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# **Trade options for Latin America. A Poverty Assessment Using Macro-Micro Linkages<sup>i</sup>**

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**Abstract:** Linking a global computable general equilibrium model with household surveys of Brazil, Mexico, Colombia and Chile, this paper estimates the initial impacts on the poor of regional and multilateral trade liberalization scenarios. This approach combines the advantages of using general equilibrium consistent changes in factor and good prices with the detailed information on household endowments and preferences provided by the surveys. Furthermore this methodology allows to decompose the total effect on poverty into growth and inequality components. Results show that due to their different initial positions in terms of trade protection, economic structure and poverty levels, the impacts on poverty are quite dissimilar across the four countries studied here, and that is also the case when growth and distributional effects are considered separately. The detailed analysis shows that, even when the aggregate poverty effects are closer, these result from diverse effects of opposite sign that can only be captured by accounting for the full heterogeneity in the household data. Such a richer analysis of the poverty impact may have implications for compensatory policy measures and even for the design of ultimately more successful trade reforms.

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**PRELIMINARY DRAFT – PLEASE DO NOT QUOTE**

# 1 Introduction

During the last two decades, bilateral and multilateral donors' policy advice to developing countries has been centered on greater market openness and better integration into the global economy. This advice is based on two major assumptions. First, that outward-oriented economies are not only more efficient and less prone to resource waste, but also appear to have performed well in terms of overall development. Second, that raising average incomes generally benefits all groups. Thus, it subscribes to the notion that as long as inequality is not increasing, economic progress through growth will reduce poverty.

However, these assumptions have been challenged, and there are doubts and uncertainties about the effects of globalization, and trade liberalization in particular, on poverty. Recent events in Cancun have confirmed how poverty impacts and the unequal distribution of gains and losses have become central in multilateral trade reforms negotiations; and the same concerns apply to regional trade agreements.

The notion that there are many and various channels of effect on the poor due to greater openness has been discussed in conceptual terms by McCulloch, Winters and Cirera (2001). While this provides a useful broad conceptual framework in the case of trade liberalization, the authors acknowledge that the evidence is rather thin, disparate and piecemeal. The technical problems involved are immense, ranging from difficulties of definition, measurement, defining the appropriate analytical tools, and deciding on the appropriate methods of assessing results.

A growing literature devoted to the empirical assessment of poverty changes due to trade reforms has recently emerged. Within this literature two groups can be broadly distinguished: the first comprises *ex-post* studies, where time series, and possibly, panel data on poverty and measures of trade policy/openness are used to ascertain their link.<sup>1</sup> The second group attempts to estimate *ex-ante* the effects on poverty of a trade shock,

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<sup>1</sup> See, for example, see Bourguignon and Morisson (1990), Edwards (1997), Li et al., (1998), Lundberg and Squire (1999), Barro (2000), Dollar and Kray (2002) and Milanovic (2002), Justino, P. and Lichfield, J. (2002), Litchfield J. and McCulloch (forthcoming), Niimi, Y., Vasudeva-Dutta, P. and Winters, L.A. (2003), McCulloch N. and Y. Cao (forthcoming).

normally using some form of numerical simulation model.<sup>2</sup> Some recent studies aiming at monitoring the progress towards the Millennium Development Goals can also be included in this second group.<sup>3</sup>

By attempting to estimate the potential poverty effects of multilateral as well regional trade reforms in Latin America, the present paper is also an ex-ante study. The methodology used here combines a computable general equilibrium global model with households surveys data for Brazil, Mexico, Colombia and Chile. The CGE model has the main advantage of being a counterfactual analysis tool so that it can generate price effects that are directly and unequivocally linked to a trade reform. The changes in relative factor prices (particularly between labor and capital remunerations, and between skilled and unskilled labor wages) and relative goods price (such as between food and non-food items) are then linked to household surveys and new income distributions are generated. We do not attempt to maintain full consistency between the micro data and the CGE results. However by combining the two, the aggregate results from the CGE can be mapped to the detailed information available in the household surveys and a much more complex and useful analysis of the poverty impact can be provided. In particular this approach has been used here to decompose the total effect on poverty into an aggregate income growth component and a redistribution component.

A useful insight from this analysis is that even if the final total impact on poverty is not too large, its dispersion across households – due to their heterogeneity in terms of factor endowments and consumption preferences – is significant and this should help in designing compensatory policies. Additionally our growth and redistribution decomposition shows that, at least in the short to medium run considered here, redistribution can be more important than growth.

The paper is structured as follows: section 2 presents the CGE model and the alternative links with the household level data. The first part of section 3 describes the general equilibrium results of the policy shocks, and the second part the poverty implications. The final section presents some conclusions.

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<sup>2</sup> Bussolo and Lay (2002), Hertel et al (2003), Ianchovichina et al (2000), Harrison, et al (2002).

<sup>3</sup> Ferreira and Leite (2002).

## **2 How to measure the effects on poverty of trade reforms: linking a CGE model to household surveys**

This section describes the main features of the CGE model and household surveys as well as the alternative approaches used to link the aggregate results to the micro data.

### **2.1 *The LINKAGE general equilibrium model and its data***

The World Bank's LINKAGE model is a relatively standard computable general equilibrium (CGE) model. It is currently based on the GTAP Release 5.3 dataset with a 1997 base year. In its standard version, the LINKAGE model exhibits constant-returns-to-scale and perfect competition. All markets, including factor markets, clear through flexible prices. The model is global, with a full accounting of bilateral trade flows. The model can be either solved in comparative statics, or dynamically as a sequenced series of comparative static equilibria linked between periods through factor updating mechanisms.<sup>4</sup> The comparative static version of the model has been used for the simulations described in this paper. Factor mobility across sectors has been restrained so model results should be interpreted as short to medium term impacts. Labor markets are segmented into two: rural and urban. Within each segment labor is perfectly mobile, however there is no flow of labor across segments.

For this application, the GTAP data has been aggregated from the potential 78 countries/regions and 57 goods and services. As seen in table 1, there are 18 countries/regions with an emphasis on the countries in the Western Hemisphere. Canada and the United States have been aggregated together and most of the major countries in Latin America are identified separately. The rest of the high-income countries are aggregated into two regions—Western Europe and Asia and Pacific. The remaining developing countries are grouped into five broad aggregate regions—East and South Asia, Middle East and North Africa, Europe and Central Asia, and Sub-Saharan Africa (aggregated with a small residual).

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<sup>4</sup> See van der Mensbrugghe (2003) for the full model specification.

*Table 1: Regional concordance*

Code	Description
Arg	Argentina
Bra	Brazil
Chl	Chile
Col	Colombia
mex	México
Per	Peru
Ury	Uruguay
Ven	Venezuela
Xcm	Rest of Central America and the Caribbean
Rlc	Rest of South America
Eap	East Asia and Pacific
Sas	South Asia
Eca	Europe and Central Asia
mna	Middle East and North Africa
Row	Rest of the World—Sub Saharan Africa plus GTAP's XRW region.
Cus	Canada and the United States
Eur	Western Europe including the EFTA countries
Rhy	Rest of the high-income countries—Australia, Hong Kong (China), Japan, Korea, New Zealand, Singapore, Taiwan (China)

The sectoral concordance focuses on some of the major protected commodities—see Table 2. These include certain agricultural and food products, textiles, clothing and footwear, metals, and motor vehicles and parts. Though services are highly protected in most markets, the levels of protection are hard to measure and the GTAP dataset has little information in this area—thus the services sectors are highly aggregated for the purposes of this paper.

