about 0.2% of Brazilian consumption. There are larger terms of trade effects with the lower elasticities which results in the lower gains from tariff reduction.

We estimate that tariff uniformity (with the same collected tariff revenue) in MERCOSUR will result in slightly larger welfare gains than a 50% cut in tariffs. These results are consistent with our earlier results (Harrison, Rutherford and Tarr [1993][2002]). Moreover, Martinez de Prera [2000] found that there would be welfare gains from tariff uniformity in all 13 countries that she evaluated. Evidently, tariffs do not typically differ from uniformity in these economies due to efficiency of taxation reasons.[31] On the contrary, the large gains from trade liberalization are typically derived from reducing tariff peaks, which is effectively accomplished with tariff uniformity. Reducing low tariffs results in proportionately smaller gains, and may even result in losses if the importing country possesses monopsony power.

Multilateral Trade Liberalization. Brazilian authorities have also encouraged multilateral trade negotiations, and supported the Doha Development Agenda. In part, this is due to the view that the most likely venue in which agricultural liberalization will take place is through the WTO. We consider a scenario in which all countries in the world reduce their tariffs and export subsidies and taxes by 50%.

Brazil gains about 0.8% of personal consumption from multilateral trade liberalization in our static model, or about $4.5 billion per year. This is larger than the gains from the FTAA, and also larger than the gains from an agreement with the EU that excludes the highly protected agricultural and food products.[32] Given the likely exclusion of agriculture from a MERCOSUR agreement with the EU, these results support the strategy of the Brazilian authorities to pursue multilateral liberalization together with the regional options.

We estimate the gains to the world from the radial cut in tariffs and export subsidies by 50% to be equal to $186 billion with central elasticities and $87 billion with low elasticities. As Harrison, Rutherford and Tarr [1997b] have argued in assessing the Uruguay Round, elasticities play an important role in explaining differences in aggregate gains from multilateral trade liberalization.

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[31] The set of elasticities we have chosen, however, makes uniformity beneficial in general. That is, the Ramsey optimal taxation rule suggests that higher taxes should be placed on the goods with the lower elasticity of demand. With our virtually homogeneous choice of elasticities, the Ramsey optimal tariffs are close to uniform.

[32] Roland-Holst and van der Mensbrugghe [2001] also find that multilateral trade liberalization is considerably more valuable to the world than the FTAA and that excluded countries lose from the FTAA.

4. Impact on Households and the Poor

In our model we have ten rural households and ten urban households in Brazil, grouped according to income. In Table 7 we present the results of the trade policy options for these households in percentage terms. The results for the households follow a similar pattern across all of the policy scenarios. We estimate that the poorest household will typically gain several multiples of the aggregate gains for the economy expressed as a percent of household consumption.[33] Although the impact on the income of households is not strictly progressive, the four poorest urban households and four poorest rural households are among the biggest gainers from the reforms as a percent of their own household consumption.[34]

Why do we obtain this robust and encouraging result? Trade protection in Brazil favors capital intensive manufactures, so liberalization shifts resources toward more unskilled labor intensive agriculture and less capital intensive manufactures. Thus, the wage rate of unskilled labor increases significantly more that the rent on capital (Table 6).[35] The poorest households earn the majority of their income from unskilled labor (Table 3), so they gain proportionally more than other households.[36]

With respect to the shifts in sectoral output and returns to factors, although the impact on the sectors depends on the specific agreement, there is also a pattern. In general, the oil seeds, other agriculture (excluding grains and wheat), other crops (which includes fruits and vegetables and wheat), processed food, and leather sectors expand production and exports. These sectors, especially the agricultural sectors,[37] are the most intensive users of unskilled labor in our model. Several

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[33] The percentage gains for the poor relative to the aggregate percentage gains are similar for low trade elasticities.

[34] The Gini coefficient does improve with the main policy scenarios we are considering. For example, it changes from 0.5850 in our benchmark to 0.5826 in scenario FTAA. For reasons explained in Harrison, Rutherford and Tarr [2001], however, we caution against use of simple measures of inequality such as the Gini when the concern is really with the impact on the poor. It is quite possible, as illustrated there, for the Gini to indicate a more egalitarian distribution of welfare while poverty increases. There are ways to modify the Gini to give greater weight to the poor, but we prefer to utilize the detailed results from the simulations directly rather than debate the virtues of alternative summary statistics.

