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Global Income Distribution and Poverty in the Absence of Agricultural Distortions

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Abstract

This paper assesses the potential impacts of the removal of agriculture trade distortions using a newly developed dataset and methodological approach for evaluating the global poverty and inequality effects of policy reforms. It finds that liberalization of agriculture and food could increase global extreme poverty (US$1 a day) by 0.2 percent and lower moderate poverty (US$2 a day) by 0.3 percent. Beneath these small aggregate changes, most countries witness a substantial reduction in poverty while South Asia—where half of the world's poor reside—experiences an increase in extreme poverty incidence due to high rates of protection afforded to unskilled-intensive agricultural sectors. The distributional changes are likely to be mild, but exhibit a strong regional pattern. Inequality is likely to fall in regions such as Latin America, which are characterized by high initial inequality, and rise in regions like South Asia, characterized by low initial inequality.

This paper—a product of the a product of the Development Prospects Group and Economic Policy Sector in Development Economics and Latin American and Carribbean Region respectively—is part of a larger effort in these departments to monitor the poverty and income distribution impact of global economic trends and policies. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The authors may be contacted at mbussolo@worldbank.org and dmedvedev@worldbank.org.

Global Income Distribution and Poverty in the Absence of Agricultural Distortions

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The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily reflect the view of the World Bank, its Executive Directors, or the countries they represent.

1 Introduction

In most cases, trade liberalization is welfare increasing but it also brings about large income redistribution. While the empirical literature generally finds the aggregate gains to be small—on the order of a few percentage points of initial GDP— "the [static] efficiency consequences of trade reform pale in comparison to its redistributive effects" (Rodrik, 1998). These effects often create complicated policy challenges both at the domestic and international levels because, in most cases, losers tend to be a smaller and more vocal group than winners.[1] The recent collapse of the Doha Round is an example of such tensions, with disputes over the reduction of agricultural distortions stalling the progress of the entire negotiations.

Resolving the current impasse could not only imply a solution to the distributional tension between countries—reconciling the demands of developing and agriculture exporting countries on one side and (mainly) high income countries with large domestic support on the other—but also narrow income disparities *within* countries by reducing or eliminating the urban bias in the protection structure of many developing nations.[2] This paper, using an ex-ante simulation analysis, assesses the likelihood of these developments by addressing the following three questions: (i) What is the likely reduction in global inequality if all agriculture trade distortions are removed? (ii) To what extent can this reduction be attributed to inequality changes between countries and within countries? (iii) What happens to global poverty and to poverty incidence in specific countries? A major result of this paper is that while the global impacts are generally mild, the likely changes at the country and regional level are much more pronounced, therefore highlighting the need for global coordination.

The paper is organized as follows. The next section presents the data used in the analysis and establishes some basic facts about the structure of global poverty and global income distribution. Section 3 discusses the methodology behind the analysis, and section 4 presents the results. Section 5 concludes with some final remarks.

2 What is at stake? The initial position of farmers and the potential benefits or cost of agricultural distortions

Almost 45 percent of the population in the world lives in households where agricultural activities represent the main occupation of the head. And a large share of this agriculture-dependent group, close to 32 percent, is poor. Agriculture households

[1] According to Anderson and Martin (2005), self-interested vocal groups lobbying hard for excluding agricultural liberalization from multilateral negotiations include "not just farmers in the highly protecting countries and net food importing developing countries but also those food exporters receiving preferential access to those markets including holders of tariff rate quotas, members of regional trading agreements, and parties to non-reciprocal preference agreements including all least-developed countries."

[2] Krueger, Schiff, and Valdés (1991) is perhaps the most well-known study documenting this anti-agriculture bias in developing counties. For 18 countries included in the study, policy interventions induced a 30 percent decline in a price index of agricultural products relative to a nonagricultural price index. In fact, a key motivation for the current study is to revisit these former estimates and assess where the anti-agriculture bias stands now.

contribute disproportionably to global poverty: three out of every four poor people belong to this group (see Table 1). So changing economic opportunities in agriculture can significantly affect global poverty and inequality. The specific opportunity considered in detail here is the removal of agricultural trade barriers. Direct effects of this liberalization will be changes in the international prices of agricultural products and in the returns of factors used intensively in agriculture with these changes determining winners and losers. Before considering these effects in detail, this section describes what is at stake by considering the socio-economic characteristics of the agricultural population.

Table 1: Poverty is higher among agricultural households even if their incomes are less unequal

	Gini (%)	Pop Shares (%)	Average Monthly Income (2000, US PPP)	1-Dollar Poverty Incidence (%)	Poverty Share (%)
Agriculture	44.9	44.8	65.4	31.7	75.9
Non-Agri.	62.8	55.2	328.9	8.1	24.0
World	67.0	1	210.8	18.7	1

Source: GIDD database

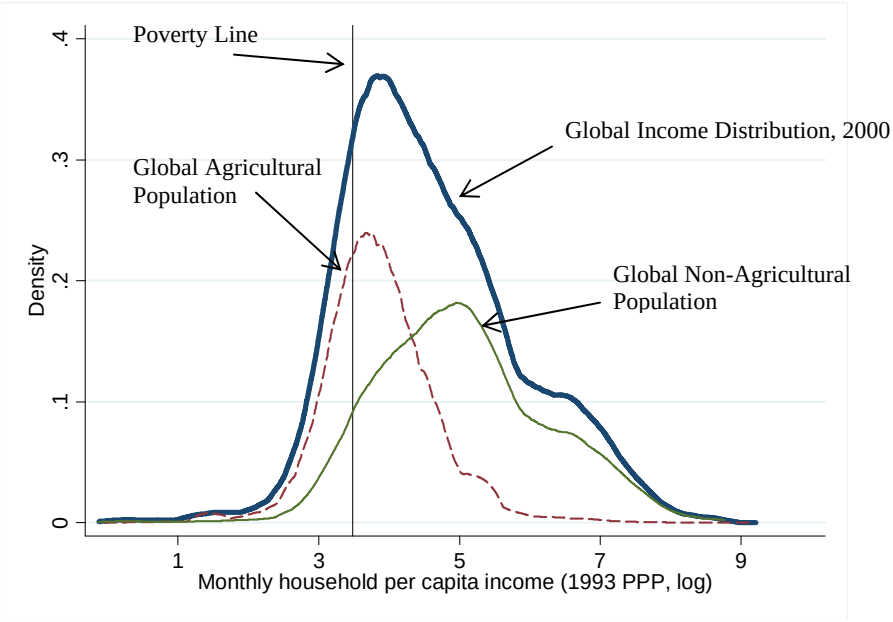
This initial descriptive analysis is based on the GIDD (Global Income Distribution Dynamics) dataset that has been recently developed at the World Bank.[3] The GIDD dataset consists of 73 detailed household surveys for low and middle income countries, complemented with more aggregate information on income distribution for 25 high income and 22 developing countries.[4] Together, data on these 120 countries covers more than 90 percent of the global population. Country coverage varies by region: while the GIDD dataset includes more than 97 percent of population in East Asia and Pacific, Eastern Europe and Central Asia, Latin America, and South Asia, coverage in Sub-Saharan Africa and Middle East and North Africa is limited to 76 and 58 percent of population, respectively. Among the detailed surveys, the majority (54) use per capita consumption as the welfare indicator, while the remaining surveys—all but one for countries in Latin America—include only per capita income as a measure of household welfare. Both income and consumption data are monthly; the data are standardized to the year 2000 and are expressed in 1993 PPP prices for consistency with the 1 and 2 dollar a day poverty lines, which are calculated at 1993 PPP exchange rates.[5]

[3] The description of the dataset may be found at the following website: http://intranet.worldbank.org/WBSITE/INTRANET/UNITS/DEC/INTPROSPECTS/0,,contentMDK:21909753~pagePK:64161873~piPK:64161126~theSitePK:334935,00.html

[4] This more aggregate information usually consists of 20 data points for each country, with each data point representing the average per capita income (or consumption) of 5 percent of the country's population. In the absence of full survey data, using these "vintile" data provides a close approximation to most economy-wide measures of inequality.

[5] The adjustment procedure for expressing welfare indicators in 1993 international dollars (PPP) is as follows. First, for countries with a survey year different than 2000, the welfare indicator (household per capita income or consumption) is scaled to the year 2000 using the cumulative growth in real income per capita between the survey year and 2000. Then, the welfare indicator is converted to 1993 national prices by multiplying the welfare indicator by the ratio of CPI in 1993 to the CPI in the survey year. Finally, the

Figure 1: Identifying the Agricultural Population in the Global Income Distribution



Three facts about the agricultural sector determine the welfare effects of a global-scale removal of agricultural distortions: (1) the proportion of the world population whose real incomes depend on the agricultural sector; (2) the initial position of the agricultural population in the global income distribution; and (3) the dispersion of incomes among the agricultural population. Using the GIDD dataset, Figure 1 shows a kernel density for the global income distribution of household per capita income/consumption and kernel *densities* for incomes/consumption of the population in and out of the agricultural sector, respectively.[6] The area below the kernel *density* for the agricultural sector is equal to 0.45, showing that 45 percent of the world population relies on agriculture for its livelihood. The distribution of the agricultural population is located to the left of the non-agricultural distribution implying that households in the agricultural sector earn, on average, lower incomes than their counterparts in other sectors. In Purchasing Power Parity (PPP) US dollars, the average agricultural household's per capita monthly income is 65 dollars, just 20 percent of the 329 dollars of per capita income earned by the average households in the non-agriculture group, see Table 1. The differences in shape between the two distributions corroborates what Kuznets hypothesized more than 50 years ago, i.e. incomes in the traditional sector are less

welfare indicator is converted to 1993 international prices by multiplying the outcome of the previous calculations by the 1993 PPP exchange rate.

[6] The distributions for the agricultural and non-agricultural populations are not, strictly speaking, density functions since the area below the curve do not add to 1. The densities of the agricultural and non-agricultural population had been rescaled so that the area under the curve represents the proportion of the world population within these two groups.

dispersed than in the modern industries. A more egalitarian traditional sector is depicted in the form of a taller and thinner distribution for agricultural population in Figure 1.

Income inequality can be estimated from the global income distribution data depicted in Figure 1. The Gini index for the world is equal to 67 %, which denotes a high level of inequality. In fact, the global Gini is about 28 points worse than that of the U.S. and even higher than the level observed in extremely unequal countries such as Mexico. As Bourguignon et al, (2004) noted: "if the world were a country, it would be among the most unequal countries of the world." How much of this inequality can be explained by the disparity on average incomes between the agricultural group and the rest? Inequality decomposition analysis shows that a quarter of global income disparities can be explained by the difference in average incomes between the two groups of households, the remaining three quarters are due to within group income variation.

