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Data and Results from Agricultural Trade Protection

Erhan Artuc
Guido Porto
Bob Rijkers

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Abstract

How do trade reforms impact households in different parts of the income distribution? This paper presents a new database, the Household Impacts of Tariffs data set, which contains harmonized household survey and tariff data for 54 low- and lower-middle income countries. The data cover highly disaggregated information on household budget and income shares for 53 agricultural products, wage labor income, nonfarm enterprise sales and transfers, as well as spending on manufacturing and services. Using a stylized model of the first-order impacts of import tariffs on household real income, this paper quantifies the welfare implications of agricultural trade protection. On average, unilateral elimination of agricultural tariffs would increase household incomes by 2.50 percentage points. Import tariffs have highly heterogeneous effects across countries and within countries across households, consumers, and income earners; the average standard deviation of the gains from trade within a country is 1.01 percentage points.

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Household Impacts of Tariffs: Data and Results from Agricultural Trade Protection*

Erhan Artuc† — The World Bank, DECTI

Guido Porto‡ — Dept. of Economics, UNLP

Bob Rijkers§ — The World Bank, DECTI

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†Development Economics Research Group, Trade and Integration, The World Bank. email: eartuc@worldbank.org

‡Universidad Nacional de La Plata, Departamento de Economia, Calle 6 e/ 47 y 48, 1900 La Plata, Argentina. email: guido.porto@depeco.econo.unlp.edu.ar

§Development Economics Research Group, Trade and Integration, The World Bank. email: brijkers@worldbank.org

1 Introduction

The recent backlash against globalization and resurgence of protectionist tendencies have renewed interest in the distributional impacts of trade protection. To inform trade and social protection policy reform, identifying who gains and who loses from trade and quantifying by how much is of crucial policy interest.

Trade reform impacts households as consumers, producers, wage earners, and, possibly, taxpayers. As a consequence, how a particular household is impacted by a trade reform depends on its income and consumption portfolios. This implies that trade reforms typically have very heterogeneous effects on household well-being. These heterogeneous impacts operating at the household level are difficult to measure with readily available data.

This paper presents a new cross-country *household survey* data set, the Household Impacts of Tariffs (henceforth HIT) data set, that enables researchers to investigate how tariff changes impact the real incomes of households across the income distribution. The data set covers 54 developing countries, and was constructed by harmonizing representative household surveys with import tariff data from UNCTAD. The sample comprises all low-income countries for which relevant nationally representative household survey data—i.e., data with information on both households incomes and consumption spending is available—and a number of middle-income countries. In addition, we use the HIT database to assess trade policy and establish stylized facts about agricultural trade protection using a simple agricultural household model and a first-order effects approach as in Deaton (1989). In mostly agrarian economies, as the ones covered in our data set, agriculture is a major source of gains and losses from trade, especially for the poor.

We find substantial gains from own agricultural tariff liberalization, amounting to 2.50 percentage points of real household income per capita across our sample of 54 countries. Because of differences in consumption and income portfolios as well as in initial tariffs, there is huge heterogeneity in the gains from trade both across countries and across households within countries. For example, the average standard deviation of the gains from trade across countries is 1.01 percentage points, but it can be as high as 2.68 percentage points. Furthermore, in 29 countries, agricultural tariff liberalization would be pro-rich in the sense

that the top 20% richest households would gain proportionately more than the bottom 20%. Yet, the poor would benefit more than the rich in 25 countries.

We also demonstrate the importance of having very disaggregated data by showing that using more aggregated data yields biased estimates of the gains from trade. The mean absolute difference in average gains estimated using disaggregated data versus aggregated data is 0.75 percentage points, or 30% of the average gains from trade across countries.

Granularity and heterogeneity are among the key features of the HIT data set, which can be downloaded from **http://www.worldbank.org/en/research/brief/hit**. The website also contains an online tariff reform simulation tool. The online data appendix describes in more detail how the data were harmonized, and how the tariff data can be updated.

The remainder of the paper is organized as follows. Section 2 presents the data and harmonization procedures, as well as some descriptive statistics both on the structure of protection as well as households' income and consumption portfolios. Section 3 presents a simple framework for assessing the first-order impacts of trade reform on household welfare. Section 4 presents the results from agricultural tariff cuts. A final section concludes.

2 Harmonizing Household Survey and Trade Data

2.1 Harmonizing household surveys

Household surveys are the predominant instrument for analyzing poverty and income inequality and are thus a natural starting point for evaluating the distributional impacts of trade policy. In this paper we introduce a harmonized household-level information data set, which is designed to assess trade policy, that covers 54 low- and middle-income countries (see Table 1 for a list of all surveys included in the HIT data set).[1] These data fill an important gap in the toolbox of policy makers and researchers, because these types of household-survey-based data are not usually readily amenable to analyzing the impacts of trade-reforms and can be hard to access. The list of countries, household surveys, year of data collection and sample sizes are reported in Table 1.

[1]Household surveys are typically collected by national statistical agencies.

A challenge for those interested in assessing how different households are impacted by trade policy is that tariff data are typically classified using the Harmonized System, whereas household survey classifications have historically been somewhat ad hoc. To render them compatible and comparable across countries, we aggregate goods in the household surveys to common 4- and 2-digit categories using separate expenditure, autoconsumption and income templates. We cover spending on, income derived from, and autoconsumption of 53 4-digit agricultural and food items. These include Staple Agriculture, such as corn and rice, and Non-Staple Agriculture, such as oils, cotton and tobacco. We also categorize spending on five classes of manufacturing items. In addition, we keep track of spending on five (non-tradeable) services and on four other expenditures. The fact that we have much more granular data on agricultural products than on manufacturing services reflects the nature and structure of the household surveys we are standardizing. Note that not all categories are populated in all surveys, which reflects both survey design and local consumption patterns (e.g., pork not being consumed in the majority of predominantly Muslim countries). The expenditure template is shown in Figure 1.

On the income side, we keep track of income derived from the sales of the same 53 food items we cover on the expenditure side. In addition, whenever the survey design allows it, we also split wage income by sector, defined roughly at the 1 digit level, and keep track of non-farm household enterprise sales across 10 sectors, as well as various types of transfers. The income template is shown in Figure 2. We also keep track of production for home consumption using the autoconsumption template, which is shown in Figure 3 and contains 53 agricultural products and a select few categories for other goods.

Since many of the surveys are subject to confidentiality agreements, we aggregate the households and offer statistics for each percentile of the household per capita real income distribution. The database thus has 5,400 observations (54 countries and 100 observations per country), but is based on an underlying data set of 521,639 households which are, in turn, representative of approximately 1.8 billion people. The HIT database is best suited for country-specific analysis. In order to facilitate cross-country comparisons, we converted incomes to their constant 2010 USD equivalent by setting the survey mean of real expenditure

equal to the 2010 GDP per capita from the World Development Indicators. It should be noted that this is only an approximation to more proper international comparisons (see e.g. Deaton and Dupriez, 2011) and that the HIT database is not the World Bank Group's official poverty data, which can be found in PovcalNet.[2]

Figure 4 pools all the data and shows how the aggregate spending categories identified in our data vary with (the log of) household income per capita (in constant 2010 USD). To start, households spend a large share of their income on food and agricultural products. Across all countries, the average household in our sample spends 44.7% of its income on food items, 17.4% on manufacturing goods, and 15.1% on services. Another 16.9% of expenditure is accounted for by goods households have produced themselves, which highlights the importance of dealing with home consumption in the analysis. This also implies that the total expenditure share in agriculture is 61.6%. While there is huge heterogeneity in spending patterns both across and within countries, the graph shows that, as households get richer, the share of income spent on food decreases, especially for the richest households. Spending on manufacturing goods, services, and other goods first declines with income but then increases sharply. The opposite happens with home consumption. The implication is that the tariff burden on different households will vary as a result of these different consumption patterns.

Agriculture is the most important source of income, accounting for 38.5% of total household income on average. This total comprises a 20.9% share of production for household consumption and 17.6% of sales of agricultural products in the market. Labor income represents 29.6% of household income, on average, and non-farm enterprises account for another 12.7%. Figure 5 shows how these aggregate income shares vary by income (in constant 2010 USD), demonstrating that for the very poorest households in our sample, agricultural income and home production tend to be the most important sources of earnings. As households get richer, wage income becomes a progressively more important source of

[2]Note also that the HIT consumption aggregates may differ from those in PovcalNet because the methodology used to calculate aggregate consumption differs from that of PovcalNet. To give a few examples, the HIT consumption aggregate includes expenditures on durable goods, while PovcalNet aggregates typically aim to capture the rental value of durables. As another example, the HIT data include all health expenditures, whereas health expenditures are not uniformly treated in PovcalNet. Note also that we are scaling up average expenditure per capita to match the national accounts estimates. Specifically, we set mean expenditure per capita equal to GDP per capita in constant 2010 US dollars.

income on average. As a consequence, on the income side too, tariff incidence will vary across households.