[35] The poor typically do not have significant real assets or financial assets accumulated, so they do not earn significant capital income or income from the rent of land. Nor do the poor typically have much human capital accumulated, so they earn a much smaller share of their income from skilled labor than the middle income classes.

[36] The two households that are most dependent on capital as a source of income (Uhh9 and Uhh10) gain the least or lose. Uhh9 typically gains even less than Uhh10 because the LSMS data indicate that Uhh9 saves and invests very little while Uhh10 saves and invests a lot. We assume that savings are spent on the capital good. Since the cost of the capital good falls, Uhh10 gains from the fall in this price, but Uhh9 does not.

[37] The EU-MERCOSUR agreement (without exceptions) induces a much larger increase in agricultural output in Brazil than the other agreements, due to the large increase in preferential access for MERCOSUR countries in the EU.

manufacturing sectors decline, including motor vehicles, other metal products, and the sector we call other manufacturing. These declining sectors are among the most capital intensive in Brazil. This reflects relative protection in Brazil, which favors manufacturing at the expense of agriculture and processed food products. Although Brazil has undertaken substantial trade liberalization, vestiges of its import-substitution industrialization protection structure remain. When protection is reduced in the economy, resources shift toward the agriculture and food sectors that had been disadvantaged relative to manufacturing. The expanding sectors tend to be less capital intensive than the contracting sectors. International trade theory argues that, following trade liberalization, the price of the factor of production used intensively in the protected sector should fall relative to the price of the factor of production in the unprotected sector.[38] Thus, the wage rate of unskilled labor rises relative to the rent on capital, and this benefits the poor. The value of land rises even more than the wage rate of unskilled labor. As a result of their land ownership, two of the richest rural households are the biggest gainers from the reforms.

To document our interpretation of why the poor can be expected to gain proportionally more than the wealthier households, we decompose the impact of the FTAA on households and present the results in Table 8. In column 1 we reproduce the base results from Table 7 for the FTAA. In column 2 we counterfactually assume that all households consume the commodities in the same proportions. We observe that while the gains to the poorest households are slightly reduced compared to the total for the economy, the percentage gains in household income of the poorest households remain between three to four times the percentage gains for all households together. Thus, *disparate consumption shares do not explain why the poor households gain more from the trade policy changes.* On the other hand, in column 3 we present the results of our FTAA scenario where we counterfactually assume that all households earn their income from the factors of production in the same proportions. That is, we ignore the data in Table 3 from the LSMS as to how the different households earn their income. Instead we assume that all households earn the same share of their income from the wages of unskilled labor, wages of skilled labor, rent on capital, and rent on land.

[38] Strictly speaking this result, known as the Stolper-Samuelson theorem, has been shown only in homogeneous product models. In our product differentiation model, however, the domestic goods do not have the same price as the imported substitute. Then a change in a tariff that affects the price of the import variety, does not translate into an equal change in the price of the domestic substitute. This mutes strict application of the Stolper-Samuelson results regarding whether the price of the factor whose price falls, must also fall relative to the numeraire good. Nonetheless, in our central elasticity case, we typically have that the price of capital falls in relative terms. But in the low elasticity case, which departs more significantly from the homogeneous model assumption of Stolper-Samuelson, we see a decline in the price of capital relative to our numeraire less often.

We see in column 3 that most of the poorest households would only obtain a slightly greater increase in income compared to the average of 0.6% if they earned their income in the same manner as the average for the economy as a whole. This confirms that what is critical for explaining why poor households are estimated to gain more from these trade policy options is that the price of the factors of production important to the income of the poor households rise more than proportionately. From Table 3 we see that the factor most important to the poor is the wage rate of unskilled labor. Data in Table 6 show that the unskilled labor wage rate rises the fastest among the important household income factors.

To further verify this explanation, we perform one additional simulation in column 4 of Table 8. For reasons explained earlier, we estimated factor shares from additional information not in the Brazilian input-output table. We estimate that the capital intensity in agriculture sectors is significantly less than reported in the input-output table. In column 4 of Table 8 we present the estimated percentage welfare gains from the FTAA to Brazilian households if we use the biased factor shares available in the original GTAP data. The results show that if we use the uncorrected factor shares in the GTAP data, there is a dramatic difference in the results. The poorest rural (urban) household is estimated to gain 0.5% (0.4%) of its consumption, equal or slightly less than the aggregate average percentage gain. This shows that the corrections we performed to the factor share data are crucial to the results at the level of the household and supports the interpretation that the shift of resources toward agriculture is important in increasing the incomes of the poor and reducing poverty.