Based on the pre-established poverty line of 1 dollar (PPP) per day, the GIDD global income data also provide information about the differences in poverty incidence among the two population subgroups. Despite the fact that incomes are better distributed among the agricultural population (the Gini coefficient is 18 points lower in agriculture), lower average incomes in this sector result in higher poverty incidence: 31.7 percent of agricultural households are poor versus 8.1 percent among the non-agricultural households.

Table 2: Characteristics of the Poor (for Developing Countries Only)

Sector of employment	Primary School Completed (%)	Age	Household Size	Female Headed (%)
Agricultural	32.29	44.7	7.0	8.7
Non-Agricultural	45.43	44.5	7.0	14

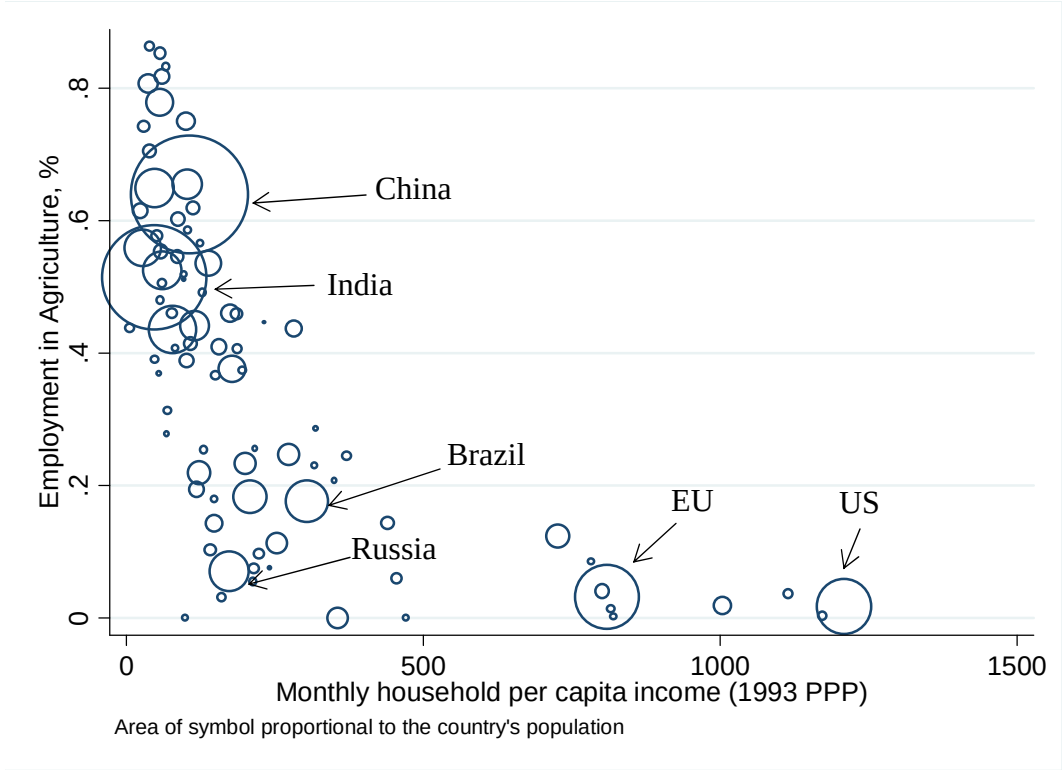
Notes: (1) Primary school completed and age, refers to the household head. (2) Using data from the GIDD.

In terms of personal characteristics of the poor in and out of the agricultural sector, Table 2 shows that no noticeable differences are observed on the average age of the head and household size. However, poor people in agriculture tend to have lower education levels: just below a third of them has completed primary education. In agriculture, poor households headed by a woman are a small minority, close to 8 percent, significantly below the 14 percent observed in the non-agriculture segment (see Table 2).

Up to this point the welfare information on agricultural and non-agricultural populations has been derived by agglomerating all households within these two groups irrespectively of their nationality. In fact, the kernel *densities* in Figure 1 exploit full income heterogeneity across households including variations between and within countries. Countries display large differences in terms of their population size, their level of development and the importance of the agricultural sector in their economies. These three country-specific characteristics are important determinants of the change of global poverty and global inequality. Clearly, as shown by **Figure 2**, global poverty would be strongly reduced in cases where China and India move towards higher income levels. Given their initial large share of global population and their position in the global income distribution, the economic expansion of these two giants is a key factor shaping the

evolution of the world economy.[7] **Figure 2** also depicts a negative relationship between income levels and share of workers in agriculture, and although this relationship is imperfectly inferred from a cross section of countries at a particular point in time, it still suggests that profound structural shifts will likely affect income distribution within countries. Clearly, the development challenges of a transition from an agriculture-based economy towards a more industrialized one, or even the management of the shocks originating from (agriculture) trade policy reform differ enormously across countries. **Figure 3**, complementing the previous one, shows this heterogeneity by displaying, for each country in our sample, the proportion of agricultural population and its corresponding share of total income. Given the large variation in the proportion of the population whose incomes depend on the agricultural sector, the income effects following a removal of agricultural distortions would be highly different *between countries*.

Figure 2: Income levels and employment in agriculture: a negative cross section relationship

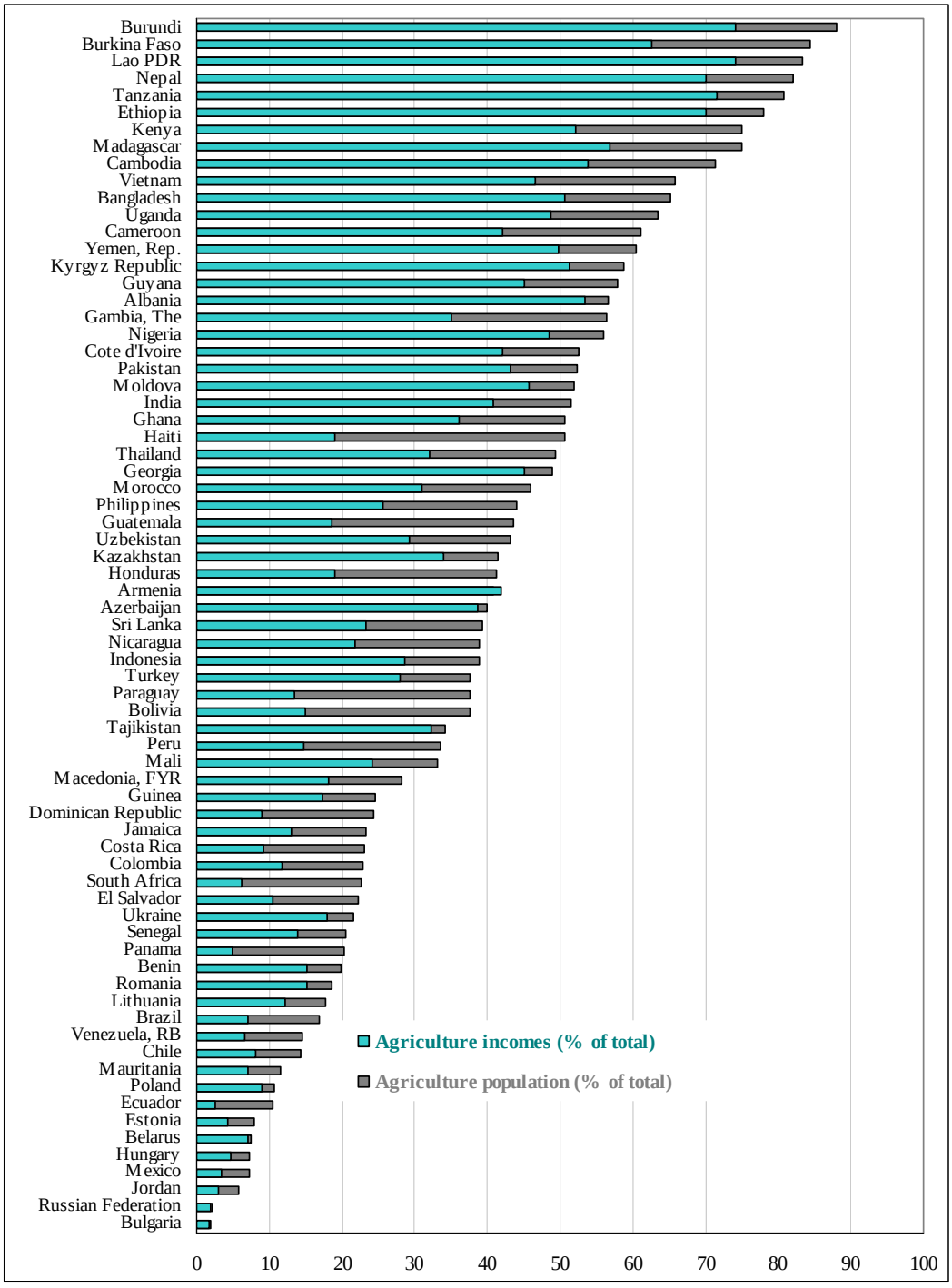


Little income effects are expected in countries like Hungary or Mexico where the proportion of population working in the agricultural sector is very small. Conversely, larger impacts can be anticipated in Nepal and Burundi where the agricultural population accounts for more than 80 percent of the total population. Confirming the negative relationship between agriculture specialization and income levels, **Figure 3** shows that the large majority of countries with a share of the agriculture population group above 50

[7] For a specific analysis of the importance of China and India for global growth and income distribution see Bussolo, De Hoyos, Medvedev and van der Mensbrugghe (2007).

percent – the agriculture-based countries – are located in the poorest region of the world: Sub-Saharan Africa. Of the 25 countries of the agriculture-based group, 12 are Sub-Saharan, 4 are from Eastern Europe and Central Asia, 3 from both East Asia and the Pacific and South Asia, and only 2 and 1 from Latin America and the Caribbean and Middle East and North Africa, respectively.