Having disaggregated and nationally representative household-level data with information on both consumption and income portfolios is a major advantage since it enables policymakers and researchers to quantify the significant heterogeneity in the impacts of trade reforms across households. At the same time, it is worth bearing in mind some of the limitations of household surveys. For instance, they typically fail to capture households at the very top of the household income distribution. In addition, they do not adequately capture capital incomes. Moreover, they suffer from measurement error, especially in incomes, which are often underreported. To minimize the role of measurement error, we dropped households in the top and bottom 0.5% of the expenditure distribution prior to aggregating.

2.2 Harmonizing tariff data

The next step in the analysis is to convert tariffs at the HS6 level to the standardized product classifications from the household surveys. Each group i from the household surveys contains many finer product groups from the HS classification. To arrive at a product level average, we computed weighted average tariff rates τ_i for each of the groups in the survey classification.

$$(1) \quad \tau_i = \sum_{c,n \in i} \tau_{c,n} \frac{m_{c,n}}{\sum_{c,n \in i} m_{c,n}},$$

where n is an HS-category that belongs to survey-category i and $m_{(c,n)}$ are imports of good n from country c. To calculate (1), we use tariffs from the latest year for which data are available.

Tariffs vary both across countries and across products. The average tariff across countries is 14.2%. Tariffs are highest on average in Bhutan, notably 48.4% on average, and lowest in Iraq (5% on average), and tend to be lower in countries with higher levels of GDP per capita. There is also significant variation in tariffs across the different products in our data. For agriculture, the focus of our applications, Figure 6 depicts both the mean and the maximum tariff for each of the 53 food items in our data. On average, the highest tariff is 39.4%, but

this masks considerable heterogeneity across countries: Sri Lanka levies a 125% tariff on cigarettes, while in Jordan the tariff on beer is 200%.[3]

3 Tariffs and Household Welfare

To derive the welfare effects of agricultural tariffs at the household level, we adopt the standard framework of Deaton (1989). In this setting, the indirect utility of household h is:

$$V^h(\mathbf{p}, y^h) = V\left(\mathbf{p}, x_0^h + \sum_j \pi_j^h(\mathbf{p})\right), \tag{2}$$

where $\mathbf{p}$ is a vector of prices, π_j^h is the profit derived from agricultural activity j, and x_0^h comprises fixed sources of income (such as gifts, remittances, transfers, and so on). Thus, household income y^h is the sum of fixed income and agricultural income and is assumed to be equal to household expenditures.[4] This is the simplest possible setting to study the welfare effects of tariffs and we adopt it here in part as homage to Deaton's (1989) original formulation to study rice export taxes in Thailand, but mostly because an extended agricultural household model is appropriate given that we will be focusing on agricultural tariffs. Furthermore, this setting does not require strong structural assumptions. Adding more structure, the literature has extended this framework to allow for effects on wages, transfers, and non-traded consumer prices as well as non-traded family enterprise income. See Porto (2005, 2006), Nicita, Olarreaga and Porto (2014), Atkin, Faber and Gonzalez-Navarro (2018) and Artuc, Porto and Rjkers (2019).

The welfare effects can be calculated with a first-order approximation. Differentiation of (2) with respect to the price of good i, p_i yields:

$$\frac{dV_i^h}{y^h} = \frac{\partial V^h}{\partial \ln y^h}\left(\phi_i^h - s_i^h\right) d\ln p_i, \tag{3}$$

where ϕ_i^h is the income share derived from the sales of good i and s_i^h is the share of good i in

[3]Note that we ignore tariffs on alcoholic products in the Arab Republic of Egypt, as they are clear outliers given that they are 1200% or higher.

[4]This rules out saving, debt and dynamic considerations.

the consumption bundle of household h. Following Deaton (1989, 1997), we can safely ignore the private marginal utility of income $\partial V^h/\partial \ln y^h$ in policy evaluation. In addition, letting τ_i be the instrument of tariff protection for sector i and assuming perfect price pass-through elasticities,[5] so that $d \ln p_i = -\tau_i/(1+\tau_i)$, the estimable welfare effects are given by:

$$(4) \quad \frac{dV_i^h}{y^h} = -\left(\phi_i^h - s_i^h\right) \frac{\tau_i}{1+\tau_i}.$$

The interpretation of this equation is straightforward. After a price change caused by tariff cuts $d \ln p_i = -\tau_i/(1+\tau_i)$, the first-order effects on real income can be well-approximated with the corresponding income and expenditure shares. In the language of Deaton (1989), because we are working with tariff cuts and price declines, net-consumers benefit while net-producers suffer. Though this is well-known, it is important to clarify that the Deaton first-order approximation captures direct, short-term effects of tariff liberalization. In particular, it does not take into consideration second-order effects such as consumption and production adjustments (which may become progressively more important over time), labor or investment decisions, or any dynamic effect more generally.

The goal is to calculate the welfare effects generated by the *entire* structure of tariff protection. To obtain a measure, we sum the changes in welfare in (4) over all traded goods i to get:

$$(5) \quad \widehat{V}^h = \frac{dV^h}{y^h} = \sum_i \frac{dV_i^h}{y^h},$$

where $\widehat{V}^h$ is the proportional change in household real income. Next, we use this expression to assess trade policy with the HIT database.

[5]Note that we are making the assumption of perfect pass-through for convenience and ease of exposition. The data in principle accommodate richer and more realistic pass-through assumptions, see e.g. Nicita (2009), Ural-Marchand (2012), and Bergquist (2017) for pass-through estimates for selected commodities in selected countries.

4 HIT Data in Action: Agricultural Tariff Liberalization

In order to illustrate the use of the database, we explore the welfare and distributional impacts of agricultural tariffs. To do this, we use our simple framework and simulate what would happen to average incomes, and their distribution, if a country were to eliminate its own agricultural import tariffs. This amounts to setting all agricultural tariffs to zero. Note that we work with unilateral tariff cuts and thus we run independent simulations for each of the 54 countries separately.[6]

The outcome of this exercise comprises a set of results on the welfare effects for households at different levels of well-being for each country. As a first step in the analysis, these effects will be aggregated to study issues related to the gains from trade (Arkolakis, Costinot and Rodriguez-Clare, 2012; Costinot, Donaldson and Komunjer, 2012; Costinot and Rodriguez-Clare, 2014; Artuc, Lederman and Porto, 2015; Caliendo and Parro, 2015; Melitz and Redding, 2015; Arkolakis, Costinot, Donaldson and Rodriguez-Clare, 2019; Caliendo, Dvornik and Parro, 2018). The results are presented in Table 2 for all 54 countries in our database. The gains from eliminating tariffs amount to 2.50% of real household income on average across countries (column 1). This means that, from a global standpoint, developing countries would win from a unilateral agricultural tariff liberalization.[7] There are two broad mechanisms at play. On the one hand, lower food prices create consumption gains, which amount to a real income gain of 4.64 percentage points on average (column 2). On the other hand, the loss of protection implied by the tariff cuts create income losses, which amount to 2.15 percentage points on average (column 3). Consequently, the overall gains from trade are driven by lower prices and consumption gains that outweigh the income losses from tariff de-protection.

A major distinctive feature of our data is that they allow analysis of heterogeneity in the welfare effects of trade. Heterogeneity takes several forms. There is heterogeneity across

[6]Although a multilateral liberalization scenario would be feasible, this requires different modeling assumptions about the functioning of global markets.

[7]Note that we ignore impacts on global prices, which we assume to be exogenous given that the countries we are considering only account for a very small share of global trade.

countries, heterogeneity across households, heterogeneity across goods, and heterogeneity across sources of gains (namely, consumption and income effects). We illustrate these varying forms of heterogeneity by slicing the results from our simulations in different ways.

To begin, Table 2 shows that the aggregate gains are highly heterogeneous across countries. While the gains can exceed 5% of real household income, as in Zambia (6.93%), Bhutan (6.53%), Jordan (6.55%), Cameroon (6.25%), and Ecuador (5.05%), there are two countries with income losses, namely Burundi (-3.23%) and Ghana (-0.50%) and a few other countries with small gains (e.g., Cambodia, 0.17%). Figure 7 clearly illustrates the cross-country heterogeneity with a map of the relative magnitudes of the gains from trade.