*Table 2: Sectoral concordance*

Code	Description
Cer	Cereals
V_f	Vegetables and fruits
Osd	Oil seeds
Sug	Sugar—raw and refined
Ocr	Other crops
Lvs	Livestock
Onr	Other natural resources
Ffl	Fossil fuels
Cmt	Cattle meat
Mil	Dairy products
Ofd	Other food
Tex	Textiles
Wap	Wearing apparel
Lea	Leather products
Bmn	Basic manufactures
Omf	Other manufacturing
Met	Metals
Mvh	Motor vehicles and parts
Oeq	Other equipment
Elg	Electric and gas utilities
Cns	Construction
Svc	Services

One area of difficulty with the GTAP dataset has been the incorporation of trade preferences. By and large, bilateral protection data reflects most favored nation (MFN) tariff rates. The dataset only recognizes two preferential arrangements—the European Union and NAFTA. For the purposes of this paper, we have pre-processed the GTAP dataset to recognize Mercosur, though we have not included other preferential arrangements within the Americas which could affect the trade policy simulations discussed herein. The pre-processor essentially uses a specialized version of the Linkage model to shock the initial data set with the ‘desired’ policy rates. It is a specialized version of the model in the sense that elasticities are set so as to minimize the distortions of the changes in the model from the initial GTAP-based equilibrium. In essence, this mainly means converting virtually all elasticities in the model to 1, making the value shares constant. The reason behind this is that the GTAP data consists of both observed and adjusted data and the adjustment procedure behind the pre-processor should minimize the perturbations to the observed data. For example, the bilateral trade flows

are observed and the adjustment procedure should not modify these. Using the standard elasticities, removing internal tariffs in Mercosur would normally lead to rather significant trade adjustments. We have modified the trade elasticities to minimize the deviations from the initially observed bilateral flows.<sup>5</sup>

## **2.2 Poverty estimation: linking household surveys to the CGE model**

A well known result of poverty analysis states that the incidence of poverty ( $H$ , i.e. the proportion of people who are poor) is fully determined by the poverty line ( $z$ ), the mean of the income distribution ( $\mu$ ) and the associated Lorenz curve ( $L$ ), or formally:

$$H = P(z / \mu, L)$$

It clearly appears that the level of poverty can decrease due to an increase of the mean income ( $\mu$ ) with respect to a constant poverty line ( $z$ ), or due to a reduction in relative inequality ( $L$ ). In other words, poverty reductions can be obtained via income growth or income redistribution, or a combination of the two. Furthermore, it can be shown that this growth / redistribution decomposition can be applied to the poverty gap index ( $PG$ , which is the aggregate income short-fall of the poor as a proportion of the poverty line and normalized by population size), and to the Foster-Greer-Thorbecke ( $FGT$  or  $P_2$  index, which is calculated as the sum of squared proportionate poverty deficits and is a measure of the severity of poverty)<sup>6</sup>. Finally, having chosen a specific functional for the Lorenz curve, it is possible to estimate (from household surveys data, or time series of growth, poverty and inequality data) the elasticity of poverty reduction<sup>7</sup> with respect to changes in average income.

### The quasi elasticity approach

The simplest approach to calculate the effects of trade reforms on poverty levels consists in using these estimated elasticities, assuming that the trade shocks are distributionally neutral (i.e. the underlying Lorenz curve has not changed). This method

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<sup>5</sup> More information is available from the authors. The procedure is similar to the 'Altertax' program used for the GTAP global model. See Malcolm (1998).

<sup>6</sup> See G. Datt and M. Ravallion, Changes in poverty measures Journal of Development Economics 38 (1992) 275-295.

<sup>7</sup> Elasticities can be calculated for each of the three poverty measures:  $H$ ,  $PG$  and  $P_2$ .

thus measures the pure growth effects of trade reforms. Table 3 displays the elasticities estimated for the four countries studied here.

*Table 3: Poverty Elasticities*

	Headcount		Poverty gap		Severity Index	
	Ratio $H$		$PG$		$P_2$	
	1 USD a day	2 USD a day	1 USD a day	2 USD a day	1 USD a day	2 USD a day
Brazil	1.2	0.9	1.9	1.2	2.5	1.4
Mexico	1.9	1.1	2.8	1.5	3.6	1.9
Chile	2.1	1.1	3.5	1.6	4.9	2.0
Colombia	1.3	0.8	1.5	1.1	1.6	1.3

A common feature of the elasticities shown above should be highlighted: they are all rather small; for the headcount ratio, the highest elasticity is close to 2, however, that is recorded for Chile which is the country with the least severe poverty incidence among the four considered. These low elasticity levels are mainly due to the fact that Latin America is a region with high levels of inequality and cross country empirical evidence convincingly shows that, *ceteris paribus*, inequality reduces the growth elasticity of poverty reduction; in other words, additional growth in unequal countries has much less effect on lowering poverty than in more egalitarian ones. (See Bourguignon, 2002).

As noted above, the elasticity approach assumes some kind of statistical distribution for the Lorenz curve, so the whole distribution is summarized in a few parameters. Here though, rather than using a parameterized income distribution and the distribution neutral elasticities, we use the full distribution as described by the survey data and then, to measure the distributionally neutral effect of a shock, we simply shift the whole income distribution by the aggregate amount of the shock. For convenience, this non-parametric method to estimate the poverty effects is labeled quasi-elasticity approach to distinguish it from the original parametric elasticity approach.

#### The full distribution approach

Clearly though very few shocks are distributionally neutral, and an approach that combines the average income change figures from a CGE with poverty elasticities does not seem very promising in evaluating the *full* poverty impact of trade reform. If a growth forecast were produced from a reduced form macroeconometric model, then poverty

elasticities based on a recent household survey could be used. This would entail combining a reduced form macro model with a reduced form poverty impact model. However with a CGE model it is possible to identify and measure (at rather disaggregated levels) one of the most important transmission channels relevant to poverty changes: relative factor and goods price changes. Just using the growth figures estimated by a CGE model would be forfeiting most of the model explanatory and numerical measurement power; indeed such a model is primarily an instrument for counterfactual analysis, rather than a growth forecasting tool.

Additionally, general equilibrium price changes on both factor and goods markets, and their associated distributional changes, may be as important as the growth effects. Our analysis will show the importance of explicitly accounting for relative price effects across factor types, urban and rural activities, and across two broad consumption categories (food and non-food). If the objective consists of capturing the distributional impact of relative factor and goods price changes associated with a specific shock and generated by a CGE model, then this should be linked to household survey data at the individual and household level. This involves a link of a structural macro model with a structural poverty impact model.

The household surveys and the CGE models are linked sequentially by a set of aggregate variables. Specifically, *firstly* the CGE calculates the new equilibrium for a specific scenario, and determines the changes in the following aggregate variables: the average real wage in each labor market segment, the average urban real capital rent, the average rural capital and land rent, and the relative price of food and non-food commodities. *Then*, the changes in these aggregate variables are used to shock the micro data so that a new full income distribution is obtained.

This method thus takes the results from the CGE and scales up the different components of household income accordingly. These different components from the survey are classified such that they can be matched with the CGE results. Household income includes the following components: income from skilled labor, income from unskilled labor, and capital (in rural areas including land) income. These are the components that are scaled up according to the CGE results. In addition, we include

transfers that are assumed to be constant in nominal terms.<sup>8</sup> The resulting household income is then deflated by a household (or household group) specific price index. When available, we also included auto-consumption, which is assumed to be constant in real terms.<sup>9</sup>

Variants of the method described here have been used in other case studies and it is possible to formalize them in well-known terms of welfare analysis.<sup>10</sup> It is important to note that this approach implies that households and individuals do not change their optimal choices in terms of goods demands and factor supplies so that, in fact, the method may not be very accurate for large shocks, when price and quantity changes have to be determined simultaneously. In such cases, a full blown micro-simulation system should be used or the right approach may be a CGE model that includes the full set of households, or at least a larger set of representative households (for such an approach see for example HRT).