Figure 3: Population in agriculture and income shares vary across countries

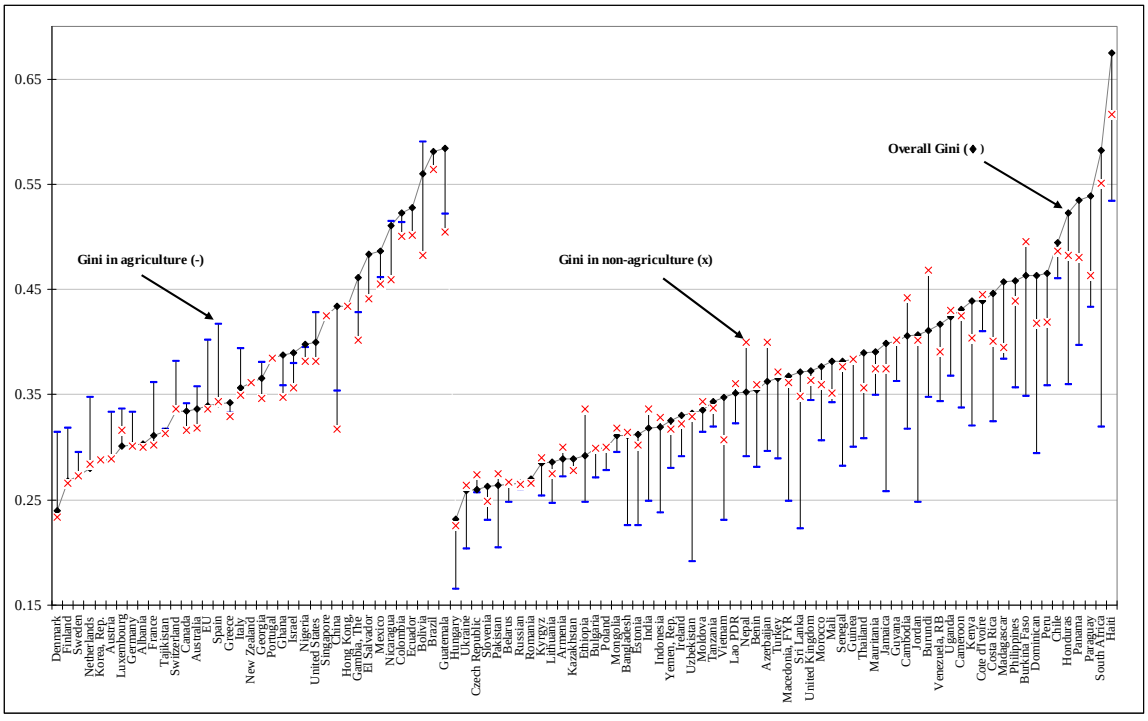


Note: authors calculations based on GIDD dataset using developing countries information only.

The pattern observed at the global level, namely that agriculture-dependent households on average earn less than other households, is replicated *for all* developing countries in the GIDD (**Figure 3**): the share of total population employed in agriculture activities is always larger than its corresponding share of total income. The simple average income premium, i.e. the ratio of non-agricultural to agricultural incomes, is equal to 2.25. Clearly this premium is unconditional in the sense that it does not take into account that in agriculture low-earning unskilled workers tend to be more abundant than skilled workers, or that other factors may explain the observed income gap. However, a simple multivariate regression analysis shows that even controlling for education, age, gender, household size, geographic region, and country fixed-effects, agriculture-related incomes are still 23 percent lower than incomes derived from other sectors.

An important element hidden in Figure 1 and only partially shown in **Figure 3** is the degree of cross-country variation in income inequality. Figure 4 shows that the difference in the Gini coefficient between countries is enormous, with former communist countries like Romania and Hungary showing an index below 0.3 whereas in highly unequal countries such as South Africa and Mozambique the index reaches values above 0.6. Once again, the tendency of higher inequality within the agriculture group observed at the global level is corroborated by the analysis of country-specific inequality. For more than three quarters of the countries included in our data (56 out of 73), Gini indicators of inequality within the agricultural group are higher than those of the non-agricultural group (Figure 4).

Figure 4: Inequality variation across countries and sectors



Note: authors calculations based on GIDD dataset using developing countries information only.

A global trade reform removing agricultural distortions is expected to reallocate resources between agricultural and non-agricultural sectors at the international level and within national states. Given global variations in: (a) the importance of the agricultural sector, (b) the agriculture to non-agriculture income premia, and (c) the within-sector income inequality, the resource reallocation following trade reform will have significant distributional effects *between and within countries*. Can economic theory provide some guidance on the expected global welfare effects following the removal of agricultural distortions?

According to Winters (2000), McCulloch et al. (2001) and Hoekman et al. (2002), trade liberalization and household welfare are linked via prices, factor markets, and consumer preferences. International prices of agricultural products will, most likely, increase as a result of the removal of agricultural trade barriers such as subsidies and tariffs (Anderson, 2003). Assuming some degree of pass-through, the increase in international prices will be followed by a rise in domestic agricultural prices enhancing a redistribution of resources from non-agricultural to the agricultural sector of the economy. Based on Figure 1, such redistribution could help reduce global poverty and inequality. However, household consumption patterns will also change as a result of the shift in prices, making the link between agricultural trade liberalization and global household welfare a complex one. As a consequence of the agricultural reform, redistribution of *real income* will take place between *net* producers and *net* consumers of agricultural products, with the welfare of the former improving at the expense of the latter.[8] Finally, factor prices will also change after trade liberalization, changing real incomes of households that are not directly involved in agricultural production.

The transition from trade theory to real world analysis presents serious challenges. A sound empirical strategy has to estimate the effects of the reform on: prices, monetary incomes (via profits in the case of farm households and returns to factors of production for non-farm households), consumption, and transfers.[9] The framework used in this paper, and described in more details below, accounts for the impact of agricultural trade liberalization through some of these channels.

3 Methodology

The empirical analysis in this paper relies on the GIDD data and methodology.[10] The GIDD, developed at the Development Economic Prospects Group of the World Bank, combines a consistent set of price and volume changes from a global CGE model with micro data at the household level to create a hypothetical or counterfactual income distribution capturing the welfare effects of the policy under evaluation.[11] Therefore, the GIDD has the ability to map CGE-consistent macroeconomic outcomes to disaggregated household survey data.

[8] A household is defined as a net producer (consumer) of agricultural products when the monetary income it derives from merchandising these products is greater (smaller) than the amount spent on them.

[9] For an empirical application of trade's effect on Mexican household welfare taking into account these effects see Nicita (2003) and De Hoyos (2007).

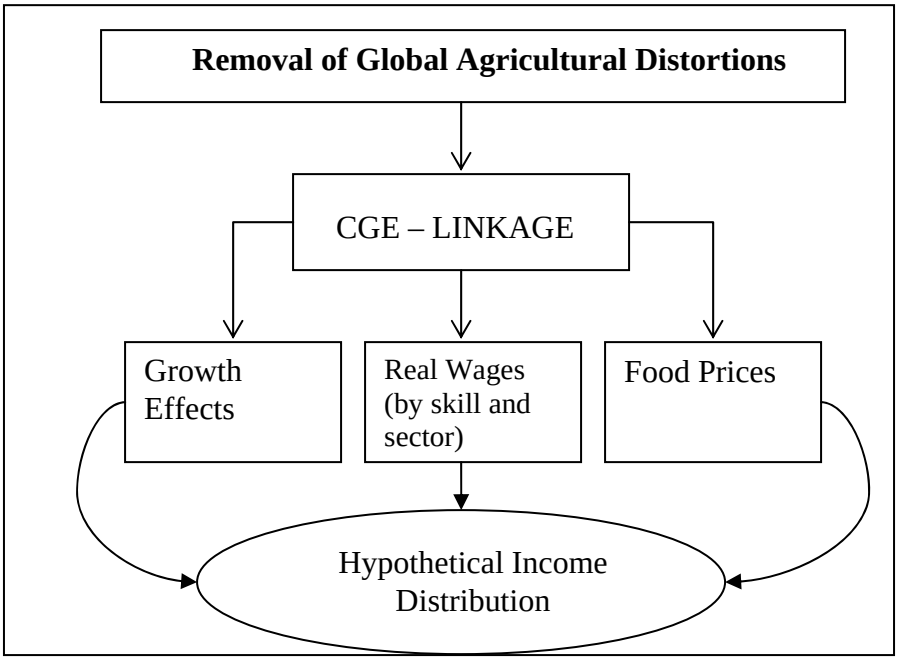
[10] A detailed methodological description of the GIDD can be found in Bussolo, De Hoyos and Medvedev (2008), as well as on the GIDD website referenced earlier.

[11] The GIDD uses the LINKAGE model as the global CGE framework; see van der Mensbrugghe (2006) for a detailed description of LINKAGE.

The GIDD's framework is based on micro-simulation methodologies developed in the recent literature, including Bourguignon and Pereira da Silva (2003); Ferreira and Leite (2003, 2004); Chen and Ravallion (2003); and Bussolo, Lay, and van der Mensbrugghe (2005). The starting point is the global income distribution in 2000, assembled using data from household surveys (see above).[12] The hypothetical distribution is then obtained by applying three main exogenous changes to the initial distribution: (a) shifts in the sectoral composition of employment; (b) economic growth, including changes in relative wages across skills and sectors; and (c) changes in real income derived from the shifts in food prices.

The empirical framework is depicted in Figure 5**.** The starting point is the price and quantity effects following the removal of agricultural distortions which are computed using the global CGE model (top part of Figure 5). The CGE will compute the values of the three variables linking the macro and micro levels of the model (middle part of Figure 5): overall economic growth, real wage premiums among agricultural/non-agricultural and skilled/unskilled groups, and the consumption (or real income) effects brought about by the change in relative price of food. These CGE results are passed-on to the household survey data, creating a new, hypothetical household income distribution (bottom link in Figure 5). Distribution and poverty comparisons between the initial and the counterfactual income distributions will capture the welfare effects of the removal of global agricultural distortions. By taking into account labor market (returns to skills in and out the agricultural sector) and consumption effects whilst evaluating macro policies, GIDD's framework closely maps the theoretical linkages outlined in the previous section.[13]

Figure 5 GIDD methodological framework



[12] Throughout the paper, when we talk about the global distribution, we are indeed referring to the GIDD's sample covering 92 percent of the world population.

[13] The GIDD does not take into account the welfare impacts via changes in transfers resulting from the trade reform.

In the real world the changes depicted in Figure 5 take place simultaneously, but in the GIDD's simplified framework they are accommodated in a sequential fashion. In the first step, consistent with an overall growth rate of real income per capita, changes in labor remuneration by skill level and sectoral location are applied to each worker in the sample depending on their education and sector of employment. In the second step, real household incomes are affected by the change in the price of food versus non-food; households with a higher share of household income allocated to food consumption will bear the larger impact after a change in the price of food.