We can also use these data to show an interesting result: there is a positive correlation between the aggregate gains from trade and the log of per capita GDP (Figure 8). Roughly speaking, this suggests that richer countries stand to gain more from unilateral agricultural liberalization than the poorest ones.

Second, we examine household heterogeneity and explore distributional impacts, which is one of the main advantages of the Household Impact of Tariffs database. There is a burgeoning literature on this topic, including Porto (2006) and more recent contributions from Fajgelbaum and Khandelwal (2015), Atkin, Faber and Gonzalez-Navarro (2018), Faber (2014) and Atkin and Donaldson (2015), Antras, de Gortari and Itskhoki (2018), and Galle, Rodriguez-Clare, and Yi (2017), and Artuc, Porto and Rijkers (2019).

We start by plotting the developing world distribution of the gains from trade to show how HIT data can be used to analyze global implications of trade with a specific focus on farm households.[8]

The variability in the gains from trade across countries is sizable; the average standard deviation of the income gains across the income distribution is 1.01% across countries. In Ukraine, the country with the lowest variance in the gains from trade, the standard deviation is 0.19 percentage points while in Burundi, the country with the highest variability, the standard deviation is 2.68 percentage points. It is interesting to note that the variability

[8]Artuc, Porto and Rijkers (2019) investigate the trade-off between the income gains and the inequality costs of liberalization for countries separately using raw data. Here, we show how related policy problems can be tackled at the global level using conveniently organized HIT data.

in the gains from trade across households is negatively correlated with the log of per capita GDP (Figure 9). This is because, in the HIT data, poorer countries tend to have more heterogeneous income and consumption household portfolios.[9]

Pooling all countries in our database, we plot the household-level gains from agricultural trade against the initial level of per capita household expenditure using a kernel non-parametric regression. Figure 10 shows the result of this exercise. In line with the stylized facts above, we find that the kernel slope is positive and steeps upward until the top percentiles of the developing world distribution of income and then becomes negative. Still, richer households tend to gain more from liberalization than poorer households. But it is the upper-middle class that stands to gain the most from agricultural tariff liberalization.

To quantify the extent to which the effects of trade vary for the poor vis-à-vis the rich, we calculate the pro-poor bias in agricultural trade policy. This is the difference between the average welfare effect for the poor (defined as the bottom 20% of the income distribution) and the average welfare effect for the rich (the top 20%).[10] On aggregate, agricultural tariff liberalization would be slightly pro-rich, with the richest households gaining 2.64 percent and the poor 2.20 percent (see columns 4-6 in Table 2). There are 29 of the 54 countries in which tariff liberalization would have a pro-rich bias. Using data from six countries which are also included in HIT data set, Nicita, Olarreaga and Porto (2014) show that tariff protection is pro-poor. In this study, however, we find that their results do not generalize to all developing countries. In 24 countries in the HIT data set tariff protection is pro-rich (and liberalization, pro-poor).

One simple way to assess how much we can gain by exploiting the heterogeneity in the household surveys is to compute the gains from trade using aggregate price changes and aggregate income and budget shares. To do this, we aggregate the staple agriculture income and budget shares from the 4-digit classification up to staple and non-staple agriculture. We then compute the welfare gains from the elimination of aggregate tariffs, as before. The

[9]Note that the HIT data have limited heterogeneity in expenditures on manufacturing and services. This may also play a role in our results.

[10]In the online Appendix we show that our results are very robust to using alternative cutoffs. In addition, we show that both average gains and the pro-poor bias are correlated with GDP per capita. The pro-poor bias is also larger in countries with higher levels of poverty.

results are in Table 3. There is indeed a bias when calculating the welfare effects with aggregated data. The size and direction of the aggregation bias calculated by comparing measures derived from aggregated data (presented in Table 3) instead of disaggregated data (presented in Table 2), are summarized in Table 4. At the developing world level, for instance, the welfare gains would be 2.39%, instead of the 2.50% obtained when we use disaggregated data; using aggregate data thus leads to an underestimation of the average gains across countries by approximately 4 percentage points.

For individual countries the biases are much larger and can be positive (in 25 countries) or negative (29 countries). The average absolute difference between average gains estimated using aggregated vs disaggregated data is 0.75 percentage points, or approximately 30 percent of the average gains from trade across countries. In the Central African Republic, Pakistan, Indonesia, or the Republic of Yemen, the welfare gains using aggregate data are roughly half of the estimates using disaggregated data. More extreme differences appear when we inspect countries with positive biases. In Cambodia and Ethiopia, the welfare gains are overestimated by a factor of 9 or 4, respectively. There are many instances where the estimates are biased by a factor of close to or above 2 (Burkina Faso, Cambodia, Ethiopia, Guinea-Bissau, Madagascar, Niger).

Using more aggregated data also gives different estimates of the distributional impacts of the gains from trade. Using the aggregated data trade policy is estimated to be pro-rich in 29 of the 54 countries, whereas it is estimated to be pro-rich in 23 of the 54 countries when using disaggregated data. More aggregated data tend to underestimate the gains accruing to rich households slightly more than they underestimate the gains accruing to poor households.

We now turn to examining product heterogeneity in the welfare effects. This is the heterogeneity that arises when we decompose the gains from trade into the consumption and income effects and, fundamentally, into disaggregated effects across goods. Since our templates build up from granular 4-digit categories of goods, we can exploit this feature of the data to showcase this heterogeneity. To do this, we select one country, Vietnam, and report the aggregate effects, the consumption effects and the income effects of each one of the 53 4-digit goods in the template (see Figures 1 and 2). Results are in Table 5.

The aggregate gains from trade in Vietnam are 1.99 percent. These gains are mostly explained by gains from lower tariffs on Other Processed Food (0.92 percent), Bananas (0.88 percent) and Cigarettes (0.61 percent). These are mostly consumption gains (with minor or even absent income gains). Fish contributes 0.37 percentage points to the aggregate gains, with a consumption gain of 0.50 percent and a lower income loss of 0.13 percent. The case of Rice is interesting because lower tariffs (and lower prices) create large income losses of –1.57 percent. Other important products are Corn (with income losses of –0.13 percent), Alcohol (with consumption gains of 0.17 percent), Pork (0.28 percent) and Tea (0.13 percent).

The pro-poor index in Vietnam is –1.70. This anti-poor bias of agricultural liberalization is due to the fact that the gains for the rich (2.74 percent) are higher than the gains for the poor (1.04 percent). Tariff liberalization in products such as Bananas and Cigarettes yields the largest pro-poor biases, but the tariff cuts in Corn, Other Processed Food and Rice are distinctly anti-poor. Note in particular the role of the rice income effect: because of lower prices and because the poor are major producers and sellers of rice, the net rice income loss for the poor is –2.35 percent, much higher than the net rice income loss for the rich (of only –0.58 percent).

To end, we report in Table 6 the results from scenarios where tariffs are eliminated only in cereals (namely, corn, wheat, rice and other cereals—sorghum, barley—in the templates). This scenario is interesting because it combines a simulation for a set of related goods that accounts for more than 50% of global calorie intake,[11] across all countries.[12] Tariff liberalization in cereals would bring aggregate developing world gains of 0.42 percent, but there is a lot of variation in the gains from trade not only among the winners but also among the losers. For example, the gains from cereals liberalization can be as high as 1.92 percent in Guinea Bissau or 1.83 percent in Bhutan to as low as being almost negligible in Armenia, Georgia, and South Africa. There are also countries that would incur large losses, such as Vietnam and the Central African Republic (–1.70 and –0.99 percent, respectively), as well as countries in which losses are almost negligible (e.g., Ghana, the Arab Republic of Egypt,

[11] See World Health Organization (2003).

[12] Note that we are running country-by-country unilateral tariff reductions rather than multilateral liberalization scenarios. In particular, we ignore spillovers of tariff reductions in one country on another country, because the low-income countries in our sample only account for a small share of world trade.

Malawi). This heterogeneity reflects the fact that some countries are more agrarian than others and that some are large net-consumers, others are large net-producers, and yet others either consume and produce little cereals or do so in similar magnitudes so that the net effects tend to cancel out. A similar story can be told about the pro-poor bias of liberalization. There are countries where cereals liberalization would be clearly pro-poor (Tanzania, Bhutan, Guinea Bissau, Ecuador) and countries where it would be clearly pro-rich (Vietnam). There are also cases where the liberalization would be neutral and this can in turn be because of little direct consumption and production of grains (Armenia, Georgia) or because of the offsetting consumption and income effects (Madagascar, Nigeria).