#### Consistency issues

Additionally, there are two main consistency issues in the proposed linkage system between the CGE model and the household survey: first the benchmark dataset used to calibrate the model is not consistent with the data observed in the household survey, and, secondly the model's change in some aggregate variables, such as total income, may not necessarily be reproduced by adding up all the individual changes in the micro data. Clearly these two issues are linked. One should in fact think of the model benchmark dataset, at least for those parts that concern the household sector, as an aggregation of the micro-data. So, for instance, total private consumption in the model base equilibrium should be equal to the sum of all households' consumption in the survey after appropriate scaling up to the national level; besides also the average proportion of food and non-food consumption in the model should be obtainable by aggregating the micro data. And the same should hold for total private income for every different source of income. The larger are the initial differences in these variables, the larger will be the deviations

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<sup>8</sup> Notice that for some of the surveys analyzed here these transfers can be finely disaggregated up to the point where it is possible to identify specific government transfer policies, such as food-stamps, health care reimbursements and other social expenditure transfers.

<sup>9</sup> Note that it could be possible to model auto-consumption explicitly in the CGE model, but this is left for future improvements.

<sup>10</sup> See for instance Hertel et al, Ravallion et al (China paper), and Porto (2003).

between the values of aggregate variables generated by model and the values calculated by summing up the individual changes in the household dataset.

The underlying problems are of course the well-known problems in reconciling household surveys and national accounts. In order to improve the evaluation of the distributional and poverty impacts of policies using macro models in conjunction with micro data, this empirical problem will have to be addressed.

The extent of the problem is highlighted in Table 4. Here the initial different factor shares determine the final (post simulation/shock) discrepancies in the real income changes between the model and the household surveys. The problem is quite serious when the total effect on poverty needs to be disaggregated between a growth and distributional component. In fact, in the CGE context the real factor price changes and the real income change are just two fully consistent (interchangeable) results of a specific trade shock. One would expect that when the real factor price changes are applied onto the survey data, the real income change resulting from summing up the households new incomes is the same as that calculated by the CGE model. For the mentioned reasons, this is not the case and the surveys' aggregation results for real income change are larger (see Table 4). Therefore, to correctly decompose the total effect on poverty, we compare the new households income distribution obtained applying the factor price changes with the other new distribution estimated by changing households incomes with the real income per cent change from the aggregation of the household surveys.<sup>11</sup>

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<sup>11</sup> Clearly another approach would be to modified the initial dataset of the model to be consistent with the households survey. There are numerous problems in doing that and this reconciliation is left for future improvements.

*Table 4: Discrepancies between households surveys and CGE model*

	Brazil	Mexico	Colombia	Chile
<b><u>In the base year SAM:</u></b>				
<b>Value added (% of total)</b>				
Unskilled	34	23	37	28
Skilled	16	9	16	11
Capital and Land	50	69	47	60
<b>Real Income (% change)</b>				
FTAA	0.13	0.10	0.24	0.08
FULL Lib	0.51	0.29	0.34	0.36
<b><u>From the household surveys:</u></b>				
<b>Value added (% of total)</b>				
Unskilled	20	19	26	14
Skilled	20	59	53	47
Capital and Land	60	22	20	39
<b>Real Income (% change)</b>				
FTAA	0.49	0.16	1.68	1.32
FULL Lib	1.06	0.60	1.54	2.27

#### Household surveys data preparation

The household survey used for the computations are for Colombia the 1997 Encuesta de Calidad de Vida, for Brazil the 2001 Pesquisa Nacional por Amostra de Domicílios, for Mexico the ENIGH 2001, and for Chile the CASEN 2000. The design of the survey of course differs between the countries under consideration and we will highlight only the most important choices made in order to match the CGE results with the household survey data.

We start on the individual level, where we only consider the active employed population aged more than 12 years, which we classify into skilled and unskilled according to their level of education. If the information on the level of education is not satisfactory, we instead use occupational variables. The employed population is also classified into wage workers and self-employed. For wage-workers, the entire income is either unskilled or skilled labor income.

We assume that the income reported by the self-employed has both a labor and a capital component. In order to separate these two components we impute a wage for the self-employed. This imputation is based on a wage equation that is estimated for the wage workers separately for rural and urban areas. The wage equation is a simple Mincerian wage equation with log wage earnings as the right hand side variable and

education, education squared, age, and age squared as explanatory variables. Additionally, we include regional and sectoral dummies. The exact specification of course differs between countries and between urban and rural areas. The coefficients of these wage equations are then used to impute a wage for the self-employed. The difference between the reported income from self-employment and the imputed wage is assumed to represent the capital component of self-employment income. In rural areas, the difference should be interpreted as a mixed factor income from land and capital, as the micro-data does not allow to differentiate between these two factors.

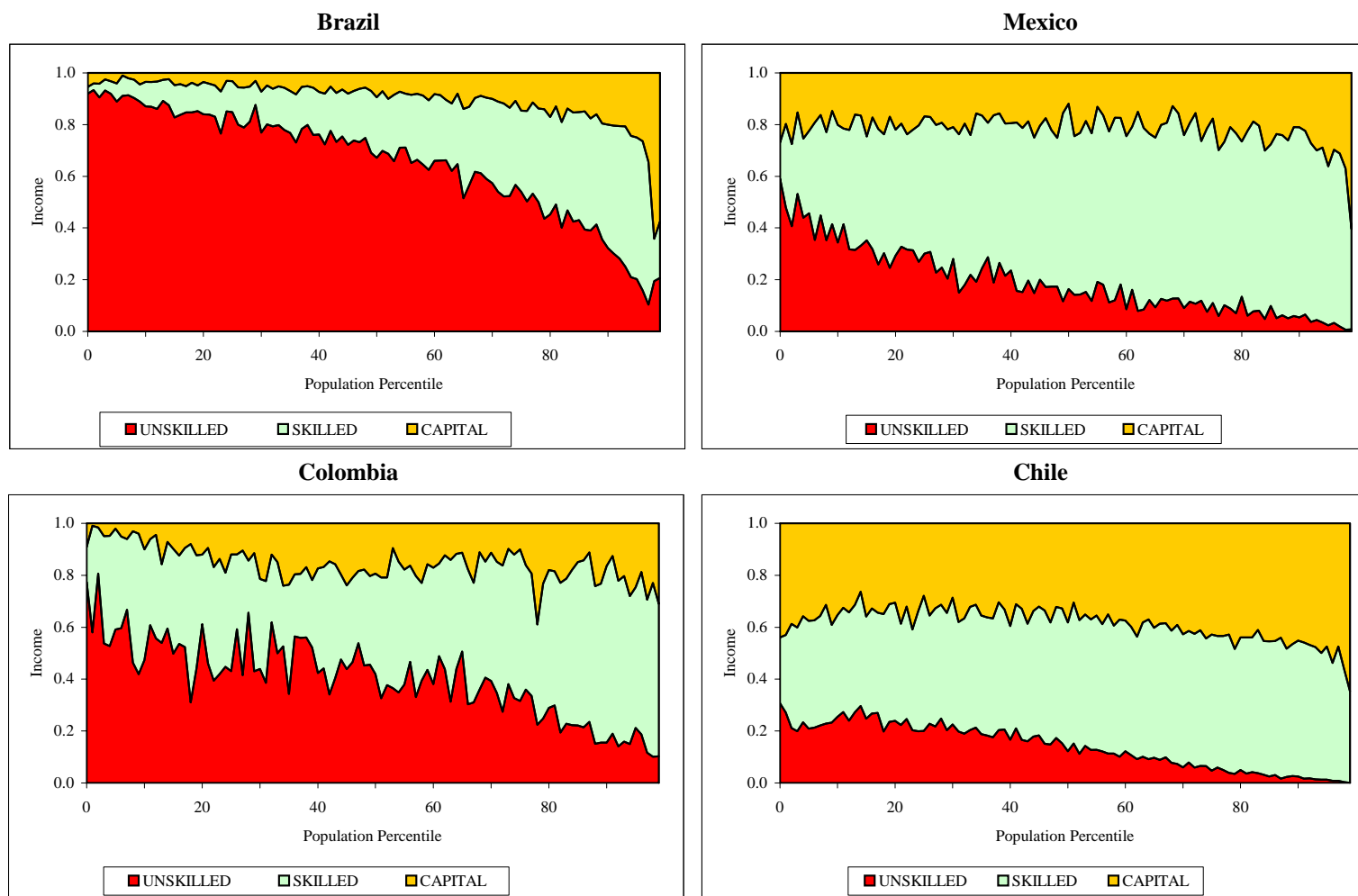
This procedure also yielded negative differences that were set to zero. The proportion of self-employed with an imputed wage higher than their reported self-employment earnings was significant for Brazil and Colombia but quite low in Mexico and Chile.