Our results also show, in column 8 of Tables 4 and 7, that the tariff changes of MERCOSUR are relatively more important to the poor than improved market access. In this scenario MERCOSUR does not change its own tariffs but obtains improved market access to the markets of the Americas. The gains to the economy on average fall by about one-third compared to the FTAA, but the gains to the poorest households fall by two-thirds. This is because MERCOSUR's tariff changes induce output expansion in the sectors that intensively use unskilled labor and that increases the unskilled wages relative to other factor prices. Improved market access does not increase the price of unskilled labor relative to capital. With only improved market access, the poor gain, but not progressively as they do with internal liberalization in MERCOSUR.

Although we find that the trade reforms are significantly pro-poor, our model implicitly assumes a time horizon long enough to re-establish equilibrium after some policy shock. Thus, it is possible that during the transition to a new equilibrium some poor households will be hurt. This is

especially likely among the households that are moving out of the declining sectors, such as the more highly protected manufacturing sectors. This emphasizes the need to have an effective safety net in place to assist the poor.

To test the robustness of the results with respect to parameter specification, we conducted 500 simulations of the impact of the FTAA. Key paramater values were drawn randomly from specified probability distributions (Appendix F on systematic sensitivity analysis). We find that as a result of the FTAA, the following will hold with virtual certainty: Brazil will gain at least 0.3% of its consumption; FTAA members will gain at least $12 billion per year; excluded countries will lose at least $6.7 billion per year; and the poorest urban and rural households will gain at least 1% of their income. The sensitivity results confirm the conclusions drawn from the point estimates regarding who the gainers and losers are at both the household level and at the aggregate country level.

5. Conclusions

We find that both the FTAA and an EU-MERCOUSR agreement would produce gains to Brazil. Exceptions to these agreements, from rules of origin, antidumping and especially agricultural exclusions in the agreement with the EU, would significantly diminish the gains to Brazil. Our estimates indicate that Brazil can optimize its choice of trade policies by combining regional arrangements in both the Americas and the EU with multilateral liberalization. If tariff uniformity is added to the regional and multilateral liberalization, still further gains would be realized.

Both the FTAA and the EU-MERCOSUR arrangements are net trade-creating for the countries involved, but excluded countries almost always lose from the agreements. Multilateral trade liberalization results in gains to the world more than four times greater than either of these relatively beneficial regional arrangements, showing the potential importance to the world trading community of the multilateral negotiations.

Most of the trade policy options we evaluate result in a distribution of the gains to the different households in Brazil that is progressive, such that the poorest households experience the greatest percentage increase in their incomes. This is because the trade policy changes tend to shift resources from capital intensive manufacturing toward unskilled labor intensive agriculture and less capital intensive manufacturing, thereby inducing an increase in the wage of unskilled labor relative to the other prices of factors of production. This is turn results in an increase in the incomes of the poorest households in Brazil relative to the richest. The percentage increase in the incomes of the

poorest households is three to four times greater than the percentage increase in the income of the average for the economy as a whole.

We expect that a micro-simulation model would find that some poor households could lose, especially in the short run. This emphasizes the need for effective safety net policies to be in place. But given that the sectors that are important to the poor tend to be disfavored by the structure of protection, the medium to long run effects of these trade reforms should be positive for the vast majority of the poorest households.

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Table 1: List of commodities, regions, factors of production and households

Commodities		Regions		Factors	
PDR	Paddy rice	BRA	Brazil	CAP	Capital
GRO	Cereal grains	ARG	Argentina	LAB	Unskilled labor
OSD	Oil seeds	URY	Uruguay	LND	Land
AGR	other agriculture	CHL	Chile	RES	Natural resources
OCR	Other crops*	COL	Columbia	SKL	Skilled labor
CMT	Bovine meat products	PER	Peru		
OMT	Other meat products	VEN	Venezuela		
MIL	Dairy products	XAP	Rest of Andean Pact		
PCR	Processed rice	MEX	Mexico		
SGR	Sugar	XCM	Central America and Caribbean		
OFD	Other food products	XSM	Rest of South America		
ENR	Energy and mining	CAN	Canada		
TEX	Textiles	USA	United States of America		
WAP	Wearing apparel	E_U	European Union 15		
LEA	Leather products	JPN	Japan		
LUM	Wood products	ROW	Rest of World		
MAN	Other manufacturing				
I_S	Iron and steel				
FMP	Other metal products				
MVH	Motor vehicles and parts				
SER	Services				
CGD	Savings good				
DWE	Dwellings				