As this analysis illustrates, the HIT data and our framework enable researchers to examine and exploit the extensive household heterogeneity in incomes and expenditures in many dimensions. There are some limitations to the framework that are important to note for accurate interpretation of our results. To make it operational, we need to impose some structure, in particular perfect competition, constant returns to scale, and product homogeneity. Since we work with household surveys and with an agricultural household model à la Deaton, there are some limitations in the scope of the analysis as well. The household surveys do not collect reliable information on the returns to capital and on profits and often fail to capture very rich households. Also, there are marked differences between consumption and production aggregates from the household surveys and those from the national accounts. As a result, there might be some discrepancies between the household welfare effects from the HIT data and the aggregate welfare effects stemming from more general trade models. In addition, some relevant impacts, such as heterogeneous varieties, two-way trade or labor and investment effects, may require additional modeling assumptions as well as additional data (such as demand and supply elasticities and so on). In any case, most of the discussion about poverty, inequality and household welfare is typically based on household surveys and these surveys and the HIT data set are thus a natural starting point for analyzing the distributional impacts of trade policy.

5 Conclusion

Quantifying who benefits and who loses from trade reform and by how much is of crucial policy interest, but often challenging because of a lack of suitable data. The Household Impacts of Tariffs (HIT) data introduced in this paper are a publicly available household survey based data set covering 54 developing countries that enables researchers to analyze the distributional impacts of tariffs. It contains granular data for each percentile of the income distribution on both the income derived from and consumption of 53 agricultural products. In addition, it keeps track of spending on five different types of manufacturing goods and services, as well as transfers, and wage income disaggregated by 1-digit sector, 10 different types of non-farm household enterprise sales and various types of transfers.

Using a stylized agricultural model and a first-order effects approach we have illustrated potential applications of the data and shown that the prevailing structure of agricultural tariffs represses household incomes by 2.50% percentage points across countries. However, the costs of protectionism vary enormously across countries and across households within countries, because households in different parts of the income distribution tend to have very different income and consumption portfolios; the average standard deviation of the gains from trade within a country is 1.01 percentage points. We also show that using disaggregated data is important, because using more aggregated data yields biased estimates of the average gains from trade.

While we have focused on the elimination of agricultural tariffs, the HIT data set has a much wider set of potential applications and can accommodate richer and more sophisticated modeling assumptions. Examples of potential applications include assessing how EU and U.S. agricultural tariffs or regional trade-agreements, such as AGOA, impact households in low-income countries.[13] An analysis of poverty and inequality impacts of food price shocks is also possible. Moreover, the data can be used to study issues that are not related to trade reform, such as food subsidies or value-added tax reforms.

[13]In the online Appendix we analyze the impact of non-tariff barriers.

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Figure 1
Expenditure Template

Expenditure								
1. Agriculture/Food								
11. Staple Food								
111. Cerals	112. Legumens	113. Fruits	114. Vegetables	115. Oils/Fats	116. Fish	117. Meat/Livestock	118. Dairy/Eggs	119. Other staple food
1111. Corn 1112. Wheat 1113. Rice 1114. Other Cereals	1121. Beans 1122. Other	1131. Banana 1132. Grapes 1133. Citrus 1134. Apples 1135. Other Fruits	1141. Tomato 1142. Potato 1143. Greens 1144. Other Vegetables	1151. Vegetable Oils 1152. Animal Fats 1153. Other oils/fats	1161. Fish 1162. Shrimp 1163. Other Crustacean	1171. Pork (Pig) 1172. Beef (Cattle) 1173. Poultry (Chicken) 1174. Other meat/animals	1181. Milk 1182. Eggs 1183. Cheese 1184. Other Dairy	1191. Other staple food 1192. Other processed food
12. Non Staple								
121. Alcohol	122. Tobacco	123. Oil seeds	124. Spices/herbs		125. Coffee/tea/cocoa	126. Nuts	127. Cotton	128. Other non-staple food
1211. Wine 1212. Beer 1213. Other alcohol	1221. Cigarettes 1222. Other tobacco	1231. Soya 1232. Other oil seeds	1241. Cloves 1242. Pepper 1243. Vanilla 1244. Saffron 1245. Qat (chat) 1246. Other spices		1251. Coffee 1252. Tea 1253. Cocoa	1261. Cashew 1262. Coconut 1263. Other nuts	127. Cotton	1281. Sugar (any kind) 1282. Other non-staple
2. Manufacturing/Household Items								
21. Energy 22. Textiles/Apparel 23. Electric/Electronics 24. Household items/Furniture 25. Other physical goods								
3. Services								
31. Transportation 32. Health 33. Education 34. Communication 35. Other Services								
4. Other Expenditures								
41. Remittances/transfers given 42. Investment of any sort 43. Festivities 44. Other Disbursement								

Notes: Template use to harmonized household expenditures. Own elaboration.

Figure 2
Income Template

Income								
1. Agriculture/Food								
11. Staple Food								
111. Cerals	112. Legumens	113. Fruits	114. Vegetables	115. Oils/Fats	116. Fish	117. Meat/Livestock	118. Dairy/Eggs	119. Other staple food
1111. Corn 1112. Wheat 1113. Rice 1114. Other Cereals	1121. Beans 1122. Other	1131. Banana 1132. Grapes 1133. Citrus 1134. Apples 1135. Other Fruits	1141. Tomato 1142. Potato 1143. Greens 1144. Other Vegetables	1151. Vegetable Oils 1152. Animal Fats 1153. Other oils/fats	1161. Fish 1162. Shrimp 1163. Other Crustacean	1171. Pork (Pig) 1172. Beef (Cattle) 1173. Poultry (Chicken) 1174. Other meat/animals	1181. Milk 1182. Eggs 1183. Cheese 1184. Other Dairy	1191. Other staple food 1192. Other processed food
12. Non Staple								
121. Alcohol	122. Tobacco	123. Oil seeds	124. Spices/herbs		125. Coffee/tea/cocoa	126. Nuts	127. Cotton	128. Other non-staple food
1211. Wine 1212. Beer 1213. Other alcohol	1221. Cigarettes 1222. Other tobacco	1231. Soya 1232. Other oil seeds	1241. Cloves 1242. Pepper 1243. Vanilla 1244. Saffron 1245. Qat (chat) 1246. Other spices		1251. Coffee 1252. Tea 1253. Cocoa	1261. Cashew 1262. Coconut 1263. Other nuts	127. Cotton	1281. Sugar (any kind) 1282. Other non-staple
2. Wages								
20. Agriculture, forestry, and fishing 21. Mining, oil, and gas extraction 22. Manufacturing 23. Construction 24. Transportation, communications, electric, gas, and sanitary services 25. Wholesale and retail trade 26. Finance, insurance, and real estate 27. Entertainment Services (Restaurant, entertainment, hotels, etc.) 28. Professional Services (Education, health, other professional occupations) 29. Public Administration								
3. Sales of Goods/Services								
31. Mining, oil, and gas extraction 32. Manufacturing 33. Construction 34. Transportation, communications, electric, gas, and sanitary services 35. Wholesale and retail trade 36. Finance, insurance, and real estate 37. Entertainment Services (Restaurant, entertainment, hotels, etc.) 38. Professional Services (Education, health, other professional occupations) 39. Public Administration								
4. Transfers								
41. Remittances/transfers received (friend, relative) 42. Profits of investment (rent, interests) 43. Government transfers 44. Non-governmental transfers 45. Other								