In addition to this capital income from self-employment total individual capital income includes dividends, interest, and property rental income. Transfers include pensions and transfers from the state and from abroad.

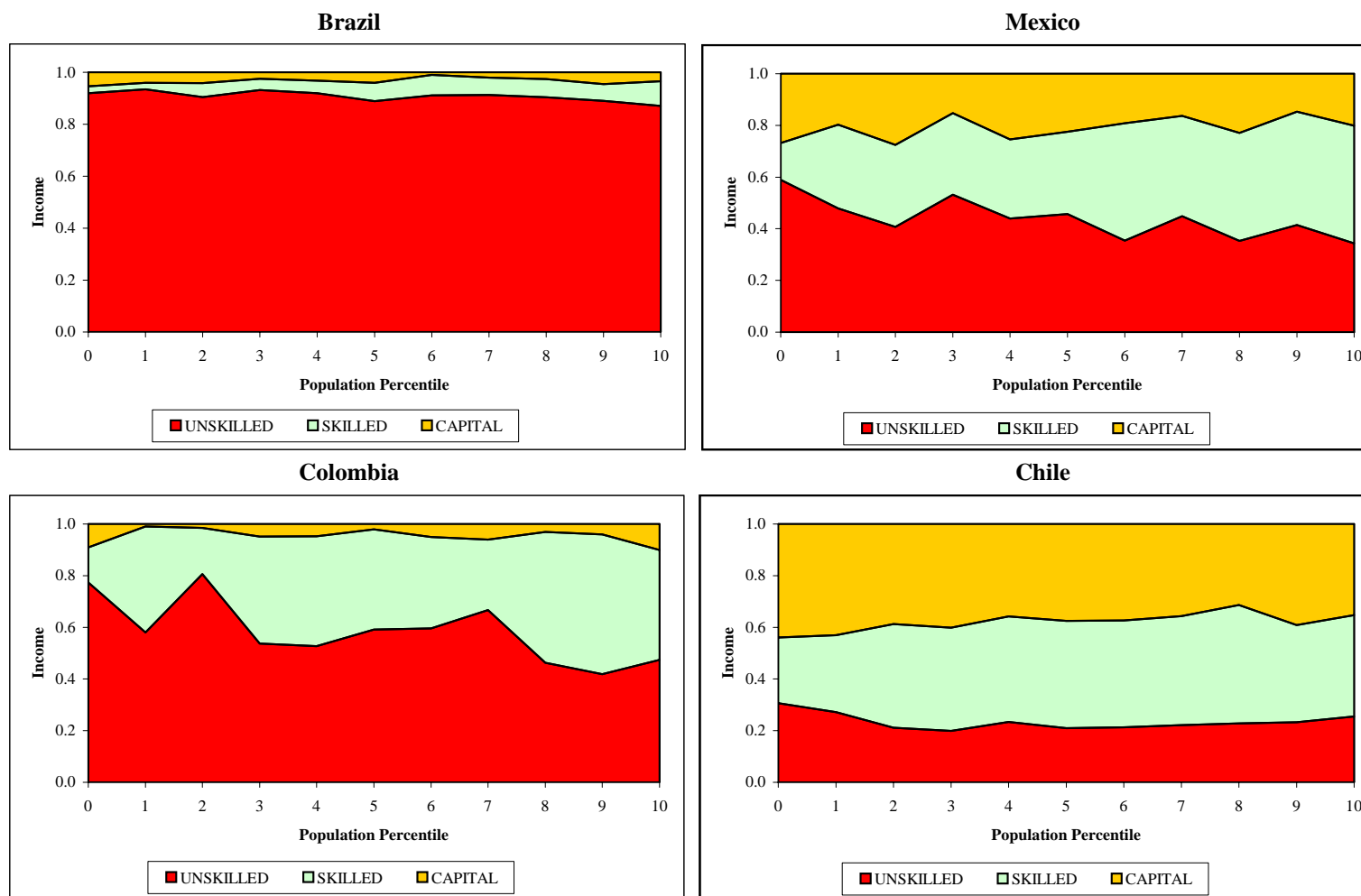
The individual incomes from unskilled and skilled labor, from urban capital, and from rural capital including a land rent comprise household income that is in some cases augmented by auto-consumption.

The graphs below show the factor income shares for the four countries when populations are ordered in centiles. Some common pattern appears: in general the capital share is highest towards the richest part of the distribution where, correspondingly, the share of unskilled labor decreases. Some poorer households may heavily rely on self-employment and, especially in the rural areas and for richer countries (such as Chile), may own some capital (or land). This explains the sort of inverse U shape of the capital share for Chile and Mexico. To highlight more dramatically factor allocations at the lower tail of the distribution, the same graph has been produced for the poorest 10 centiles.

*Figure 1: Factor Allocation (stacked area) in four Latin American countries (% contribution of each factor by centile)*



*Figure 2: Factor Allocation (stacked area, % contribution of each factor by centile, 10 poorest centiles)*



### **3 The poverty effects of two trade development agendas: the Free Trade Area of the Americas and the multilateral trade liberalization**

This section first presents the results of the general equilibrium model and then the poverty estimations obtained by linking the changes in the macro variables to the household surveys. For brevity, the Brazilian case will be analyzed in detail, whereas the results for Mexico, Colombia and Chile will be presented more succinctly and contrasted with Brazil and among each other.

#### ***3.1 Initial protection and policy simulations***

The initial protection, both in its level and sectoral variability, is among the key elements determining the adjustments and the final results of a trade reform. That is why the analysis starts here with Table 5, which shows the import weighted average tariffs by macro sector, and geographic origin and destination market.

Table 5: Trade protection by origin, destination and sector (import weighted 1997 tariff rates)