* Note: Our "other crops" is an aggregate of the following sectors from the full GTAP dataset: wheat, vegetables and fruits, fiber based plants, wool, forestry, fishing and the GTAP category other crops.

Household Types and Characteristics

Rural	mean per capita income*	mean household income*	% of sample	representative no. of individuals (in millions)	no. of individuals in survey	**Urban**	mean per capita income	mean household income*	% of sample	representative no. of individuals (in millions)	no. of individuals in survey	no. of individuals in survey in household i (Rhhi + Uhhi)	Monthly household income in 1996 Reals
Rhh1	48	129	5.89	6.10	1,090	Uhh1	63	135	4.38	4.54	707	1,797	0 - 206
Rhh2	103	259	3.92	4.06	868	Uhh2	131	264	5.54	5.74	955	1,823	207 - 313
Rhh3	116	364	2.64	2.73	661	Uhh3	155	375	6.14	6.36	1,152	1,813	314 - 431
Rhh4	140	489	2.31	2.39	556	Uhh4	196	497	6.78	7.03	1,260	1,816	432 - 564
Rhh5	165	647	1.87	1.94	470	Uhh5	239	649	7.34	7.61	1,347	1,817	565 - 741
Rhh6	228	838	1.41	1.46	328	Uhh6	286	846	8.74	9.05	1,486	1,814	742 - 964
Rhh7	286	1,074	0.7	0.73	194	Uhh7	390	1,123	9.27	9.60	1,624	1,818	965 - 1,290
Rhh8	385	1,528	0.96	0.99	235	Uhh8	479	1,561	8.06	8.35	1,582	1,817	1,291 - 1,889
Rhh9	615	2,282	0.32	0.33	103	Uhh9	752	2,449	8.99	9.31	1,716	1,819	1,890 - 3,196
Rhh10	2,363	7,864	1.52	1.58	408	Uhh10	2,187	6,728	13.22	13.70	2,648	3,056	3,197 - 66,809
Total Rural			21.54	22.31	4,913	Total Urban			78.46	81.27	14,477	19,390	

* Income figures are in 1996 Reals.

** The number of individuals the stratified sample is estimated to represent.

Source: Authors' calculations from the Living Standards Measurement Survey conducted by IBGE.

Table 2: Structure of protection for all countries in the sample*

	BRA**	USA	CAN	MEX	ARG	CHL	COL	PER	VEN	URY	XCM	XAP	XSM	EUR	JPN	ROW
PDR	12	5	***	15	12	11	13	22	13	12	25	12	15	65	409	7
GRO	7	1	9	38	7	11	12	12	12	7	9	11	5	44	20	77
OSD	6	18	***	3	6	11	11	12	11	6	5	8	4	3	76	52
AGR	10	3	12	17	10	11	17	12	17	10	12	17	7	13	18	24
OCR	8	14	2	12	9	11	12	16	12	9	9	9	7	10	46	20
ENR	4	0	1	7	5	11	9	12	6	5	6	6	4	1	-1	5
CMT	12	5	16	35	12	11	19	15	19	12	15	18	11	95	36	34
OMT	14	4	72	68	14	11	18	20	18	14	20	19	13	61	58	33
MIL	19	42	215	38	19	11	19	19	17	19	24	18	16	90	287	43
PCR	15	5	1	15	15	11	20	20	20	15	36	20	18	86	409	19
SGR	19	53	5	4	19	11	18	12	18	19	20	17	24	76	116	17
OFD	18	8	29	22	18	11	18	15	19	18	16	18	17	28	34	32
TEX	16	11	16	15	16	11	17	16	17	16	16	11	16	10	8	16
WAP	20	13	21	33	20	11	20	20	20	20	24	15	23	12	13	17
LEA	26	13	15	25	26	11	16	18	18	23	15	15	19	8	15	13
LUM	15	2	7	13	13	11	17	12	16	14	15	15	20	3	3	11
MAN	13	2	3	10	13	11	9	12	10	13	9	9	11	4	1	7
I_S	13	3	5	8	12	11	10	12	12	12	6	9	11	3	3	8
FMP	16	4	6	14	16	11	14	12	15	16	10	12	16	4	1	12
MVH	26	2	5	14	26	10	21	12	25	29	13	20	14	5		13