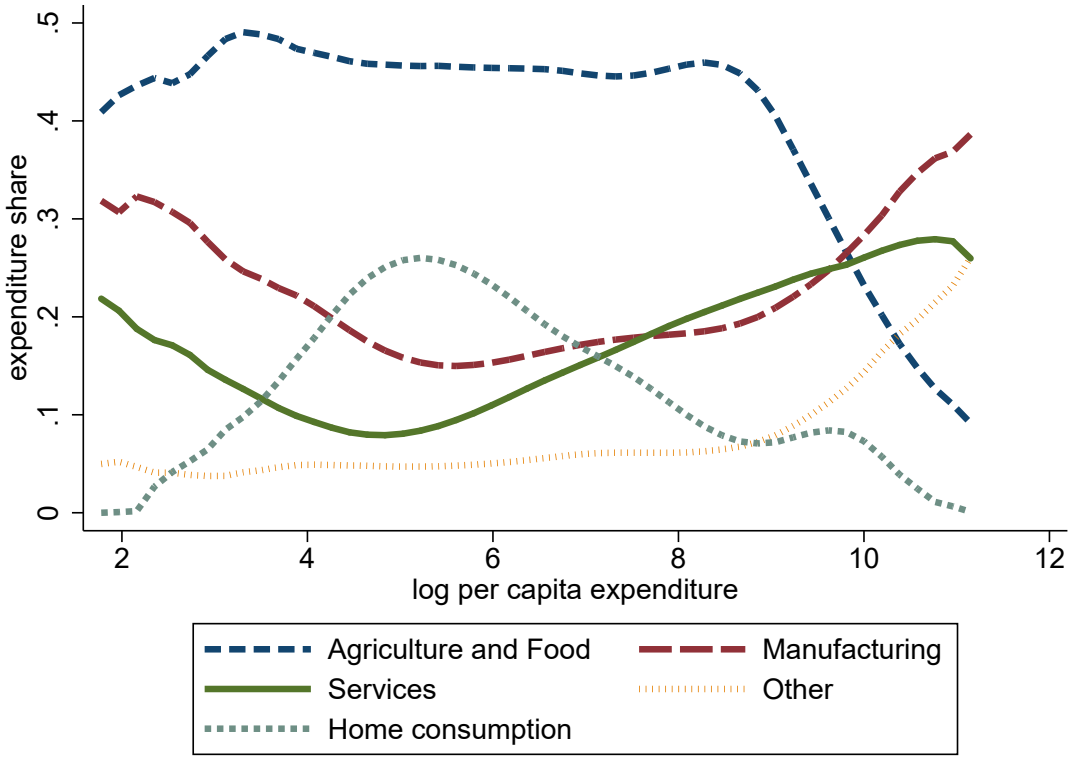
Notes: Template use to harmonized household incomes. Own elaboration.

Figure 3
Auto-Consumption Template

Autoconsumption								
1. Agriculture/Food								
11. Staple Food								
111. Cereals	112. Legumens	113. Fruits	114. Vegetables	115. Oils/Fats	116. Fish	117. Meat/Livestock	118. Dairy/Eggs	119. Other staple food
1111. Corn 1112. Wheat 1113. Rice 1114. Other Cereals	1121. Beans 1122. Other	1131. Banana 1132. Grapes 1133. Citrus 1134. Apples 1135. Other Fruits	1141. Tomato 1142. Potato 1143. Greens 1144. Other Vegetables	1151. Vegetable Oils 1152. Animal Fats 1153. Other oils/fats	1161. Fish 1162. Shrimp 1163. Other Crustacean	1171. Pork (Pig) 1172. Beef (Cattle) 1173. Poultry (Chicken) 1174. Other meat/animals	1181. Milk 1182. Eggs 1183. Cheese 1184. Other Dairy	1191. Other staple food 1192. Other processed food
12. Non Staple								
121. Alcohol	122. Tobacco	123. Oil seeds	124. Spices/herbs		125. Coffee/tea/cocoa	126. Nuts	127. Cotton	128. Other non-staple food
1211. Wine 1212. Beer 1213. Other alcohol	1221. Cigarettes 1222. Other tobacco	1231. Soya 1232. Other oil seeds	1241. Cloves 1242. Pepper 1243. Vanilla 1244. Saffron 1245. Qat (chat) 1246. Other spices		1251. Coffee 1252. Tea 1253. Cocoa	1261. Cashew 1262. Coconut 1263. Other nuts	127. Cotton	1281. Sugar (any kind) 1282. Other non-staple
2. Other goods								
21. Energy (wood, coal) 22. Gathering (forest, mushrooms, berries, etc.) 23. Other goods collected for free 24. Other goods produced and consumed within the household								

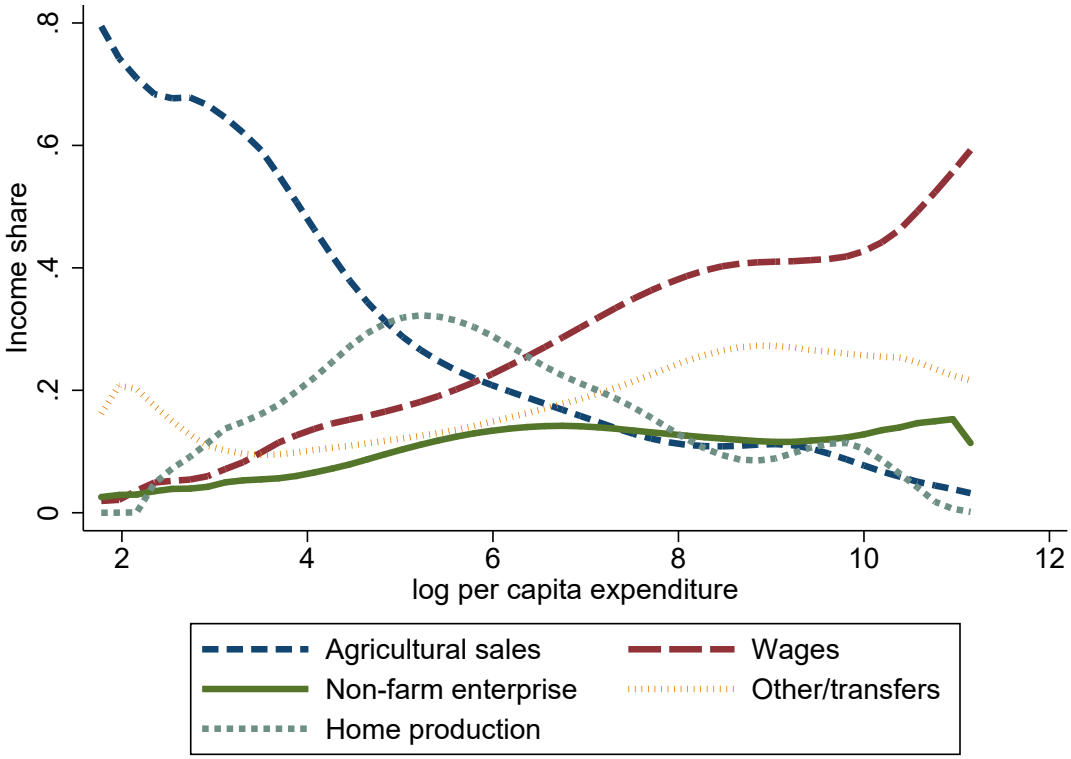
Notes: Template use to harmonized household home production. Own elaboration.

Figure 4
Expenditure Shares Across the Income Distribution



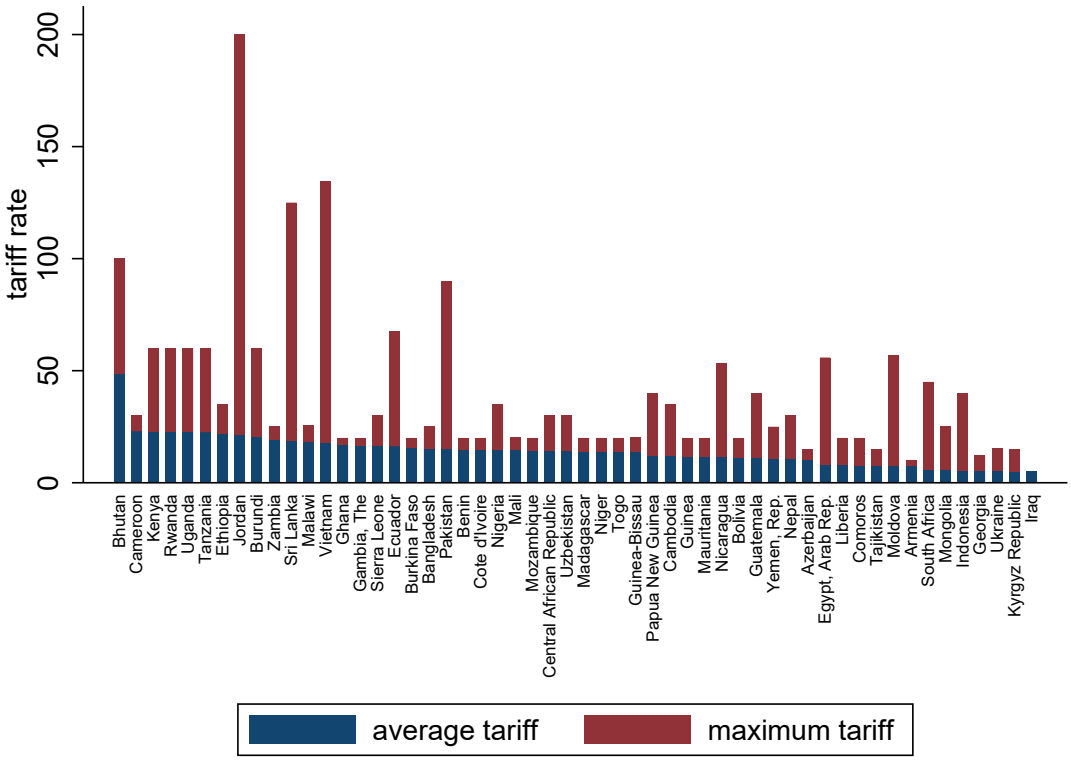
Notes: non-parametric kernel regressions of budget shares on the log of per capita household expenditure across the 54 countries included in the HIT database.