Sector	Importer	Exporter								
			whm	lac	bra	chl	col	mex	cus	xwh
all sectors (excl. services)	Western Emisphere	whm	3.1	4.3	5.6	8.9	9.8	1.4	2.5	5.2
	Latin America & Carib.	lac	7.2	7.8	5.3	11.7	12.4	12.0	6.8	12.5
	Brazil	bra	8.0	2.9		7.5	10.4	16.7	12.4	13.5
	Chile	chl	10.9	11.0	11.0		11.0	11.0	10.7	11.1
	Colombia	col	11.7	14.2	11.7	14.6		13.2	9.9	12.0
	Mexico	mex	2.4	11.2	10.7	13.7	10.4		2.0	11.4
	Canada & USA	cus	1.3	2.8	5.9	5.2	8.0	0.5	0.6	3.8
	Not West. Hem.	xwh	9.7	13.5	13.8	8.0	9.0	7.7	8.9	5.6
agriculture & food products	Western Emisphere	whm	12.6	11.9	12.9	11.6	17.5	9.2	13.4	14.4
	Latin America & Carib.	lac	13.2	10.1	7.3	15.7	15.5	15.4	16.4	17.7
	Brazil	bra	4.5	3.0		12.8	14.7	16.3	11.0	14.4
	Chile	chl	11.0	11.0	11.0		11.0	11.0	11.0	11.3
	Colombia	col	16.1	16.6	11.3	15.6		17.5	15.3	15.7
	Mexico	mex	18.8	17.8	9.2	21.1	13.2		18.9	25.6
	Canada & USA	cus	12.2	12.9	17.2	8.8	18.0	8.7	11.5	13.5
	Not West. Hem.	xwh	29.9	25.7	25.7	28.5	13.4	27.5	33.1	17.9
agriculture	Western Emisphere	whm	10.9	12.8	15.7	9.0	18.4	9.0	8.4	13.1
	Latin America & Carib.	lac	9.6	7.4	4.2	13.3	14.3	13.1	11.3	10.5
	Brazil	bra	3.5	2.4		11.0	9.4	10.8	7.2	9.2
	Chile	chl	11.0	11.0	11.0		11.0	11.0	11.0	11.3
	Colombia	col	12.4	12.7	9.8	14.0		13.6	12.1	10.7
	Mexico	mex	11.9	9.3	7.0	17.4	4.1		12.0	11.5
	Canada & USA	cus	11.6	14.7	20.4	6.1	19.0	8.9	5.9	13.6
	Not West. Hem.	xwh	26.7	21.6	18.6	28.5	10.9	20.4	31.0	14.1
food products	Western Emisphere	whm	14.2	10.9	9.8	13.7	13.8	9.5	17.3	14.8
	Latin America & Carib.	lac	16.2	11.9	9.0	17.5	17.2	16.4	22.4	19.9
	Brazil	bra	5.5	3.5		15.6	16.5	17.3	17.7	17.6
	Chile	chl	11.0	11.0	11.0		11.0	11.0	11.0	11.3
	Colombia	col	18.0	17.9	17.9	18.0		18.2	18.1	18.2
	Mexico	mex	31.2	23.9	18.3	24.9	19.1		32.5	30.4
	Canada & USA	cus	12.9	9.9	10.9	10.9	11.4	8.5	14.9	13.5
	Not West. Hem.	xwh	33.2	30.5	35.2	28.6	31.4	36.0	35.1	19.8
mining and natural resources	Western Emisphere	whm	1.5	2.1	1.7	4.2	2.0	0.5	0.5	1.2
	Latin America & Carib.	lac	5.3	6.2	2.3	5.5	8.0	5.4	3.1	5.1
	Brazil	bra	2.6	3.0		2.1	5.0	5.1	1.3	4.9
	Chile	chl	11.0	11.0	11.0		11.2	11.4	11.0	11.3
	Colombia	col	9.5	9.8	8.0	5.0		5.6	8.5	7.5
	Mexico	mex	2.0	7.8	9.8	10.0	6.8			6.9
	Canada & USA	cus	0.3	0.6	1.1	0.1	0.5			0.5
	Not West. Hem.	xwh	1.6	1.6	1.6	0.4	0.6	1.3	1.7	2.0
manufacturing	Western Emisphere	whm	2.2	3.5	4.6	7.7	11.6	0.9	1.8	5.1
	Latin America & Carib.	lac	6.3	7.9	5.2	11.0	13.0	12.7	5.8	12.9
	Brazil	bra	10.0	3.5		7.7	13.3	18.6	13.2	15.5
	Chile	chl	10.8	11.0	11.0		11.0	11.0	10.7	11.0
	Colombia	col	11.0	13.9	11.8	13.8		13.0	9.3	11.9
	Mexico	mex	0.3	10.6	10.9	11.7	10.0			10.8
	Canada & USA	cus	0.5	1.8	3.7	1.8	8.0			3.7
	Not West. Hem.	xwh	4.4	4.3	5.2	1.9	4.4	5.5	4.4	4.5

source: GTAP and authors calculations

As mentioned in the above description of the model, the protection structure shown in this table takes into account of the significant trade preference embedded in the Mercosur agreement. The average protection of the Latin American and Caribbean (LAC) region against its own regional partners is relatively low (a regional average of 7.2 %) and for

certain countries (such as Mexico) liberalization against the North American partners is also evident. Chile shows a quite uniform trade protection with an 11% average rate applied across different trade partners and different sectors. Overall LAC is more liberal with the western hemisphere partners than vis-à-vis the external world (XWH). Some sectors, such as manufacturing and food products, seem to receive higher degree of protection in LAC, whereas the North American countries clearly protect more intensively their agriculture.

Two basic policy simulations are implemented—a free trade area in the Western Hemisphere (FTAA), and global trade liberalization (FULLIB). The latter is a benchmark providing the best that one can expect to achieve. In these simulations only tariffs are modified.<sup>12</sup> Though export subsidies could also be included, given their levels in the GTAP dataset, changes to these have little quantifiable impact. We also do not modify domestic distortions—which can be considerable, particularly in agriculture.

As mentioned earlier, each of the simulations is based on a comparative static framework with no capital accumulation, nor increased labor employment or changes in the ratio of skilled workers to unskilled. Besides some degree of market segmentation is assumed: capital and land, are virtually sector specific, and labor markets are segmented between agriculture and non-agriculture, with labor fully mobile within each of the two broad sectors, but fully immobile across them. These segmentations are maintained to increase the consistency with the household surveys, where we do not allow individuals to migrate or increase their human capital endowments.

### **3.2 Trade reforms: macro results first...**

In 1997, the base year for our model, Brazil displays a weighted average tariff rate of about 10%, however this is not uniform across sectors, nor across geographic sources, and, as can be seen in Table 5 above, the domestic manufacturing sectors enjoys a relatively higher protection than the agriculture-food sectors. As expected, more disaggregated sectors have even higher rates of protection: average rates for *wearing apparel, motor vehicles and parts* and *sugar* are close to 20 per cent. Additionally,

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<sup>12</sup> Service trade, though highly distorted is not subject to changes in these simulations.

Brazil's average rate of protection against Latin American exports is much lower (3%) than its rates against North America (12%) or against the Rest of the World (13%), and this is mainly due to current preferential trade agreements (Mercosur).

Before examining the results, it is helpful to quickly consider some other structural features of the Brazilian economy. For the four countries under study, Table 6 displays sectoral shares of GDP, import intensities (measured as the ratio of sectoral imports over sectoral GDP), export intensities (ratios of exports to GDP), and factor intensities (measured as the factor's per cent contribution to total sectoral value added).

Consider Brazil first, its highest dependency on imports is in capital goods sectors (which have quite elevated protection rates) and fossil fuels; conversely its export strength is concentrated in food processing and export crops (and natural resources). As expected, export oriented sectors, within agriculture, intensively use land and unskilled labor, and, within light manufacturing, intensively employ unskilled labor. Apart from the service sectors, the protected import competing sectors are major employers of skilled labor, however, in conjunction with unskilled workers.

Table 7 presents a summary of the structural adjustment Brazil incurs in the two simulated trade liberalization scenarios. Tariff reductions result in large import inflows and a reallocation of resources away from sectors facing relatively more intense competition with foreign production and towards export expanding sectors. More explicitly these trade flows adjustments entail a contraction of the domestic activity in other manufacturing and an expansion of light manufacturing and agriculture activities. Although at a more sectorally disaggregate level it is possible to discern opposite changes, the FTAA and the full liberalization scenarios seem to imply an equivalent pattern of sectoral adjustment. Rather than in their sign then, the major, and quite obvious, difference between the two shocks is in the size of their effects.

Due to the closure rule of the external account, namely the fixing of foreign savings, and the full employment assumption, the larger expansion of the volumes of exports, with respect to import volumes is compensated with a real exchange rate depreciation which originates from falling domestic resource costs. In other words, exporting sectors expand by employing resources whose relative prices have declined because of their demand from the contracting import competing sectors has fallen.