The sequential changes described above reshape national income distribution under a set of strong assumptions. In particular, income inequality within population subgroups formed by skills and sector of employment is assumed to remain constant after the trade reform. Moreover, data limitations affect estimates of the initial inequality and its evolution. Although consumption expenditure is a more reliable welfare measure than income, and its distribution is normally more equal than the distribution of income, consumption data are not available for all countries' surveys. To get a global picture, the present study had to include, both, countries for which only income data were available with countries with consumption information. Finally, measurement errors implicit in purchasing power parity exchange rates, which have been used to convert local currency units, also affect comparability across countries. The resulting hypothetical income distribution should thus not be seen as a *forecast* of what the future distribution might look like; instead it should be interpreted as the result of an exercise that captures the *ceteris paribus* distributional effect of agricultural trade liberalization.

4 What happens to poverty and income distribution when agriculture trade distortions are removed?

In this section, we link the macro outcomes of global agricultural trade reform to the changes in the distribution of income *between* and *within* countries. Our analysis is carried out in three stages. First, we briefly examine the macroeconomic results of the LINKAGE model, focusing on the variables that are passed on to the household survey data. Second, we consider the income distribution results from a global perspective, quantifying the likely changes in global poverty and inequality and identifying groups of countries and individuals that are likely to benefit the most (least) from agricultural trade reform. Thirdly, we assess the potential trends in the distribution of income within countries, identifying countries where inequality pressures may heighten and thus erode support for additional reforms.

4.1 Macroeconomic general equilibrium results

The LINKAGE simulation analysis has been carried out with the 7.0 pre-release of the GTAP database, which disaggregates global trade into bilateral flows between 101 countries/regions in 57 commodity groups. The base year for the simulations is 2004, and the data take into account changes in the global trade and tariff structure due to the implementation of the Uruguay Round commitments, the EU enlargement, China's accession to the WTO, and implementation of most major preferential trade agreements. The model is solved in a comparative static mode, which means that simulations are

implemented as one-time shocks and do not take into account potential growth effects through changes in capital accumulation rates or variations in productivity.

Our main simulation envisions the full removal of import tariffs and export taxes/subsidies on agriculture and food products around the globe. The liberalization schedule includes 17 out of 57 commodities in GTAP, and the initial level of protection by exporter is shown in Table 3.[14] We also consider an alternative scenario where all border distortions are removed and use it as a second reference point in our analysis; in other words, we are interested not only in the pattern of changes in the global economy following the removal of agricultural distortions, but also how this pattern compares with the adjustments likely to take place if all trade were liberalized.

Table 3 Developing income countries face higher tariffs than high income countries

Importer / Exporter	Low and middle income countries		High income countries	
	Tariffs faced (%)	Exports (% of total)	Tariffs faced (%)	Exports (% of total)
World total	13.0	31.5	10.6	68.5
High income countries	12.9	23.7	7.8	76.3
United States	10.0	48.3	24.1	51.7
EU 15	14.7	15.0	2.9	85.0
Low and middle income countries	13.0	44.3	16.6	55.7
East Asia and Pacific	16.5	41.4	23.7	58.6
China	16.7	25.3	27.6	74.7
Indonesia	15.6	57.6	11.3	42.4
Europe & Central Asia	9.2	51.7	9.3	48.3
Poland	12.3	35.0	3.6	65.0
Russia	13.3	59.0	21.4	41.0
Latin America and the Caribbean	14.1	40.9	16.5	59.1
Brazil	18.2	47.9	24.3	52.1
Mexico	16.2	7.4	5.4	92.6
Middle East & North Africa	10.4	55.1	12.2	44.9
Egypt	9.4	55.3	12.8	44.7
Morocco	12.8	17.7	7.8	82.3
South Asia	12.0	57.2	15.4	42.8
India	12.3	55.5	15.5	44.5
Pakistan	9.5	72.8	27.4	27.2
Sub-Saharan Africa	9.7	39.1	9.8	60.9
South Africa	13.5	39.4	8.8	60.6
Nigeria	10.9	17.6	1.6	82.4

Note: "Tariffs faced" column shows the import-weighted average tariff imposed by the column country/region on exports from the row country/region. "Exports" column shows the exports of the row country/region to the column country/region as a share of the former's total exports.

Source: Authors' calculations with GTAP7.0 database

Due to the removal of barriers to trade in agriculture and food products, global consumption rises by 0.29 percent, two-thirds of the improvement expected under a full trade liberalization scenario. Low and middle income countries gain more than the

[14] Trade in other beverages and tobacco is excluded from the liberalization list. See Annex Table XX for a full list of commodities where trade is liberalized.

average, with consumption rising by 0.47 percent in the developing world compared to 0.24 percent for high-income countries. 50 out of 60 LINKAGE country/regions — representing nearly 95 percent of the world—experience positive changes in consumption following the removal of agricultural distortions, compared to 47 country/regions that are likely to experience consumption gains under global trade reform (Figure 6).

There are three main channels that transmit the trade reform shocks to household consumption in the LINKAGE model and help explain the heterogeneity of the results in Figure 6. The first channel is the changes in the terms of trade, the ratio of export prices to import prices without taking into account domestic price distortions (i.e., own import tariffs and export taxes/subsidies). Net exporters of agriculture and food, such as Brazil, Ecuador, and New Zealand, reap significant welfare gains when the world export prices of these commodities rise by 8, 19, and 11 percent, respectively.[15] On the other hand, net importers of food, such as China, Mexico, and Senegal, experience real consumption losses due to higher import prices.

The second channel is tightly linked to the first, and has to do with the impact of countries' own policies. Thus, countries with high pre-reform tariffs or export taxes, such as Lithuania, Nigeria, and North Africa, tend to experience larger consumption gains than countries where the initial distortions are low. If the initial trade barriers are sufficiently high, consumers may face lower post-reform prices of food even if import prices are rising; this is the case of North Africa, which experiences an increase in real consumption despite being a net food importer.

The third channel is the impact of trade reform on government budgets. Since the model does not include an explicit transversality condition, we maintain a fixed budget deficit closure, which means that any losses in public revenue (such as a reduction in tariff income) must be offset by a compensatory increase in the direct tax rate on the households.[16] Therefore, welfare gains are limited in countries such as Tanzania and Zimbabwe, which rely on taxes on international trade as an important component of public revenue.[17]

In addition to changes in levels of per capita consumption *across* countries, the LINKAGE results hint at important distributional consequences of trade reform *within* countries through changes in returns to labor in different sectors and at varying skill levels. Figure 7 shows the contributions of payments to different factors to the total change in real GDP at factor cost (in percentage points) following the removal of agricultural trade distortions. With the exception of China, all countries experiencing an increase in payments to unskilled labor in agriculture also register consumption gains due to trade reform, but the converse does not hold. Real consumption increases in 29 out of 40 countries that show a decline in unskilled agriculture wages; since unskilled workers in agriculture tend to be the poorest part of the population, these results suggest that

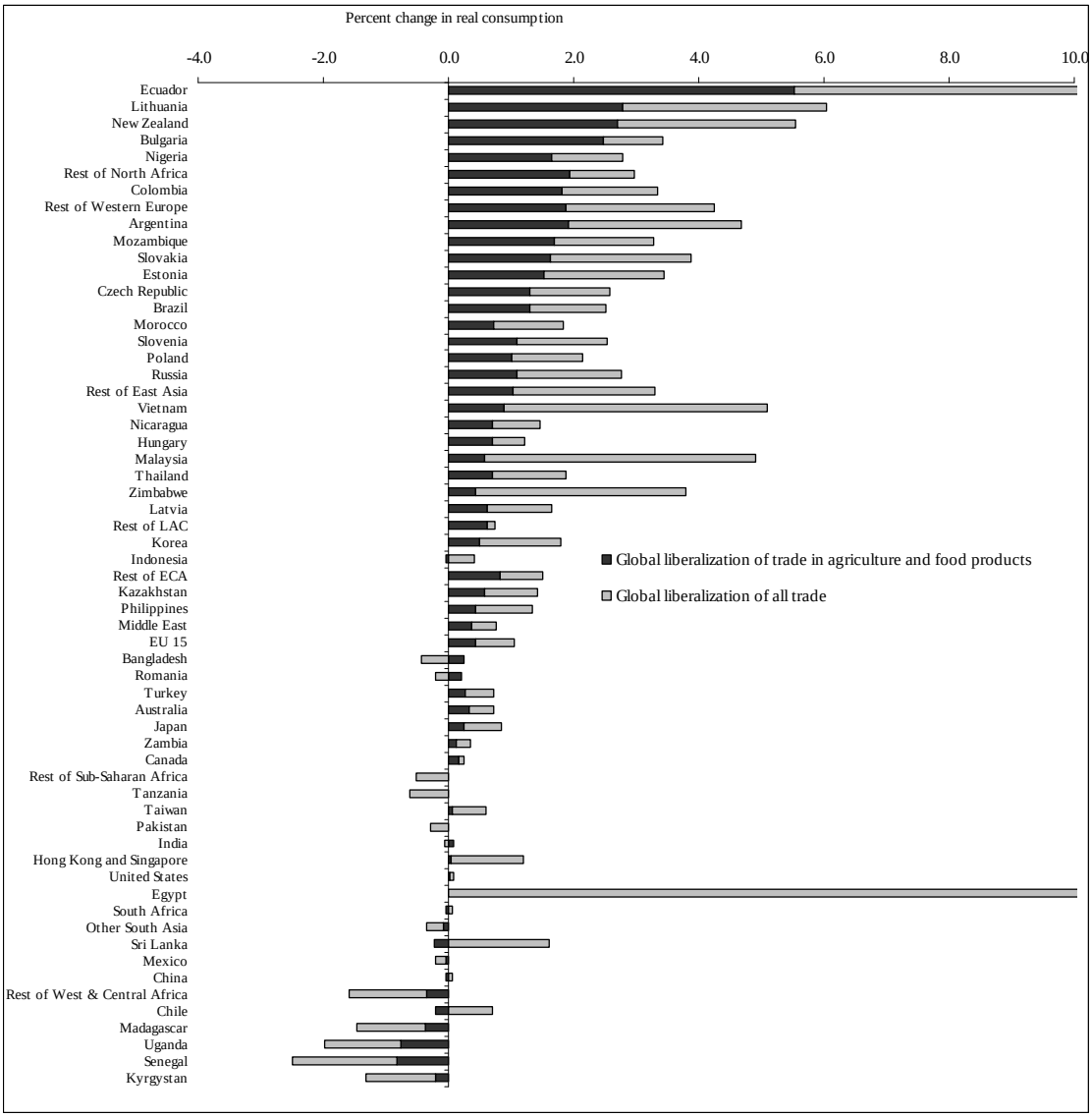
[15] The price increases are calculated using the Paasche price index, i.e. using the post-reform exports as weights for aggregating the prices of individual commodities. Unless explicitly noted, all price indices in this section are calculated using the Paasche formula. Price indices differ by country due to differences in the composition of exports (i.e., aggregation weights).