Figure 5
Income Shares Across the Income Distribution



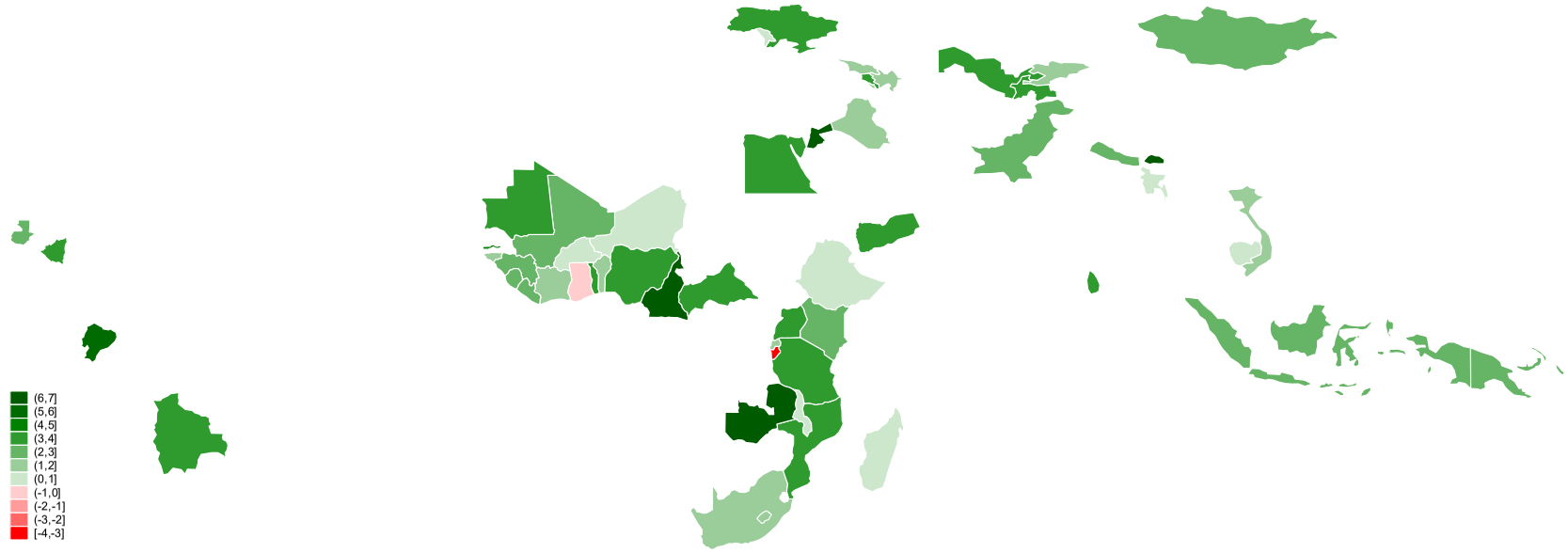
Notes: non-parametric kernel regressions of income shares on the log of per capita household expenditure across the 54 countries included in the HIT database.

Figure 6
Tariff Dispersion in Agriculture



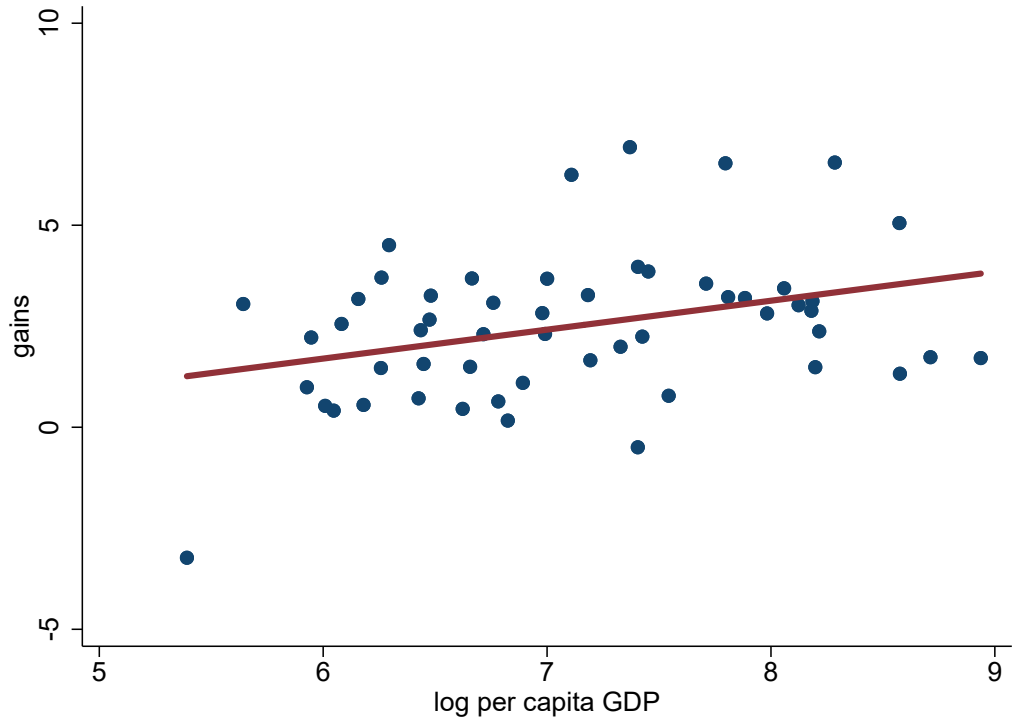
Notes: Average tariffs and tariff dispersion in Agriculture.

Figure 7
The Developing World Distribution of the Gains from Trade



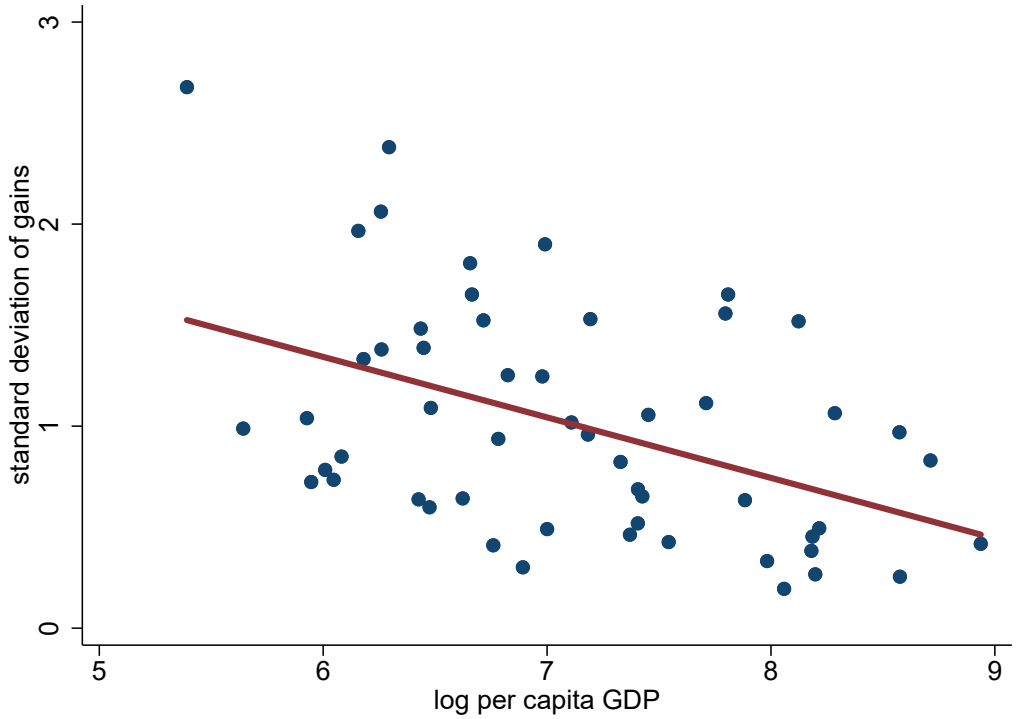
Notes: The developing world distribution of the aggregate gains from the elimination of own agricultural import tariffs.

Figure 8
The Gains from Trade and per capita GDP



Notes: scatter plot and linear fit of the aggregate gains from agricultural liberalization and the log of per capita GDP.

Figure 9
Variability in the Gains from Trade and per capita GDP



Notes: scatter plot and linear fit of the standard deviation in the gains from agricultural liberalization and the log of per capita GDP.