Table 6: Economic structure for Brazil, Mexico, Chile and Colombia (% rates)

	Brazil						Mexico						Chile						Colombia					
				Value Added						Value Added						Value Added						Value Added		
	GDP	M /	X /	Un-	Skill	K	GDP	M /	X /	Un-	Skill	K	GDP	M /	X /	Un-	Skill	K	GDP	M /	X /	Un-	Skill	K
	GDP	GDP	GDP	skill	+L		GDP	GDP	GDP	skill	+L		GDP	GDP	GDP	skill	+L		GDP	GDP	GDP	skill	+L	
Cereals	1	15	1	25	2	74	3	12	1	35	1	64	1	21	5	46	1	53	1	63	0	46	2	52
Vegetables and fruits	3	3	1	23	1	76	3	3	18	46	1	53	4	2	39	46	1	53	3	6	18	46	1	53
Oil seeds	1	6	30	23	1	76	0	592	12	43	1	56	0	110	28	47	0	53	0	30	0	46	1	53
Sugar	1	0	31	26	2	73	1	1	6	33	1	65	0	53	0	43	4	54	1	0	28	39	6	54
Other crops	1	16	66	23	1	76	0	42	67	46	1	53	0	115	118	46	1	53	3	5	113	46	1	53
Livestock	2	1	1	23	1	76	3	5	3	45	1	54	2	1	3	46	1	53	4	1	1	46	1	53
Other natural resources	1	9	52	30	4	66	1	9	9	21	2	77	5	2	81	23	3	74	1	6	1	62	5	33
Fossil fuels	1	132	9	13	2	84	5	12	59	6	1	93	0	701	8	12	2	85	4	6	94	13	2	85
Cattle meat	0	13	13	28	5	68	0	43	2	8	1	91	0	83	5	36	6	58	1	6	2	58	9	33
Dairy products	0	24	0	36	6	59	0	124	6	13	2	84	0	16	11	28	4	68	1	10	1	36	5	59
Other food	3	12	34	40	7	53	5	12	16	15	3	82	6	14	72	31	5	64	4	22	19	37	6	57
Textiles	2	14	10	34	6	60	1	54	65	26	4	70	1	86	19	38	6	56	1	79	53	46	7	48
Wearing apparel	1	6	2	28	5	68	1	49	106	23	4	74	1	87	16	42	7	51	1	21	76	53	8	39
Leather products	1	11	51	46	8	46	1	24	34	30	5	65	0	281	37	44	7	49	0	21	40	43	6	51
Basic manufactures	5	11	15	47	8	46	5	48	40	19	4	78	5	44	59	30	5	65	3	56	26	43	7	49
Other manufacturing	5	29	12	39	6	54	4	90	45	18	5	77	3	127	43	35	9	56	3	123	56	36	8	56
Metals	1	22	77	45	7	48	2	64	60	22	4	74	4	28	191	26	5	69	0	250	88	46	7	47
Motor vehicles and parts	1	78	51	60	10	31	2	119	203	24	5	71	0	840	33	31	7	62	0	700	54	60	12	28
Other equipment	4	79	25	50	8	42	6	190	209	25	7	68	1	1029	53	44	12	44	1	920	70	51	12	37
Electric and gas utilities	1	35	0	53	17	31	1	6	1	30	15	55	3	1	0	15	7	78	2	1	0	18	8	74
Construction	6	0	0	35	8	57	4	0	0	54	10	35	7	0	0	43	8	49	6	0	0	39	7	54
Services	59	4	2	32	24	44	50	6	7	19	13	67	53	8	8	23	17	60	61	7	7	36	23	40
total	100	11	8	34	16	50	100	29	33	23	9	69	100	32	28	28	11	60	100	20	17	37	16	47
Agri / Rural Act	9	5	12	24	1	75	10	11	11	42	1	57	9	10	24	46	1	53	13	8	32	46	1	53
Mining	2	62	34	23	3	74	7	11	48	9	2	90	5	54	76	22	3	75	5	6	79	21	3	76
Light Manuf	7	12	21	36	6	58	9	27	36	18	3	78	9	38	54	33	5	61	7	24	26	41	6	52
Other Manuf	17	39	23	46	8	47	20	110	113	21	5	74	14	144	92	31	7	62	7	203	48	42	8	50
Services	65	4	2	32	22	45	54	6	6	22	13	65	63	7	7	25	16	59	69	6	6	36	21	42

*Table 7: Sectoral adjustments in Brazil (% changes with respect to initial levels)*

Per cent changes in :	Exports Vol.		Imports Vol.		Production V.	
	FTAA	FULL	FTAA	FULL	FTAA	FULL
<b>total</b>	<b>15</b>	<b>29</b>	<b>10</b>	<b>19</b>	<b>0.0</b>	<b>0.0</b>
Agri / Rural Act	4	1	4	15	0.1	0.3
Mining	3	13	0	4	0.2	0.6
Light Manuf	16	54	9	39	0.3	1.3
Other Manuf	22	36	16	29	-0.3	-1.1
Services	4	12	-2	-5	0.0	0.2

The mentioned price adjustments in the factor markets are central to our analysis and need some additional elucidation. The top panel of Table 8 displays the percent variation in factor prices arising from the simulated trade reforms. With the segmented market assumption, capital (and land) are sector specific and labor can only move within the agriculture and non-agriculture sectors, but not between them; therefore the increase in agricultural output is mirrored by increasing prices of the rural factors and, conversely, the reduction of other manufacturing is accompanied by a contraction of urban factor prices.

*Table 8: Price changes in factors, consumption aggregates and RGDP changes*

	Brazil		Mexico		Colombia		Chile	
	FTAA	FULL	FTAA	FULL	FTAA	FULL	FTAA	FULL
	<i>per cent changes</i>							
Urban Skilled real wage	-0.03	-0.18	1.57	1.63	0.83	1.29	1.22	1.96
Urban Unskilled real wage	-0.05	-0.40	1.72	1.57	1.17	1.39	1.89	2.67
Urban Capital real rent	0.67	1.50	1.59	2.09	2.42	2.99	1.98	3.29
Rural Skilled real wage	2.52	7.54	-8.52	-7.72	6.36	4.37	2.99	7.13
Rural Unskilled real wage	2.45	7.50	-8.84	-8.17	3.37	0.49	3.69	7.70
Rural Cap. & Land real rent	1.20	3.43	-0.32	-0.07	2.14	1.73	1.43	2.79
Urban Skill / Unskill wage gap	0.02	0.23						
Rural Skill / Unskill wage gap	0.07	0.04						
Food prices	-0.64	-0.15	-4.58	-6.25	-1.06	-2.98	0.37	1.72
Non Food Prices	-1.36	-3.55	0.20	-2.19	-0.62	-2.99	-0.73	-2.12
CPI	-1.19	-2.76	-1.05	-3.28	-0.82	-3.07	-0.46	-1.18
Real Income	0.13	0.51	0.10	0.29	0.24	0.34	0.08	0.36

In summary for Brazil, the impact on factor remuneration of an FTAA agreement should be beneficial to rural workers, both wage-employed or self-employed who own physical capital and land, and it would imply a slight reduction of wage workers's

earnings in the urban sector. Notice also that the wage gap between skilled and unskilled workers does not significantly change with this kind of trade reform.<sup>13</sup> The same pattern of price adjustment but with larger magnitudes is observed for the full liberalization scenario. In this latter case rural skilled and unskilled wage workers register an increase of 7.5% in their real remunerations.

The bottom panel of Table 8 reports the percent change of: food and non-food prices, the consumer price index, and real income. Import liberalization induces a general price reduction that seems to be more intense for non-food items, as expected, given the initial pattern of sectoral protection. In the FTAA scenario, due to trade diversion and slightly worsening terms of trade, real GDP registers a minor expansion, whereas the efficiency gains obtained through the full elimination of regional discrimination allows larger aggregate gains. In all these simulations, the government budget position is invariant: tariff revenues losses are compensated via increased direct taxes.

[to be completed]

### **3.3 ... and micro results: the poverty effects of trade reforms**

In a second step, the aggregate macro results are used to estimate poverty impacts. Initially, the factor and goods prices changes are used to shock the micro data to produce – with what is called “full distribution” approach – a new income distribution. Then, the difference in the mean incomes of this new distribution and the initial one is calculated and used to generate a second simulated distribution. This is obtained by simply multiplying the initial individual incomes by a factor equal to the mentioned difference among the means. This second simulated distribution has the exact same ‘shape’ of the initial one since *almost* no redistribution has occurred. The qualification is needed because under this quasi-elasticity method, rural and urban differentials in growth rates are taken into account. For the four countries and the two simulations the aggregate income change rates (consistently estimated by aggregation from the micro data shocked with the factor and goods prices changes) are shown in Table 9.