*Import share trade weighted average import tariff defined over the set of countries subject to positive tariffs.
**See Table 1 for definitions of countries and products.
***There are only imports are from the US and these are not subject to duties.

Table 3: Household income shares from factors of production and transfers

Household*	Income Shares (in percentages)					
	Skilled labor	Unskilled labor	Rent from Capital	Rent from Land	Transfers	Sum
Rhhd1	6	68	3	1	22	100
Rhhd2	8	80	0	0	11	100
Rhhd3	11	87	0	2	1	100
Rhhd4	8	64	3	2	22	100
Rhhd5	11	57	32	0	0	100
Rhhd6	22	47	31	0	0	100
Rhhd7	9	49	42	0	0	100
Rhhd8	15	62	20	3	0	100
Rhhd9	18	45	35	1	0	100
Rhhd10	7	75	15	3	0	100
Uhhd1	1	70	0	0	28	100
Uhhd2	18	67	1	0	14	100
Uhhd3	10	74	3	0	14	100
Uhhd4	13	68	8	0	10	100
Uhhd5	27	57	16	0	1	100
Uhhd6	28	52	19	0	0	100
Uhhd7	27	30	42	0	0	100
Uhhd8	33	28	39	0	0	100
Uhhd9	30	21	49	0	0	100
Uhhd10	17	15	69	0	0	100

*Households are defined in Table 1.

Source: Authors' calculations based on the LSMS survey data for Brazil, 1996.

Table 4: The Impact of MERCOSUR Trade Policy Options on Different Countries
(welfare change as a percent of consumption-- central elasticities)

	AGREEMENTS *							
Country	FTAA (1)	FTAA (excluded products) (2)	EU - MERCOSUR (3)	EU - MERCOSUR (excluded products) (4)	FTAA and EU - MERCOSUR (5)	Unilateral 50% tariff cut (6)	Multilateral Tariff Liberalization by 50% (7)	FTAA no MERCOSUR Liberalization (8)
Brazil	0.6	0.4	0.9	0.1	1.8	0.4	0.9	0.4
Argentina	-0.2	-0.2	2.3	0.2	2.2	0.2	0.8	0.2
Uruguay	1.7	1.6	43.9	1.2	43.4	1.4	7.8	0.4
Chile	1.1	1.1	-0.2	0.0	0.9	0.1	1.3	0.8
Columbia	1.7	2.0	-0.1	-0.1	1.7	0.0	1.0	1.7
Peru	1.0	1.0	-0.1	0.0	0.9	0.0	1.3	1.0
Venezuela	1.1	1.1	0.0	-0.1	1.1	0.0	0.9	1.1
Rest of Andean Pact	1.9	2.0	0.0	0.0	1.9	0.1	2.5	1.8
Mexico	0.3	0.4	0.0	0.0	0.3	0.0	0.5	0.0
Central America and Caribbean	4.3	4.8	0.0	0.0	4.4	0.0	2.1	4.6
Rest of South America	0.8	0.8	-1.2	0.1	0.0	0.3	4.1	0.1
Canada	0.0	0.1	0.0	0.0	0.0	0.0	0.2	0.1
United States of America	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
European Union 15	-0.1	0.0	0.5	0.1	0.4	0.0	0.8	-0.1
Japan	0.0	0.0	0.0	0.0	0.0	0.0	1.8	0.0
Rest of the World	-0.1	-0.1	0.0	0.0	-0.1	0.0	2.3	-0.2

*** FTAA** Free Trade Agreement of the Americas

FTAA (excluded products) Free Trade Agreement of the Americas, with US antidumping policy denying improved access to its four protected sectors

EU-MERCOSUR A Free Trade Agreement between MERCOSUR and the European Union

EU-MERCOSUR Excluded Products-- A Free Trade Agreement between MERCOSUR and the European Union , with the most seven most protected food and agricultural products in the European Union excluded from the agreement.