Figure 10
The Gains from Trade and Household Income

Notes: non-parametric kernel regression of the household-level gains from trade and the log of per capita household expenditure.

Table 1
Household Surveys

Country	Year	Obs	Survey
Benin	2003	5296	Questionnaire Unifié sur les Indicateurs de Base du Bien-Être
Burkina Faso	2003	8413	Enquête sur les Conditions de Vie des Ménages
Burundi	1998	6585	Enquête Prioritaire, Etude Nationale sur les Conditions de Vie des Populations
Cameroon	2001-2002	10881	Deuxième Enquête Camerounaise Auprès des Ménages
Central African Republic	2008	6828	Enquête Centrafricaine pour le Suivi-Evaluation du Bien-être
Comoros	2004	2929	Enquête Intégrale auprès des Ménages
Côte d'Ivoire	2008	12471	Enquête sur le Niveau de Vie des Ménages
Egypt, Arab Republic	2008-2009	23193	Household Income, Expenditure and Consumption Survey
Ethiopia	1999-2000	16505	Household Income, Consumption and Expenditure Survey
Gambia, The	1998	1952	Household Poverty Survey
Ghana	2005-2006	8599	Living Standards Survey V
Guinea	2012	7423	Enquête Légère pour l'Evaluation de la Pauvreté
Guinea Bissau	2010	3141	Inquerito Ligeiro para a Avalicão da Pobreza
Kenya	2005	13026	Integrated Household Budget Survey
Liberia	2014-2015	4063	Household Income and Expenditure Survey
Madagascar	2005	11661	Permanent Survey of Households
Malawi	2004-2005	11167	Second Integrated Household Survey
Mali	2006	4449	Enquête Légère Intégrée auprès des Ménages
Mauritania	2004	9272	Enquête Permanente sur les Conditions de Vie des Ménages
Mozambique	2008-2009	10696	Inquérito sobre Orçamento Familiar
Niger	2005	6621	Enquête Nationale sur les Conditions de Vie des Ménages
Nigeria	2003-2004	18603	Living Standards Survey
Rwanda	1998	6355	Integrated Household Living Conditions Survey
Sierra Leone	2011	6692	Integrated Household Survey
South Africa	2000	25491	General Household Survey
Tanzania	2008	3232	Household Budget Survey
Togo	2011	5464	Questionnaire des Indicateurs de Base du Bien-être
Uganda	2005-2006	7350	National Household Survey
Zambia	2004	7563	Living Conditions Monitoring Survey IV

Notes: List of household surveys included in the HIT databse.

Table 1 (cont.)
Household Surveys

Country	Year	Obs	Survey
Armenia	2014	5124	Integrated Living Conditions Survey
Bangladesh	2010	12117	Household Income and Expenditure Survey
Bhutan	2012	8879	Living Standards Survey
Cambodia	2013	3801	Socio-Economic Survey
Indonesia	2007	12876	Indonesian Family Life Survey
Iraq	2012	24895	Household Socio-Economic Survey
Jordan	2010	11110	Household Expenditure and Income Survey
Kyrgyz Republic	2012	4962	Intergrated Sample Household Budget and Labor Survey
Mongolia	2011	11089	Household Socio-Economic Survey
Nepal	2010-2011	5929	Living Standards Survey
Pakistan	2010-2011	16178	Social and Living Standards Measurement Survey
Papua New Guinea	2009	3776	Household Income and Expenditure Survey
Sri Lanka	2012-2013	20335	Household Income and Expenditure Survey
Tajikistan	2009	1488	Tajikistan Panel Survey
Uzbekistan	2003	9419	Household Budget Survey
Vietnam	2012	9306	Household Living Standard Survey
Yemen, Republic of	2005-2006	12998	Household Budget Survey
Azerbaijan	2005	4797	Household Budget Survey
Georgia	2014	10959	Household Integrated Survey
Moldova	2014	4836	Household Budget Survey
Ukraine	2012	10394	Sampling Survey of the Conditions of Life of Ukraine's Households
Bolivia	2008	3900	Encuesta de Hogares
Ecuador	2013-2014	28680	Encuesta de Condiciones de Vida
Guatemala	2014	11420	Encuesta Nacional de Condiciones de Vida
Nicaragua	2009	6450	Nicaragua - Encuesta Nacional de Hogares sobre Medición de Niveles de Vida

Notes: List of Household Surveys in the HIT database.

Table 2
The Gains From Agricultural Tariff Liberalization

Country	Aggregate Gains	St.Dev. Gains	Consumption Effects	Income Effects	Pro-Poor Bias	Gains Poor	Gains Rich
Developing world	2.50	1.01	4.64	-2.15	-0.44	2.20	2.64
Armenia	3.12	0.45	3.70	-0.58	-0.87	2.79	3.66
Azerbaijan	1.73	0.83	4.37	-2.64	1.64	2.59	0.95
Bangladesh	0.64	0.94	4.87	-4.23	-2.15	-0.37	1.78
Benin	1.50	1.81	4.25	-2.75	-4.75	-0.78	3.97
Bhutan	6.53	1.56	10.61	-4.08	1.80	6.51	4.71
Bolivia	3.56	1.11	5.01	-1.45	-0.00	2.70	2.70
Burkina Faso	0.72	0.64	3.79	-3.08	-0.09	0.73	0.83
Burundi	-3.23	2.68	7.82	-11.05	-4.80	-4.59	0.21
Cambodia	0.17	1.25	4.95	-4.79	0.11	0.47	0.36
Cameroon	6.25	1.02	9.60	-3.35	-1.38	5.42	6.80
Central African Republic	3.05	0.99	7.29	-4.24	1.45	3.57	2.13
Comoros	0.46	0.64	1.59	-1.13	-1.41	-0.35	1.06
Côte d'Ivoire	1.66	1.53	4.62	-2.97	-3.75	-0.76	2.99
Ecuador	5.05	0.97	6.98	-1.93	2.35	5.90	3.56
Egypt, Arab Rep.	3.20	0.63	4.95	-1.75	-1.31	2.43	3.74
Ethiopia	0.41	0.73	3.68	-3.26	-0.20	0.63	0.83
Gambia, The	4.51	2.38	6.08	-1.57	-5.72	1.07	6.79
Georgia	1.49	0.27	2.16	-0.68	-0.27	1.25	1.53
Ghana	-0.50	0.52	1.19	-1.69	-0.84	-1.02	-0.19
Guatemala	2.82	0.33	3.78	-0.96	-0.19	2.57	2.76
Guinea	2.56	0.85	4.93	-2.38	-1.63	1.82	3.45
Guinea-Bissau	1.47	2.06	5.89	-4.42	-4.62	-1.69	2.93
Indonesia	2.88	0.38	3.13	-0.25	0.63	3.05	2.42
Iraq	1.33	0.25	1.79	-0.46	0.57	1.48	0.91
Jordan	6.55	1.06	6.87	-0.32	2.64	7.58	4.94
Kenya	2.83	1.25	7.64	-4.82	-2.24	1.61	3.85
Kyrgyz Republic	1.10	0.30	1.82	-0.72	-0.21	1.01	1.22

Notes: Authors' calculations based on HIT data.
The table presents the gains associated with the elimination of country's own agricultural import tariffs.

Table 2 (cont.)
The Gains From Agricultural Tariff Liberalization

Country	Aggregate Gains	St.Dev. Gains	Consumption Effects	Income Effects	Pro-Poor Bias	Gains Poor	Gains Rich
Developing world	2.50	1.01	4.64	-2.15	-0.44	2.20	2.64
Liberia	2.22	0.72	3.22	-1.00	-1.41	1.28	2.69
Madagascar	0.53	0.78	3.08	-2.55	-1.80	-0.24	1.55
Malawi	0.55	1.33	3.36	-2.81	-3.40	-0.72	2.67
Mali	2.30	1.52	3.59	-1.29	3.65	4.25	0.60
Mauritania	3.27	0.96	4.94	-1.67	1.99	4.13	2.14
Moldova	0.78	0.43	1.44	-0.66	0.50	1.18	0.68
Mongolia	2.37	0.49	2.93	-0.55	1.25	2.87	1.63
Mozambique	3.18	1.97	4.98	-1.81	-4.93	0.91	5.84
Nepal	2.66	0.60	3.19	-0.52	1.52	3.37	1.85
Nicaragua	3.85	1.06	5.42	-1.57	1.80	4.60	2.80
Niger	0.99	1.04	4.06	-3.07	-2.41	-0.16	2.25
Nigeria	3.22	1.65	5.93	-2.71	-2.80	0.89	3.69
Pakistan	2.31	1.90	3.58	-1.27	4.92	4.45	-0.47
Papua New Guinea	2.24	0.65	4.90	-2.65	0.46	2.36	1.90
Rwanda	1.57	1.39	4.33	-2.76	2.89	3.40	0.51
Sierra Leone	2.40	1.48	5.40	-3.00	-3.36	0.98	4.34
South Africa	1.71	0.42	1.75	-0.04	0.60	1.66	1.06
Sri Lanka	3.02	1.52	4.74	-1.72	4.21	4.97	0.75
Tajikistan	3.08	0.41	3.24	-0.16	-0.38	2.93	3.31
Tanzania	3.68	1.65	5.94	-2.26	3.04	5.26	2.22
Togo	3.70	1.38	5.39	-1.69	-3.21	1.62	4.83
Uganda	3.26	1.09	5.44	-2.18	0.72	4.39	3.67
Ukraine	3.44	0.19	3.64	-0.20	-0.42	3.17	3.59
Uzbekistan	3.97	0.69	4.68	-0.71	-1.71	3.25	4.96
Vietnam	1.99	0.82	5.52	-3.53	-1.70	1.04	2.74
Yemen, Rep.	3.68	0.49	4.64	-0.96	0.67	3.84	3.17
Zambia	6.93	0.46	8.07	-1.14	0.75	7.35	6.60