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<sup>13</sup> This outcome may not hold under a different production specification where skilled workers, for example, are modeled as a complement to capital, rather than as substitutes.

*Table 9: Real income rates of change estimated by aggregation of the household surveys*

	Real Income (% change)			
	Brazil	Mexico	Colombia	Chile
<b>FTAA values</b>				
All	0.49	0.16	1.68	1.32
Urban	0.37	0.90	1.02	1.29
Rural	1.21	-2.98	2.97	1.39
<b>FULL Lib values</b>				
All	1.06	0.60	1.54	2.27
Urban	0.67	1.29	1.55	2.03
Rural	3.33	-2.35	1.51	2.78

The next Table 10 finally shows the poverty effects, initially for Brazil, under the full shock (full distribution columns) and the distributionally neutral shock (quasi-elasticity columns).

*Table 10: Brazil, initial poverty levels and per cent changes due to trade reforms*

		Full distribution			Quasi-Elasticity		
		<i>H</i>	<i>PG</i>	<i>P2</i>	<i>H</i>	<i>PG</i>	<i>P2</i>
<b>Absolute levels</b>							
<b>Initial levels</b>	All	2 USD	19.7	8.3	4.8		
		1 USD	7.3	2.9	1.6		
	Urban	2 USD	14.5	5.7	3.1		
		1 USD	4.5	1.7	0.9		
	Rural	2 USD	45.4	21.5	13.1		
		1 USD	20.9	8.7	5.1		
<b>Percent changes from initial levels values</b>							
<b>FTAA</b>	All	2 USD	-0.5	-1.0	-1.2	-0.6	-0.7
		1 USD	-1.4	-1.4	-1.5	-0.1	-0.7
	Urban	2 USD	0.0	0.1	0.2	-0.6	-0.6
		1 USD	0.0	0.2	0.3	0.0	-0.6
	Rural	2 USD	-1.2	-2.4	-2.8	-0.9	-1.3
		1 USD	-3.0	-3.1	-3.2	-1.6	-1.7
<b>FULL Lib</b>	All	2 USD	-1.3	-2.6	-3.2	-0.9	-1.4
		1 USD	-2.7	-4.0	-4.2	-0.8	-1.6
	Urban	2 USD	0.6	0.9	1.0	-0.8	-1.0
		1 USD	1.7	1.1	1.4	-0.4	-1.0
	Rural	2 USD	-4.2	-7.1	-8.1	-2.5	-3.6
		1 USD	-7.4	-9.0	-9.3	-4.1	-4.6

The initial poverty conditions in Brazil, as depicted by the indicators shown in the top panel of the Table 10, are typical of a developing country: poverty especially affects rural areas which normally also record high incidence at the extreme poverty levels of the 1

dollar a day threshold. Although informative, the rural and urban poverty measurement obtained in this way may be to some extent misleading. Price levels and the corresponding purchasing powers in rural and urban sectors of the economy can be quite different so, instead of a single international level applied to the whole population, zone specific poverty lines should be used to guarantee more accurate estimates.

Overall, the FTAA slightly reduces poverty in Brazil. The headcount ratio for the whole population is reduced in both the full distribution and the elasticity approach and actually slightly more in the elasticity approach. This implies that overall there is a slightly negative anti-poor distributional shift related to the relative factor price changes if poverty is measured by the headcount ratio at the 2 USD poverty line.

However, by considering the headcount ratio with 1 USD a day the picture already changes and the full distribution approach gives a larger reduction than the elasticity approach. This indicates that there is a pro-poor distributional shift induced by trade liberalization that works in favor of the poorer amongst the poor.

This is also visible (for both the 1 and the 2 USD a day poverty lines) in the PG and P2 indicators. For the whole population their reduction is more important in the full distribution than in the elasticity approach; this is due to the properties of the PG and P2 indicators. Both indices account for inequality among the poor with P2 being more sensitive to inequality changes. Basically the full simulation takes into account that the poorer among the poor have a larger share of income coming from those factors whose prices have gone up.

The sensitivity of poverty changes to distributional shifts, which are accounted for by the full distribution approach, also become clear in the rows that consider urban and rural poverty changes. The results clearly show that urban households do not fare very well, whereas rural households record higher than national averages of poverty reduction. The urban-rural gap thus narrows, which explains part of the pro-poor distributional change that we observe in the nation-wide figures. In urban areas, the full distribution approach gives small increases in poverty despite growth in average incomes, which implies an anti-poor distributional shift in urban areas. In contrast, the results indicate a pro-poor distributional shift in rural areas. These patterns are consistent across the three poverty measures considered.

Under the full trade liberalization scenario the reductions in poverty in Brazil are similar to the changes under the FTAA scenario above. However, the magnitudes of the changes are much stronger and the full distribution approach always registers larger reductions in poverty than the elasticity approach. The distributional shifts – anti-poor in urban areas and pro-poor in rural areas – are much more pronounced in this scenario. The very strong decrease in P2 with the 1 USD a day poverty line shows that the poorest of the poor gain most and much more than under the FTAA scenario.

To explain these results, it is necessary to look again at the underlying drivers that modify the initial income distribution, namely the factor price changes displayed in Table 8. Here we clearly see that rural factor prices are increasing whereas urban wages are contracting. This explains the different behavior of poverty reduction across rural and urban areas. Furthermore the increase of poverty in the urban areas and the worsening of the income distribution is due to the fact that the poor do not benefit from the increase in capital remuneration, given that most of their income is derived from wages. In rural areas, the poor gain from the strong increase in rural unskilled labor remuneration that is even stronger under the full trade liberalization than under the FTAA scenario. As Figure 2 shows, the poorest 10 percent of the population earn their income almost exclusively from unskilled labor. The strong pro-poor distributional shift in rural areas can be explained by the gains of unskilled labor relative to capital and land remuneration.<sup>14</sup>

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<sup>14</sup> These impact would most likely be dampened with an assumption of nationally integrated labor markets.

Table 11: Mexico, Colombia, Chile, initial poverty levels and per cent changes due to trade reforms

			Mexico						Colombia						Chile					
			Full distribution			Quasi-Elasticity			Full distribution			Quasi-Elasticity			Full distribution			Quasi-Elasticity		
			H	PG	P2	H	PG	P2	H	PG	P2	H	PG	P2	H	PG	P2	H	PG	P2
Absolute levels																				
Initial levels	All	2 USD	15.1	5.1	2.4				42.9	20.0	12.4				6.8	2.5	1.4			
		1 USD	4.0	1.0	0.4				20.2	8.4	4.9				2.0	0.9	0.5			
	Urban	2 USD	5.3	1.4	0.6				25.9	10.0	5.7				5.5	2.0	1.2			
		1 USD	0.9	0.2	0.1				8.8	3.4	2.1				1.6	0.7	0.5			
	Rural	2 USD	42.8	15.4	7.6				63.7	32.3	20.6				14.5	5.3	2.9			
		1 USD	12.9	3.2	1.2				34.1	14.4	8.3				4.2	1.6	0.9			
Percent changes from initial levels values																				
FTAA	All	2 USD	0.0	3.3	3.7	-0.5	-0.3	-0.4	-1.5	-1.9	-2.1	-1.3	-1.9	-2.0	-2.3	-2.1	-1.8	-2.4	-2.2	-2.0
		1 USD	2.4	4.4	4.7	-0.9	-0.5	-0.5	-2.0	-2.4	-2.4	-2.2	-2.3	-2.3	-0.9	-1.3	-1.1	-2.2	-1.8	-1.5
	Urban	2 USD	-10.9	-4.9	-5.5	-9.5	-2.2	-2.4	-1.5	-1.4	-1.3	-1.5	-1.6	-1.5	-2.1	-2.0	-1.6	-2.3	-2.2	-1.9
		1 USD	-11.3	-7.9	-7.8	-11.3	-3.4	-3.9	-0.4	-1.4	-0.9	-2.3	-1.6	-1.3	-0.6	-1.2	-1.3	-2.3	-1.5	-1.5
	Rural	2 USD	3.8	5.4	5.8	3.8	5.4	6.4	-1.5	-2.1	-2.4	-2.1	-2.8	-3.3	-2.9	-2.3	-1.9	-2.2	-2.4	-2.4
		1 USD	5.2	6.3	6.1	5.4	9.1	10.0	-2.5	-2.7	-2.8	-3.2	-3.9	-4.3	-1.5	-1.3	-0.9	-1.9	-2.3	-2.1
FULL Lib	All	2 USD	-0.7	2.3	2.5	-2.9	-1.2	-1.3	-0.9	-1.0	-0.9	-1.2	-1.7	-1.9	-4.1	-3.5	-3.0	-3.8	-3.7	-3.4
		1 USD	1.0	2.5	2.5	-1.3	-1.9	-1.9	-1.1	-0.9	-0.8	-2.0	-2.1	-2.1	-3.2	-2.2	-1.9	-3.2	-2.9	-2.7
	Urban	2 USD	-11.4	-5.1	-5.8	-9.5	-3.2	-3.4	-1.5	-1.8	-1.7	-1.7	-2.4	-2.3	-3.5	-3.1	-2.7	-3.8	-3.3	-2.9
		1 USD	-11.3	-8.5	-9.8	-11.3	-5.1	-5.9	-2.3	-1.7	-1.1	-2.3	-2.4	-1.9	-2.8	-2.0	-1.9	-3.1	-2.3	-2.4
	Rural	2 USD	3.0	4.2	4.4	3.1	4.3	5.1	-0.6	-0.6	-0.7	-1.0	-1.5	-1.7	-5.7	-4.5	-3.7	-4.3	-4.7	-4.6
		1 USD	3.5	4.3	3.8	3.5	7.1	7.9	-0.7	-0.7	-0.7	-2.0	-2.0	-2.2	-4.0	-2.4	-1.7	-3.9	-4.4	-4.1