FTAA and EU-MERCOSUR Free Trade Agreement of the Americas combined with a free trade agreement between MERCOSUR and the European Union

Unilateral 50% tariff cut—a MERCOSUR only tariff cut by 50%.

Multilateral tariff liberalization—All regions reduce tariffs and export subsidies by 50%.

FTAA (no MERCOSUR liberalization) Free Trade Agreement of the Americas, but MERCOSUR does not change its own external tariff to the rest of the Americas.

Table 5: The Impact of MERCOSUR Trade Policy Options on Different Countries
(welfare gain in billions of 1996 US dollars -- central elasticities)

	AGREEMENTS *							
Country	FTAA (1)	FTAA (excluded products) (2)	EU - MERCOSUR (3)	EU - MERCOSUR (excluded products) (4)	FTAA and EU - MERCOSUR (5)	Unilateral 50% tariff cut (6)	Multilateral Tariff Liberalization by 50% (7)	FTAA no MERCOSUR Liberalization (8)
Brazil	3.1	2.3	5.0	0.5	9.5	1.9	4.6	2.3
Argentina	-0.5	-0.5	5.9	0.5	5.7	0.5	2.0	0.5
Uruguay	0.2	0.2	6.5	0.2	6.4	0.2	1.2	0.1
Chile	0.5	0.6	-0.1	0.0	0.5	0.1	0.7	0.4
Columbia	1.1	1.3	-0.1	-0.1	1.1	0.0	0.6	1.1
Peru	0.4	0.4	0.0	0.0	0.4	0.0	0.6	0.4
Venezuela	0.7	0.7	0.0	0.0	0.7	0.0	0.5	0.6
Rest of Andean Pact	0.4	0.4	0.0	0.0	0.4	0.0	0.5	0.3
Mexico	0.9	1.0	0.0	0.0	0.7	0.0	1.2	0.0
Central America and Caribbean	3.4	3.8	0.0	0.0	3.5	0.0	1.7	3.6
Rest of South America	0.1	0.1	-0.1	0.0	0.0	0.0	0.3	0.0
Canada	0.1	0.3	0.0	0.0	-0.1	0.0	0.8	0.2
United States of America	2.3	2.0	-0.4	-0.4	1.7	0.3	3.0	-0.5
European Union 15	-2.6	-2.2	25.0	5.6	21.2	1.6	39.3	-3.2
Japan	-1.0	-0.9	0.7	0.4	-0.5	0.3	45.7	-1.2
Rest of the World	-4.8	-4.2	-0.2	-0.2	-5.0	1.3	83.6	-5.6
Sum for Included Countries	12.7	12.4	42.3	6.9	51.6	NA	NA	9.1
Sum for Excluded Countries	-8.4	-7.2	-0.2	-0.4	-5.5	NA	NA	-9.9
Sum over all countries	4.3	5.2	42.2	6.4	46.1	NA	186.0	-0.9

* See Table 5A for description of Agreements.

Table 6: Trade Policy Options Impact on Macro Variables
(percentage change - central and low elasticities)

		AGREEMENTS *							
		FTAA	FTAA (excluded products)	EU - MERCOSUR	EU - MERCOSUR (excluded products)	FTAA and EU - MERCOSUR	Unilateral 50% tariff cut	Multilateral Tariff Liberalization by 50%	FTAA no MERCOSUR Liberalization
	Elasticity	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Real exchange rate	central	2.61	2.73	2.25	2.70	3.00	1.97	1.43	-0.2
	low	1.86	2.01	1.08	1.89	1.98	1.82	1.20	1.9
Change in Tariff Revenue as a % of GDP	central	0.60	0.56	0.56	0.55	0.69	0.10	0.12	0.0
	low	0.52	0.50	0.50	0.48	0.72	0.20	0.24	0.5
Unskilled labor wage rate	central	2.91	1.87	4.24	2.42	5.81	0.94	3.02	0.0
	low	1.61	1.05	2.51	1.38	3.64	0.73	2.04	0.7
Skilled labor wage rate	central	0.97	1.01	1.12	0.60	1.77	0.54	0.31	1.1
	low	0.66	0.65	0.85	0.44	1.37	0.46	0.48	1.6
Rental rate on capital	central	-0.13	0.18	-0.47	-0.39	-0.31	-0.08	-0.59	-0.1
	low	0.17	0.32	0.00	-0.04	0.22	0.10	-0.09	0.2
Rental rate on land	central	14.21	9.19	25.12	14.84	31.00	5.79	30.00	4.4
	low	6.31	3.94	13.19	7.38	16.76	3.56	16.27	6.3