[16] In other words, this closure choice gives rise to consistent measurement of household utility as the utility function does not include the consumption of public goods.

[17] In this situation, the ability of households to gain or lose from trade reform depends on (in addition to the impacts of the first two channels) their ability to substitute out of more expensive goods into cheaper alternatives.

pressures towards increased inequality may be intensifying in many regions in the world.[18] Furthermore, the losses and gains in agriculture wages exhibit strong regional patterns: real wages of unskilled farmers rise in Latin America, the Middle East, and East Asia & Pacific, while declining in other developing regions, and, much more strongly, in high income countries.

Figure 6 Most countries gain from the removal of agricultural distortions



Note: The black bars show the percent increase in consumption (at pre-reform prices) due to the removal of trade distortions in agriculture and food products (excluding beverages and tobacco). The grey bars show the additional gains in consumption due to the removal of all remaining trade barriers. The combined length of the two bars shows the consumption gains from a full global trade reform.

Source: Authors' simulations with the LINKAGE model.

[18] Note that trends in consumption per capita are unlikely to be representative of the welfare of agricultural households, since their weight in total consumption is low due to limited incomes and high incidence of poverty.

The initial level of protection in agriculture (excluding processed food), combined with the terms of trade shock, represent the main determinants of the trends in farm factor prices. Consider the example of India, where unskilled farm wages decline by 6.1 percent following trade reform.[19] Indian farmers must contend with falling international prices of imported agriculture products (a decline of 1.7 percent) as well as a loss of tariff protection (2.0 percent), export subsidies (3.3 percent), and output subsidies (6.9 percent). The first two channels decrease the farmers' competitiveness on the domestic market and lead to higher import penetration, while the third channel erodes their competitiveness on the international markets. The fourth channel increases production costs and makes Indian farmers less competitive overall. Together, these effects create strong incentives for farmers to exit the agriculture sector and result in lower farm labor earnings.

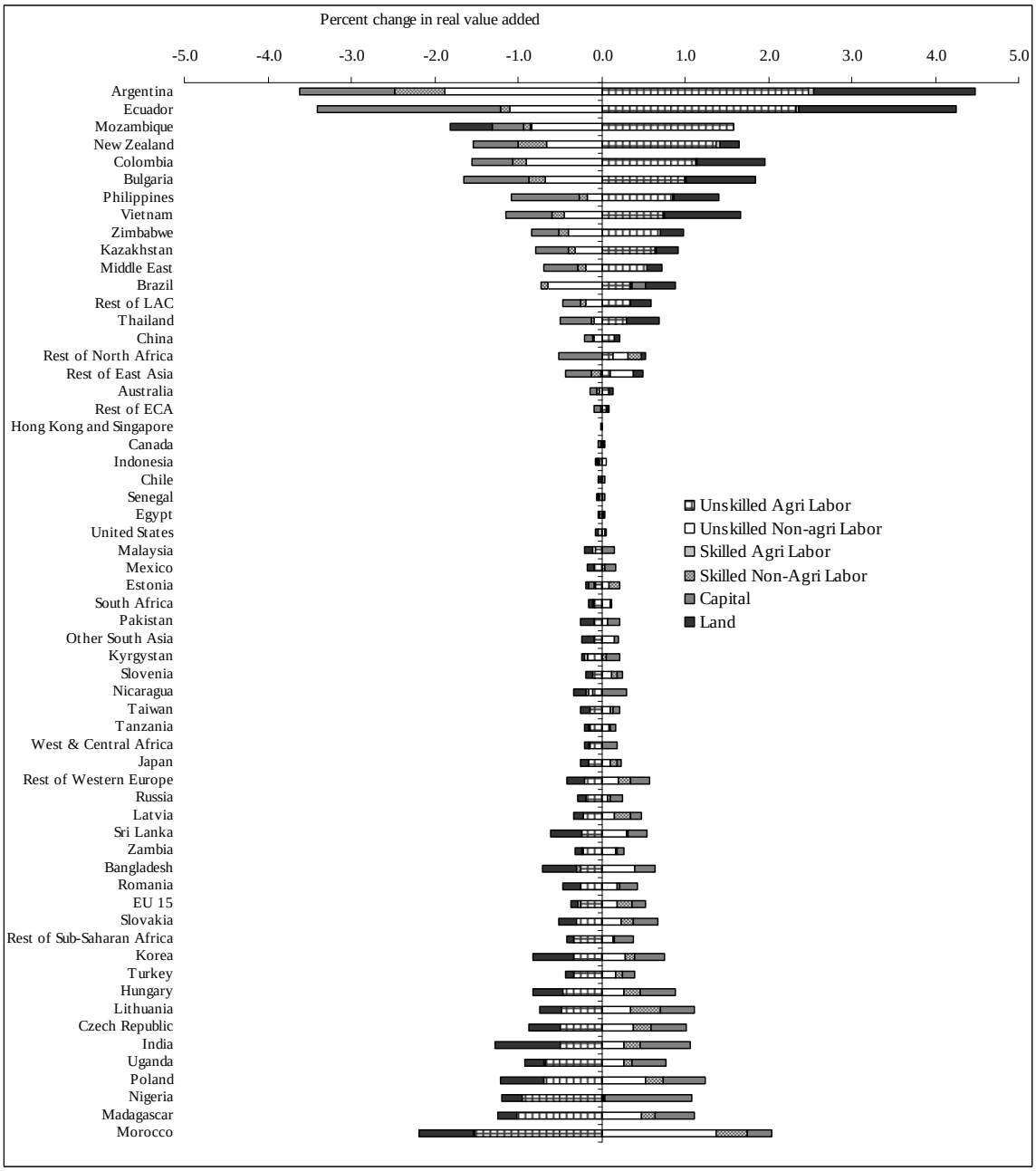
In Mexico, the income losses among unskilled farmers are lower than in India. This is partially attributable to its close trading relationship with the US. Mexico purchases 75 percent of its agriculture imports from the US, whose export prices rise by 5.7 percent due to the elimination of export and production subsidies. Thus, the removal of agriculture price support in the US puts upward pressure on import prices of agriculture in Mexico, which hurts consumers but increases the competitiveness of farmers on the domestic market. On the other hand, this trend is counteracted by the removal of tariff protection on agriculture (1.2 percent) and output subsidies (0.8 percent), which lead to a decrease in competitiveness of agriculture producers in Mexico and market share losses in both domestic and export markets.

Brazil, on the other hand, is an example of a country where a number of positive developments combine to produce a nearly 34 percent gain in the wages of unskilled agriculture workers.[20] The import prices of agriculture in Brazil rise by 1.8 percent, bolstering the domestic competitiveness of its farmers, while export prices increase by more than 10 percent. Because Brazilian farmers do not receive any export or production subsidies, they are well-positioned to take advantage of these opportunities and gain market share both domestically and abroad. Although some of the gains to agriculture producers are offset by the loss in domestic protection (import tariff of 2.4 percent), Brazilian agriculture is still able to increase its production volume by 17.8 percent following trade reform.

[19] The 6 percent figure refers to increase in the nominal wages. The change in real wages depends on the choice of deflator: while the CPI increases by 2 percent relative to the base year, the GDP deflator falls by 1 percent.

[20] This is a nominal, not a real increase. Consumer prices in Brazil rise by 4 percent following trade reform.

Figure 7 In the majority of countries, unskilled wages in agriculture decline



Note: Each bar shows a contribution of changes in value added of a specific factor to the total change in value added, deflated by the price of GDP at factor cost. Countries are sorted (in descending order) by the increase in payments to unskilled farm labor.

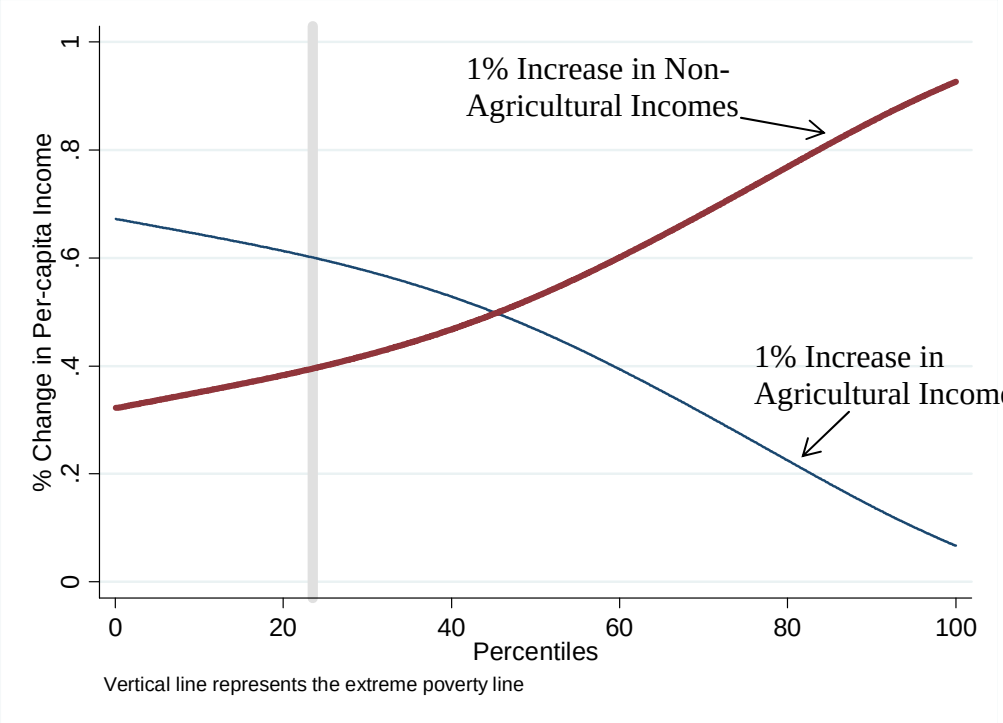
Source: Authors' simulations with the LINKAGE model.