In Mexico, the full distribution approach shows an overall increase in poverty (when measured at the 1 USD a day level) for both trade liberalization scenarios. On a national level there are thus strong anti-poor distributional shifts that overcompensate the small positive growth effects shown by the elasticity approach. Under the full trade liberalization scenario the growth effects are stronger, but the anti-poor distributional shifts appear to be equally important and poverty hence increases using the full distribution approach.

The nation-wide figures however conceal striking differences between urban and rural areas. Actually, the urban-rural disaggregation shows that the nation-wide anti-poor distributional shift is mainly due to a widening urban-rural gap, a result driven by the high losses in real factor rewards in rural areas, as indicated in Table 8. In contrast to Brazil, it is the urban poor who gain and the rural poor who lose under both scenarios.

There is a strong reduction in urban poverty and the distributional changes work in favor of the poorer among the poor, as indicated by the sharp decreases of the PG and the P2 indices with the 1 USD a day poverty line. These developments reflect the relative factor price changes as well as the endowments of poor urban households. Their main sources of income are urban unskilled wages and urban capital. Under the FTAA scenario it appears to be the relative gain of unskilled wages that produces the distributional change whereas the relative gain of capital seems to drive the results in the full liberalization scenario.

In rural areas however the negative growth effects accounts for almost the entire increase in poverty. There is only a slightly positive distributional change that can be traced back to the relative importance of income from capital/land for the poorer households among the poor and the relative gains of this factor in rural areas.

In Colombia, poverty is reduced under both trade liberalization scenarios in both urban and rural areas. Whereas the reductions under the two scenarios are of comparable size in urban areas, the reductions in rural areas are significantly higher under the FTAA scenario reflecting the sharp increases in rural factor prices. The FTAA scenario induces only minor distributional changes, as the quasi-elasticity approach yields reductions quite close to the full distribution approach. Under the full liberalization scenario we however observe an anti-poor distributional change on the national level. This difference between

the two scenarios can be explained by the narrowing urban-rural gap under FTAA and a widening gap under the full liberalization scenario. This can be verified by comparing the real factor price changes in Table 8. The narrowing gap between urban and rural areas under FTAA would result in an overall positive distributional change if the within distribution would not change unfavorably. In urban areas, the reductions under the full distribution approach are only slightly lower than under the quasi-elasticity approach, but some more pronounced after full liberalization. Only in rural areas, the strong gains of skilled labor relative to unskilled labor and capital/land imply a negative distributional shift. This relative gain of skilled labor in rural areas is stronger under the full liberalization scenario, which is reflected in the stronger distributional shift working against the rural poor.

For Chile, the poverty reducing effects are stronger if trade is fully liberalized. Despite the substantial gains in real factor rewards in rural areas also in relative terms in comparison with the urban gains, full liberalization is accompanied by distributional changes not in favor of the poor. Except for headcount index assuming the 2 USD a day poverty line, the poverty indices are reduced less using the full distribution approach. This result is mainly driven by a worsening income distribution for the rural poor, especially for the poorest among the poor, as the large difference between the two approaches with respect to P2 with the 1 USD a day poverty line shows. A look at the endowments of poor households in Chile given in Figure 2 and the factor price changes from Table 8 explains this result. The rural poor are well endowed with land/capital, which is the factor that experiences a relative decrease. This worsening of the rural income distribution in its lower tails is less pronounced under FTAA, as the differences in real factor price changes are less important. In urban areas, distributional effects are minor in both scenarios. Both the growth and distributional effects of FTAA are similar although of a smaller magnitude. It should be noted that despite the negative distributional effect in particular in rural areas poverty reduction is higher with full liberalization.

In summary, the results show that the poverty impact of the two trade reform scenarios differs substantially across the countries under consideration. The only country where poverty is reduced significantly under both reforms is Chile. In Colombia, the results are

also unambiguous, but we observe only minor improvements for the poor, in particular in rural areas. Rural poverty increases substantially in Mexico in both reforms, whereas urban poverty declines from already quite low levels. In Brazil, trade reform works in favor of the rural poor, and leaves the urban poverty situation basically unchanged.

The differences in rural and urban real income growth induce important distributional shifts that have to be taken into account when the poverty impact of trade reform is to be judged. The most striking example for this is Mexico. Even if differential urban and rural income growth is considered, further relative factor price changes matter for poverty reduction. Anti-poor distributional shifts within rural or urban areas due to such changes can substantially reduce the poverty impact of growth. The poverty impact of full trade liberalization in urban Brazil illustrates this aspect. What drives these distributional changes are the endowments of the poor and the relative factor price changes induced by trade liberalization.

## 4 Conclusions

[to be completed]

Our results show that an approach that considers just growth effects on poverty would be quite misleading when analyzing trade reforms shocks. In most cases, the aggregate poverty changes that are calculated based on such an approach are far off the results obtained under a full-survey approach that accounts for changes in the distribution.

Of course, trade liberalization triggers more than just factor price changes, especially in the longer run. It induces different types of labor market switching. Individuals migrate from rural to urban areas, they move between sectors or different occupational categories, e.g. from self-employment into wage-employment or vice versa. The simple survey-based approach we use here does not allow for labor market switching. This drawback becomes more serious the more extended the timeframe of our analysis, as individuals become more mobile across geographic areas, sectors, and occupations.

The poverty changes recorded here for Brazil as well as for the other cases are in general of minor importance. To put things in a broader context it is useful to compare the results of this paper with what would be required to fulfill the MDG. Halving poverty within 15 years would require an annual reduction of almost 5 percent. The timeframe of

our analysis here is the short-to medium term of about 2 to 4 years and the gains we simulate are one-time gains: the highest overall annual poverty reduction under the full distribution approach is the full liberalization scenario in Chile with an annual poverty reduction of less than 2 percent for a time period of 2 to 4 years.<sup>15</sup> The contribution of trade liberalization to reaching the Millennium Development Goals will therefore be limited. However, it should be borne in mind that our model does not capture all the possible channels through which trade liberalization may affect economic performance.

## 5 References

[to be completed]

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<sup>15</sup> These figures are obtained by multiplying the initial poverty levels with the percent changes given in the two results tables.

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