Table 7: The Impact of MERCOSUR Trade Policy Options on Brazilian Households
(welfare change as a percent of consumption-- central elasticities)

Household types	AGREEMENTS *							
	FTAA (1)	FTAA (excluded products) (2)	EU - MERCOSUR (3)	EU - MERCOSUR (excluded products) (4)	FTAA and EU - MERCOSUR (5)	Unilateral 50% tariff cut (6)	Multilateral Tariff Liberalization by 50% (7)	FTAA no MERCOSUR Liberalization (8)
Rhh1	2.5	1.7	4.0	2.1	5.5	1.5	2.9	0.8
Rhh2	2.3	1.5	3.9	1.8	5.4	1.2	2.8	1.0
Rhh3	2.5	1.5	4.5	1.9	6.2	1.1	3.5	1.3
Rhh4	2.5	1.8	3.9	2.2	5.4	1.5	3.1	0.8
Rhh5	1.3	0.8	2.3	0.7	3.5	0.6	1.8	0.8
Rhh6	1.5	1.0	2.3	0.8	3.6	0.7	1.7	0.8
Rhh7	1.3	0.9	2.0	0.7	3.2	0.6	1.6	0.7
Rhh8	3.1	2.0	4.8	2.4	6.9	1.2	4.1	1.4
Rhh9	0.9	0.4	1.7	0.6	2.6	0.4	1.8	0.7
Rhh10	3.7	2.3	6.0	2.8	8.3	1.4	4.9	1.6
Uhh1	2.5	1.8	3.8	2.1	5.2	1.5	2.7	0.7
Uhh2	2.3	1.6	3.8	1.8	5.2	1.3	2.6	0.8
Uhh3	2.2	1.4	3.6	1.7	5.0	1.2	2.6	0.9
Uhh4	2.0	1.3	3.1	1.5	4.5	1.0	2.4	0.8
Uhh5	1.3	0.7	2.4	0.8	3.5	0.7	1.8	0.8
Uhh6	1.6	1.0	2.6	1.0	3.9	0.7	1.9	0.8
Uhh7	0.4	0.3	0.9	0.0	1.6	0.3	0.7	0.4
Uhh8	0.3	0.2	0.7	-0.1	1.4	0.3	0.7	0.4
Uhh9	-0.5	-0.4	-0.3	-0.7	-0.1	0.0	0.1	0.2
Uhh10	0.0	0.2	-0.2	-0.5	0.5	0.1	0.0	0.2

Table 8: Decomposition of the Impact of the Free Trade Agreement of the Americas on Brazilian Households
(percentage change in welfare -- central elasticities)

	AGREEMENTS *			
	FTAA	FTAA uniform consumption shares	FTAA uniform income shares	FTAA with I-0 factor shares
Household types	(1)	(2)	(3)	(4)
Sum over all households	0.6	0.6	0.6	0.5
Rhh1	2.5	2.0	1.0	0.5
Rhh2	2.3	1.8	0.7	0.3
Rhh3	2.5	2.0	0.5	0.1
Rhh4	2.5	2.1	0.9	1.0
Rhh5	1.3	0.8	0.5	0.4
Rhh6	1.5	0.7	0.9	0.7
Rhh7	1.3	0.6	0.7	0.5
Rhh8	3.1	2.8	1.0	2.2
Rhh9	0.9	1.2	0.0	0.8
Rhh10	3.7	3.2	1.1	2.0
Uhh1	2.5	2.0	1.0	0.4
Uhh2	2.3	1.8	0.9	0.2
Uhh3	2.2	1.8	0.7	0.0
Uhh4	2.0	1.6	0.7	0.9
Uhh5	1.3	1.0	0.3	0.1
Uhh6	1.6	1.4	0.6	0.4
Uhh7	0.4	0.2	0.3	0.1
Uhh8	0.3	0.3	0.2	0.0
Uhh9	-0.5	0.0	-0.3	-0.3
Uhh10	0.0	0.1	0.9	0.9