4.2 Micro-simulation results: Global Poverty and Inequality

In this section, we use the GIDD model and data to simulate the likely changes in global poverty and inequality due to the elimination of all agricultural trade distortions. Given the richness of the data and the numerous factors affecting global poverty and

inequality within the GIDD, this section starts with two simulations that illustrate, in a simple way, the expected effects of a global agricultural trade reform. Focusing only on low and middle income countries in our data, both simulations raise the average income in the developing world by 1 percent. In the first instance, this occurs due to an increase in incomes of agricultural households only, while in the second exercise, the increase is due entirely to an expansion in non-agricultural incomes. The results of these examples are shown with two growth incidence curves (GIC)[21] in Figure 8. The thin GIC captures the effects of assigning income gains only to agricultural households, while the thick GIC raises incomes only for those households whose head works in non-agricultural activities.

Figure 8 Growth Incidence Curve of a 1% Increase in Incomes



4.2.1 Poverty and Inequality Impacts: A Global View

Translating the shocks from the LINKAGE model into poverty and inequality outcomes with the GIDD shows that the effects of a full removal of agricultural trade distortions on global poverty are close to zero. This limited impact is explained by several factors. First, the growth effects of the reform (i.e., changes in per capita consumption) are very small.

[21] The GIC is shows the changes in welfare along the entire income distribution, therefore capturing, in a single graph, the growth and distributional components of overall welfare changes. For a detailed description of the properties characterizing the growth incidence curves see Ravallion and Chen (2003).

According to the GIDD, the world's average monthly household income increases 0.3 percent after the removal of agricultural distortions, passing from an initial level of $207 to a final value of $208, 1993 PPP (see Table 4). Second, the reform has little impact on inequality at the global level. Although incomes rise in the agricultural and non-agricultural sectors alike, agricultural incomes increase by a little more than 1 percent whilst incomes in non-agricultural activities rise at the much lower rate of 0.2 percent. While this reduction in the non-agricultural income premium reduces inequality, Table 4 shows that income dispersion within the agricultural sector is also increasing, with the final change in global income distribution being close to zero. The distributional changes taking place within the agricultural sector are such that the incidence of extreme poverty (under 1 dollar a day, PPP) in this sector rises by almost 1 percentage point as a consequence of the elimination of agricultural trade distortions. On the other hand, poverty among non-agricultural households experienced a reduction equal to 0.36 percentage points. The combination of poverty changes occurring in and out of the agricultural sector ends up increasing global poverty by 0.4 percentage points, or 21 million additional individuals below the extreme poverty line. This result should be taken with caution since the poverty effect of the agricultural trade reform depends on where the poverty line is set. While global poverty measured by the 1 dollar a day poverty line shows a moderate increase of 0.18 percentage points as a consequence of the reform, when measured at 2 dollars a day, poverty reduces by 0.3 percentage points.

Table 4: Simulated Global Poverty and Inequality and Changes w.r.t. Initial Levels

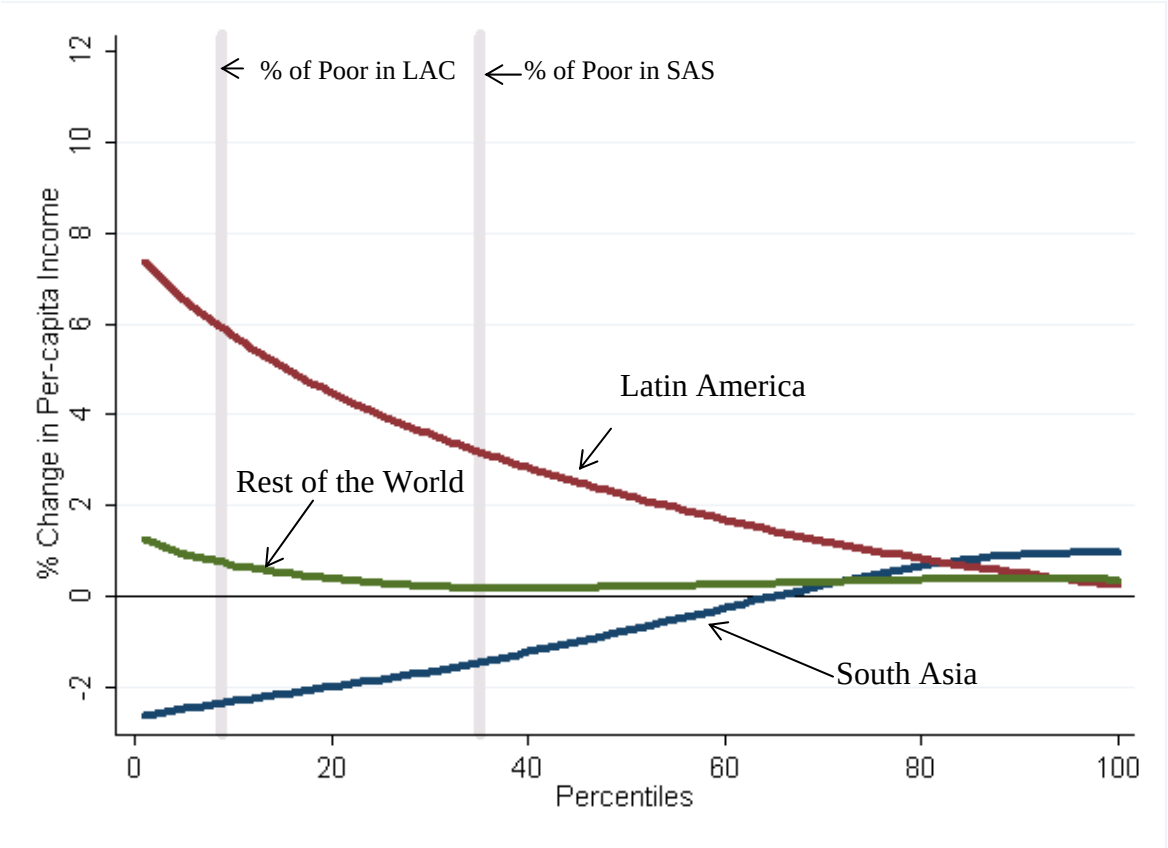
Strata	Gini (%)	Pop Shares (%)	Average Income	1-Dollar Poverty Incidence (%)	Poverty Share (%)
Agri	44.9	44.8	65.4	31.7	75.9
Non-Agri	62.8	55.2	328.9	8.1	24.0
Total	67.0	1	210.8	18.7	1
Change with respect the observed (Simulated - Observed)					
Agri	0.5	-	1.2*	0.87	1.02
Non-Agri	-0.2	-	0.2*	-0.36	-1.02
Total	-0.1	-	0.3*	0.18	-

* Changes in average income are expressed in percentage.

The results presented so far have treated the world as a single entity, making no distinction between regions or countries. Thus, lack of major changes at the global level could be the outcome of offsetting trends between regions. As discussed in Section 4.1, farmers in Latin America (LAC) are big winners from trade reform with an impressive increase of 16 percent in their household income. By contrast, incomes of farmers in South Asia (SA) shrink more than 3 percent after agricultural distortions are dismantled. In order to show the incidence of these changes among the population in the different regions, Figure 9 plots the GIC for Latin America, South Asia and the rest of the world. The GIC for Latin America shows that the agriculture-based growth in the region is highly pro-poor; on the contrary, South Asia's reduction in agricultural incomes is highly regressive, with the poorest households losing from the reform. East Asia and, to a lesser

extent, Sub-Saharan Africa benefit from the global reform, while the effects of the reform are progressive, albeit close to zero, for the rest of the world.

Figure 9 Regional Growth Incidence Curves



The differences in reform outcomes across regions help explain the lack of significant change in global poverty. With half a billion people in extreme poverty, South Asia alone accounts for almost half of global poverty; on the other hand, Latin America contributes less than 5 percent to global poverty (see Table 5). Hence, although removing agricultural distortions alleviates extreme poverty in most regions in the world, the increase in South Asia's head count ratio offsets these gains and drags an extra 9.8 million people below the poverty line. The results using the 2 dollars per day poverty line show a very different picture. Poverty is alleviated in all regions except for Middle East and North.[22] The results at the moderate poverty line are particularly interesting for South Asia, where agricultural trade reform becomes pro-poor instead of anti-poor as it was the case when using the 1 dollar-a-day PPP poverty line. This result is explained by the large number of non-agricultural households that are below the moderate poverty line in South Asia. South Asian households working in non-agricultural activities experience an increase in purchasing power after the agricultural markets are liberalized and therefore contribute to reduction in moderate poverty in the region.

[22] Due to space restriction, the results using the 2 dollars a day poverty line are included in an Appendix.

Table 5 Global and Regional Poverty

Region	Number of Poor (in thousands)	Share of Global Poverty	Simulated Number of Poor (in thousands)	Δ (Simulated – Observed)
East Asia	261,677	27.1	258,937	-2,740
Eastern Europe	3,607	0.4	3,576	-31
Latin America	40,075	4.1	37,677	-2,397
Middle East	1,614	0.2	1,544	-71
South Asia	466,165	48.3	481,350	15,185
Sub-Saharan Africa	192,555	19.9	192,461	-94
Global	965,693	100.0	975,545	9,851

Notes: (1) Number of poor expressed in thousands. (2) The simulations are based on the GIDD's results.

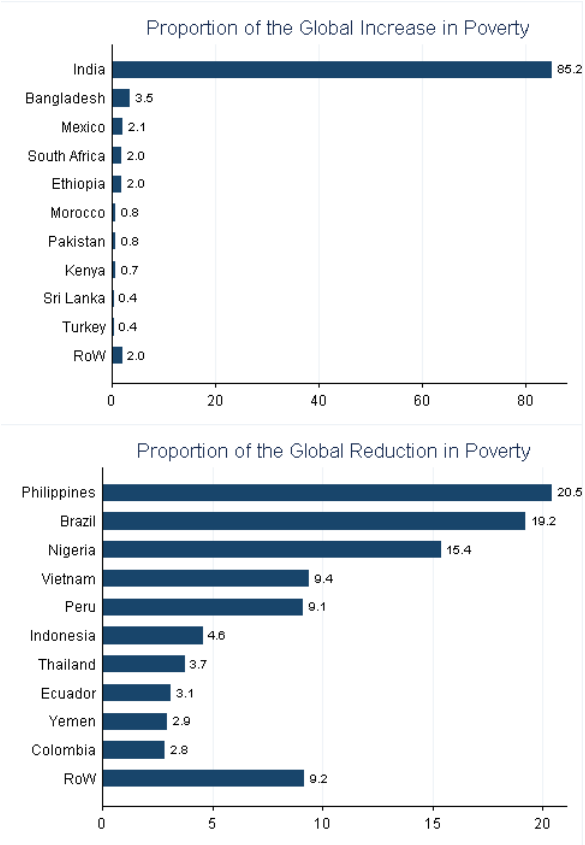
4.2.2 Zooming in: Poverty and Inequality Effects Between and Within Countries

Global agricultural liberalization has distributional and poverty effects that vary not only across regions but also between and within countries. This section summarizes the poverty effects for each of the countries included in our sample and the distributional changes taking place within them. Table 5 shows that the roughly 10 million individuals that would be pushed into poverty as a consequence of agricultural reform is the combination of a 15 million increase in poverty in South Asia and a 5 million decrease in poverty in all other regions. Figure 10 shows the countries that contribute the most to this reduction and increase in global poverty, respectively. Among the *new* poor, 85.2 percent—almost 13 million—are Indian nationals, while 3.5 percent are located in Bangladesh, and 2.1 percent are Mexican. Although the increase in poverty is mainly an Indian phenomenon, all 5 South Asian countries contribute significantly to the global increase in poverty. On the other hand, the gross reduction in global poverty is distributed more evenly among the *winning* countries with the great majority of them being located in Latin America and East Asia and the Pacific (EAP). In fact, no country in EAP and only Chile and Mexico in LAC experience an increase in the number of extreme poor as a result of agricultural trade reform.

The contributions to the global entry and exit of poverty depicted in Figure 10 are, to a certain extent, the outcomes of differences in population size. For instance, a very populous country such as India can have a substantial contribution to global poverty without necessarily implying a large increase in the country's *head count ratio*. Another way of ranking countries in terms of their poverty outcomes is to consider the post-reform change in the head count ratio. Undertaking this exercise shows that, among countries where poverty falls, Peru's reduction of 3 percentage points in the head count ratio is, by far, the largest in the developing world. The incidence of poverty in Philippines and Ecuador decreases by 1.8 percentage points, just below the fall registered in Yemen and Paraguay (1.2). On the other hand, with an increase of 1.4 percentage points in the head count ratio, India is still the country with the largest increase in poverty. At the same time, as mentioned earlier, poverty in India falls by 0.3 percentage points if changes are evaluated at the 2 dollars a day poverty line. Interestingly, these

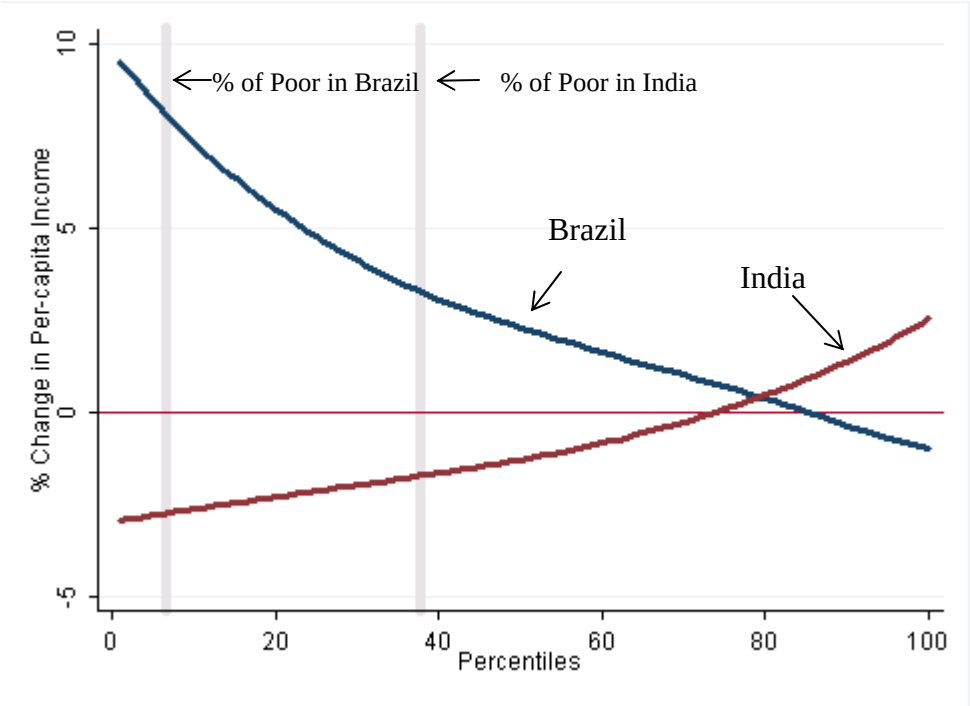
changes in the head count ratio in India occur while average household income remains constant, and are therefore entirely a result of a deterioration in income distribution.

Figure 10 Poverty Changes as a Proportion of the Total Change among the 10 Most Losing/Winning Countries



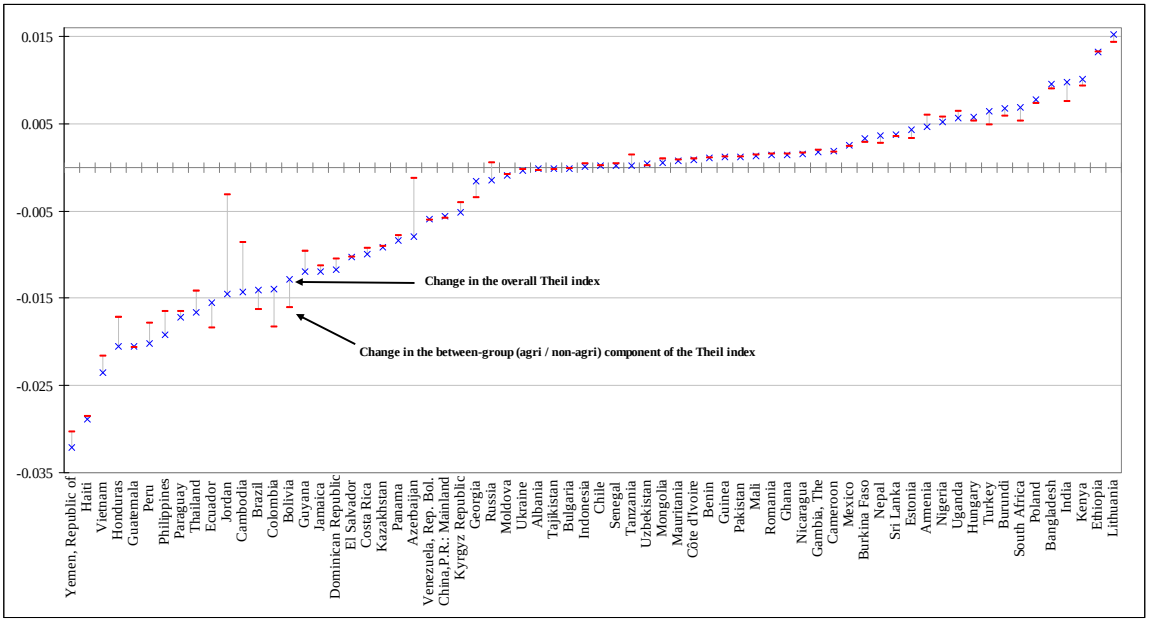
Our results show that the significant increase in poverty in India is entirely explained by a post-reform increase in inequality of almost 1 Gini point. Three quarters of this increase is attributable to a rise in the agricultural-to-non-agricultural income gap in India. On the other hand, poverty reduction in Brazil is the outcome of a combination of a 1 percent increase in average income and a reduction in inequality of more than half a Gini point. The changes in overall growth and distribution taking place in India and Brazil are summarized by the GIC for these two countries plotted in Figure 11. Given the importance of Brazil and India in their respective regions, it is not surprising that the shape of the GIC for these countries are very similar to the GICs of their respective regions plotted in Figure 9. Figure 11 shows that the only beneficiaries of agricultural liberalization in India are those in the top 22 percent of the distribution; given than 83 percent of the Indian population is below the 2 dollars a day poverty line, part of the top 22 percent is formed by household under moderate poverty.

Figure 11 Growth Incidence Curves for Brazil and India



As we mentioned in Section 2, agricultural reforms can have important--agricultural to non-agricultural--real income distributional effects. Our results show that for most countries in our sample, removing agricultural distortions does not have large distributional effects. In more than half of the countries, the Gini coefficient shows a change of less than half a Gini point. This pattern is also observed in the changes in the country-specific Theil index plotted in Figure 12. There are distinguishable regional differences in the distributional effects of the reform, with countries in Latin America and East Asia experiencing a considerable reduction in income inequality whilst inequality in countries outside these regions remains constant or rises marginally. The advantage of using the Theil index as the inequality measure is that we can decompose its change into an effect attributable to shifts in the agricultural to non-agricultural wage gap (between effect) and the effects due to income changes within these two groups. Figure 12 shows the total changes in the Theil index (depicted by a star) and the changes attributable to movements in the non-agricultural income premium (little horizontal bar). Since the "between" effect is very close to the total distributional effect for the majority of countries, we can conclude that the total change in income distribution in these economies is mainly the outcome of changes in mean incomes of the agricultural and non-agricultural sectors.

Figure 12 Most of the Distributional Changes are Attributable to the Between Component



5 Conclusions and policy messages

Trade distortions in agriculture and food represent the last major bastion of protection and have proven to be the main point of contention in recent multilateral trade negotiations. Using a newly developed dataset and methodological approach for evaluating the poverty and inequality effects of policy reforms—the GIDD—this paper has evaluated the potential impacts of the removal of agriculture trade distortions on the global income distribution.

There are three main messages emerging from our analysis. First, the liberalization of agriculture and food markets is unlikely to have large effects on global poverty. Our results show that the incidence of extreme poverty could rise by 0.2 percent, while moderate poverty is likely to fall by 0.3 percent.

The second message is that these small aggregate changes are produced by a combination of offsetting trends at the regional and country levels. With the elimination of all agriculture trade distortion, extreme poverty is reduced in all regions but in the Middle East and North Africa, where it is almost stable, and in South Asia, where it increases considerably. Since about 50 percent of all poor people live in South Asia, the worsening of poverty in this region counterbalances all the gains in the other parts of the world and an additional 9 million people fall into poverty. At the moderate poverty line, 14 million people escape poverty and most regions benefit from lower poverty incidence with the exclusion of Eastern Europe and Central Asia and Middle East and North Africa. Many non-agriculture households in South Asia are clustered below the 2 dollar a day poverty line and trade reform-related improvement in their incomes, versus the agricultural incomes' decline, explain the difference in global poverty results when the 1 dollar or the 2 dollar a day lines are used.

The third message is that the distributional changes due to agricultural trade reform are also likely to be mild, but exhibit a strong regional pattern. Inequality is likely to fall in regions such as Latin America, which are characterized by high initial inequality, and rise in regions like South Asia, characterized by low initial inequality. In addition, the decrease in inequality between agriculture and non-agriculture groups is offset by a higher within group inequality which mainly originates from a widening of incomes within the agriculture sector. Inequality within countries varies within a wide interval ranging from increases of up to 3 Gini points to reduction of 2 Gini points. The majority of countries, around 60% of those included in the sample, experience an increase of inequality.

These results suggest that allocative efficiency gains combined with distributional shifts originating from the removal of agriculture trade restrictions are not enough to significantly alleviate poverty at the 1 dollar a day threshold nor at a higher poverty line. The pattern of global incomes change triggered by such trade reform, as simulated by the model used in this paper, is complex and cannot be simplistically reduced to a boost in growth rates of agriculture. The latter remains an essential component in the strategy for poverty eradication and trade liberalization can only play a constructive but somewhat limited role.

There are several important caveats to our analysis. First, it should be emphasized that, although poverty reduction is a most worthy goal, it should not be the only, or even the first, metric with which to measure trade policy. Trade reform cannot be expected to benefit all constituents, and can only do so in the presence of other complimentary policies. Second, our analysis is confined to examination of the effects of static efficiency gains only, and does not consider the potential growth effects of trade liberalization. Although our results show that the static gains from agriculture trade reform may not contribute to reduction in extreme poverty and may do little to combat moderate poverty, they do not imply that this pattern of trade liberalization cannot be an effective tool for poverty reduction. Finally, our micro model considers only changes in labor income: while this is the most important income source for households at or near the poverty line, accounting for changes in other factor returns may yield results of a different magnitude.

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6 Appendix

Table A1: Changes in Moderate Poverty

Region	Number of Poor (in thousands)	Share of Global Poverty	Simulated Number of Poor (in thousands)	Δ (Simulated – Observed)
East Asia	888,988	36.1	882,473	-6,515
Eastern Europe	42,194	1.7	41,641	-553
Latin America	104,573	4.2	100,044	-4,528
Middle East	11,425	0.5	11,720	294
South Asia	1,084,989	44.0	1,081,615	-3,374
Sub-Saharan Africa	331,264	13.4	331,203	-61
Global	2,463,434	100.0	2,448,696	-14,737

Notes: (1) The number of poor is expressed in thousands. (2) The simulations are based on the GIDD's results.

Table A2: Household Surveys Included in the GIDD

Region	Covered population	Actual population	Covered Population (%)
World	**5,498,162**	**6,076,509**	**90.48**
East Asia and Pacific	1,733,358	1,817,232	95.38
Eastern Europe and Central Asia	460,385	471,549	97.63
High Income Countries	764,285	974,612	78.42
Latin America	500,199	515,069	97.11
Middle East and North Africa	190,397	276,447	68.87
South Asia	1,332,800	1,358,294	98.12
Sub-Saharan Africa	516,737	663,305	77.90

Economy	Covered population	Actual population	Data used
East Asia and Pacific	**1,733,358**	**1,805,691**	
China	1,260,000	1,260,000	grouped
Indonesia	212,000	212,000	individual
Vietnam	80,400	80,400	individual
Philippines	71,600	71,600	individual
Thailand	61,700	61,700	individual
Malaysia	23,300	23,300	grouped
Cambodia	11,900	11,900	individual
Lao PDR	4,927	4,927	individual
Papua New Guinea	5,133	5,133	grouped
Mongolia	2,398	2,398	grouped
Myanmar		47,700	
Korea, Dem. Rep.		21,900	
Fiji		811	
Timor-Leste		784	
Solomon Islands		419	
Vanuatu		191	
Samoa		177	
Micronesia, Fed. Sts.		107	
Tonga		100	
Kiribati		91	
Marshall Islands		53	
Eastern Europe and Central Asia	**460,385**	**471,549**	
Russian Federation	136,000	146,000	individual
Turkey	69,600	67,400	individual
Ukraine	47,600	49,200	individual
Poland	38,300	38,500	individual
Uzbekistan	25,100	24,700	individual
Romania	21,800	22,400	individual
Kazakhstan	15,000	14,900	individual
Serbia and Montenegro	10,600	8,137	grouped
Czech Republic	10,300	10,300	grouped
Hungary	9,876	10,200	individual
Belarus	9,994	10,000	individual
Azerbaijan	8,199	8,049	individual
Bulgaria	7,906	8,060	individual
Tajikistan	6,376	6,159	individual
Slovak Republic	5,393	5,389	grouped
Georgia	4,514	4,720	individual

Kyrgyz Republic	5,008	4,915	individual
Turkmenistan	4,644	4,502	grouped
Croatia	4,446	4,503	grouped
Moldova	4,259	4,275	individual
Lithuania	3,477	3,500	individual
Armenia	3,065	3,082	individual
Albania	3,139	3,062	individual
Latvia	2,383	2,372	grouped
Estonia	1,363	1,370	individual
Macedonia, FYR	2,044	2,010	individual
Bosnia and Herzegovina		3,847	
High Income Countries	**764,285**	**974,612**	
United States	282,000	282,000	grouped
Germany	82,200	82,200	grouped
France	58,900	58,900	grouped
United Kingdom	58,800	59,700	grouped
Italy	57,700	56,900	grouped
Korea, Rep.	47,000	47,000	grouped
Spain	40,500	40,300	grouped
Canada	30,800	30,800	grouped
Netherlands	15,900	15,900	grouped
Greece	10,900	10,900	grouped
Belgium	10,300	10,300	grouped
Portugal	10,100	10,200	grouped
Sweden	8,875	8,869	grouped
Austria	8,011	8,012	grouped
Hong Kong, China	6,669	6,665	grouped
Israel	6,282	6,289	grouped
Denmark	5,338	5,337	grouped
Finland	5,177	5,176	grouped
Norway	4,492	4,491	grouped
Singapore	4,020	4,018	grouped
New Zealand	3,864	3,858	grouped
Ireland	3,815	3,805	grouped
Slovenia	1,986	1,989	grouped
Luxembourg	441	438	grouped
Netherlands Antilles	215	176	grouped
Japan		127,000	
Taiwan, China		22,200	
Saudi Arabia		20,700	
Australia		19,200	
Switzerland		7,184	
Puerto Rico		3,816	
United Arab Emirates		3,247	
Kuwait		2,190	
Cyprus		694	
Bahrain		672	
Qatar		606	
Macao, China		444	
Malta		390	
Brunei Darussalam		333	
Bahamas, The		301	
Iceland		281	
French Polynesia		236	

New Caledonia		213	
Guam		155	
Channel Islands		147	
Virgin Islands (U.S.)		109	
Antigua and Barbuda		76	
Isle of Man		76	
Bermuda		62	
Greenland		56	
Latin America	**500,199**	**515,069**	
Brazil	172,000	174,000	individual
Mexico	98,000	98,000	individual
Colombia	41,600	42,100	individual
Argentina	37,300	36,900	individual
Peru	26,800	26,000	individual
Venezuela, RB	24,300	24,300	individual
Chile	15,200	15,400	individual
Ecuador	12,000	12,300	individual
Guatemala	11,800	11,200	individual
Bolivia	8,514	8,317	individual
Dominican Republic	7,950	8,265	individual
Haiti	8,146	7,939	individual
Honduras	6,281	6,424	individual
El Salvador	6,409	6,280	individual
Paraguay	5,386	5,346	individual
Nicaragua	5,186	4,920	individual
Costa Rica	3,805	3,929	individual
Uruguay	3,332	3,342	individual
Panama	2,849	2,950	individual
Jamaica	2,607	2,589	individual
Guyana	733	744	individual
Cuba		11,100	
Trinidad and Tobago		1,285	
Suriname		434	
Barbados		266	
Belize		250	
St. Lucia		156	
St. Vincent and the Grenadines		116	
Grenada		101	
Dominica		71	
St. Kitts and Nevis		44	
Middle East and North Africa	**190,397**	**276,447**	
Egypt, Arab Rep.	67,300	67,300	grouped
Iran, Islamic Rep.	63,700	63,700	grouped
Morocco	27,800	27,800	individual
Yemen, Rep.	16,500	17,900	individual
Tunisia	9,565	9,564	grouped
Jordan	5,532	4,857	individual
Algeria		30,500	
Iraq		23,200	
Syrian Arab Republic		16,800	
Libya		5,306	
Lebanon		3,398	
West Bank and Gaza		2,966	
Oman		2,442	

Djibouti		715	
South Asia	**1,332,800**	**1,358,294**	
India	1,020,000	1,020,000	individual
Pakistan	142,000	138,000	individual
Bangladesh	131,000	129,000	individual
Nepal	20,800	24,400	individual
Sri Lanka	19,000	19,400	individual
Afghanistan		26,600	
Bhutan		604	
Maldives		290	
Sub-Saharan Africa	**516,737**	**663,305**	
Nigeria	137,000	118,000	individual
Ethiopia	64,300	64,300	individual
South Africa	43,900	44,000	individual
Tanzania	34,500	34,800	individual
Kenya	28,100	30,700	individual
Uganda	24,600	24,300	individual
Ghana	19,300	19,900	individual
Côte d'Ivoire	16,500	16,700	individual
Madagascar	16,000	16,200	individual
Cameroon	15,500	14,900	individual
Zimbabwe	12,600	12,600	grouped
Zambia	12,600	10,700	grouped
Niger	11,800	11,800	grouped
Mali	11,100	11,600	individual
Burkina Faso	10,800	11,300	individual
Malawi	10,300	11,500	grouped
Rwanda	8,024	8,025	grouped
Guinea	7,929	8,434	individual
Senegal	7,914	10,300	individual
Benin	6,718	7,197	individual
Burundi	6,563	6,486	individual
Sierra Leone	4,509	4,509	grouped
Mauritania	2,668	2,645	individual
Lesotho	1,743	1,788	grouped
Gambia, The	1,217	1,316	individual
Comoros	554	540	grouped
Congo, Dem. Rep.		50,100	
Sudan		32,900	
Mozambique		17,900	
Angola		13,800	
Chad		8,216	
Somalia		7,012	
Togo		5,364	
Central African Republic		3,777	
Eritrea		3,557	
Congo, Rep.		3,438	
Liberia		3,065	
Namibia		1,894	
Botswana		1,754	
Guinea-Bissau		1,366	
Gabon		1,272	
Mauritius		1,187	
Swaziland		1,045	

Cape Verde	451
Equatorial Guinea	449
São Tomé and Principe	140
Seychelles	81