Notes: Authors' calculations based on HIT data.
The table presents the gains associated with the elimination of country's own agricultural import tariffs.

Table 3
The Gains From Agricultural Tariff Liberalization
Aggregated Data

Country	Aggregate Gains	St.Dev. Gains	Consumption Effects	Income Effects	Pro-Poor Bias	Gains Poor	Gains Rich
Developing world	2.39	0.85	4.33	-1.94	-0.33	2.16	2.48
Armenia	3.52	0.32	4.12	-0.60	0.07	3.70	3.62
Azerbaijan	1.32	0.56	2.96	-1.64	1.25	2.02	0.77
Bangladesh	1.17	0.27	3.55	-2.38	0.20	1.29	1.09
Benin	1.28	1.87	4.29	-3.01	-4.86	-1.13	3.72
Bhutan	6.47	1.57	10.45	-3.98	1.77	6.38	4.62
Bolivia	3.73	1.17	5.21	-1.48	0.03	2.84	2.82
Burkina Faso	1.70	0.57	4.43	-2.73	0.27	1.94	1.67
Burundi	-3.12	2.98	9.70	-12.82	-5.70	-5.20	0.50
Cambodia	1.53	0.82	4.33	-2.81	0.40	1.81	1.41
Cameroon	4.65	0.69	6.73	-2.08	-1.08	4.05	5.13
Central African Republic	1.34	0.99	9.28	-7.94	-1.31	0.75	2.05
Comoros	0.89	0.40	1.70	-0.81	-0.59	0.56	1.15
Côte d'Ivoire	1.72	0.99	3.70	-1.97	-2.31	0.16	2.46
Ecuador	4.35	0.81	5.84	-1.49	1.89	4.96	3.07
Egypt, Arab Rep.	2.11	0.69	4.09	-1.98	-1.61	1.22	2.83
Ethiopia	1.78	0.38	3.16	-1.38	0.10	2.02	1.92
Gambia, The	3.18	1.24	4.16	-0.98	-2.76	1.25	4.01
Georgia	1.86	0.23	2.39	-0.53	0.15	1.78	1.64
Ghana	-0.56	0.47	1.23	-1.79	-0.77	-0.95	-0.18
Guatemala	3.15	0.32	4.02	-0.87	0.15	3.04	2.89
Guinea	3.15	0.84	5.90	-2.75	-1.57	2.46	4.03
Guinea-Bissau	3.10	1.62	6.88	-3.78	-3.09	0.71	3.79
Indonesia	1.57	0.24	1.87	-0.30	0.48	1.77	1.28
Iraq	1.33	0.25	1.79	-0.46	0.57	1.48	0.91
Jordan	4.49	0.56	4.95	-0.46	1.38	5.07	3.69
Kenya	2.54	1.11	6.63	-4.09	-2.18	1.39	3.57
Kyrgyz Republic	1.97	0.32	2.77	-0.79	0.18	2.02	1.84

Notes: Authors' calculations based on HIT data.
The table presents the gains associated with the elimination of country's own agricultural import tariffs.

Table 3 (cont.)
The Gains From Agricultural Tariff Liberalization
Aggregated Data

Country	Aggregate Gains	St.Dev. Gains	Consumption Effects	Income Effects	Pro-Poor Bias	Gains Poor	Gains Rich
Developing world	2.39	0.85	4.33	-1.94	-0.33	2.16	2.48
Liberia	2.39	0.52	3.18	-0.79	-0.87	1.81	2.67
Madagascar	1.13	0.52	3.49	-2.36	-1.03	0.67	1.70
Malawi	0.74	0.88	2.98	-2.25	-2.16	-0.05	2.10
Mali	2.29	1.50	3.62	-1.33	3.58	4.18	0.60
Mauritania	3.84	1.00	5.14	-1.29	2.30	4.79	2.49
Moldova	0.78	0.35	1.40	-0.62	0.44	1.15	0.70
Mongolia	2.42	0.47	2.94	-0.53	1.20	2.90	1.69
Mozambique	2.32	1.88	4.32	-2.01	-4.76	0.30	5.05
Nepal	2.29	0.58	2.76	-0.47	1.51	2.99	1.48
Nicaragua	3.41	0.77	4.84	-1.43	1.04	3.85	2.81
Niger	2.75	1.06	5.17	-2.42	-2.48	1.45	3.93
Nigeria	2.39	1.79	5.25	-2.85	-3.60	-0.33	3.27
Pakistan	1.07	0.93	1.57	-0.50	2.43	2.13	-0.30
Papua New Guinea	1.63	0.45	2.99	-1.36	-0.35	1.42	1.76
Rwanda	2.24	1.63	5.19	-2.95	3.60	4.39	0.79
Sierra Leone	3.34	1.01	6.09	-2.75	-1.98	2.52	4.50
South Africa	2.52	0.99	2.57	-0.04	2.67	3.65	0.98
Sri Lanka	1.99	1.26	3.77	-1.78	3.50	3.75	0.25
Tajikistan	2.73	0.38	2.89	-0.15	-0.21	2.66	2.88
Tanzania	2.68	1.11	4.66	-1.99	1.56	3.26	1.70
Togo	3.35	1.25	5.28	-1.93	-2.91	1.44	4.35
Uganda	2.54	0.83	4.21	-1.67	0.43	3.36	2.93
Ukraine	2.49	0.14	2.62	-0.13	-0.31	2.30	2.60
Uzbekistan	4.23	0.60	5.22	-0.99	-1.37	3.67	5.04
Vietnam	1.80	0.75	4.13	-2.33	-1.76	0.82	2.58
Yemen, Rep.	2.10	0.28	3.07	-0.97	0.14	2.14	2.00
Zambia	7.44	0.46	8.61	-1.17	0.72	7.84	7.12

Notes: Authors' calculations based on HIT data.
The table presents the gains associated with the elimination of country's own agricultural import tariffs.

Table 4
Bias arising from using aggregated instead of disaggregated data

	Aggregate Gains	St.Dev. Gains	Consumption Effects	Income Effects	Pro-Poor Bias	Gains Poor	Gains Rich
Average bias	-0.10	-0.16	-0.31	0.20	0.11	-0.04	-0.16
Countries with positive bias	25	11	23	32	29	26	24
Countries with negative bias	29	43	31	22	25	28	30
Minimum bias	-2.06	-1.14	-2.87	-3.71	-2.75	-2.83	-2.78
Maximum bias	1.76	0.57	2.00	1.98	2.96	2.40	1.67
Average absolute bias	0.75	0.22	0.84	0.53	0.65	0.94	0.55

Notes: Authors' calculations based on HIT data.
The table presents the bias associated with using aggregated instead of disaggregated data, by comparing results from Tables 2 and 3.

Table 5
The Gains From Agricultural Tariff Liberalization
Across Commodities
Vietnam

Product	Aggregate Gains	St.Dev. Gains	Consumption Effects	Income Effects	Pro-Poor Bias	Gains Poor	Gains Rich
Aggregate	1.99	0.82	5.52	-3.53	-1.70	1.04	2.74
Animal fats	0.17	0.07	0.17	0.00	0.20	0.28	0.08
Apples	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Banana	0.88	0.23	0.92	-0.04	0.59	1.16	0.57
Beans	0.01	0.01	0.01	-0.00	0.00	0.01	0.00
Beef	0.02	0.07	0.09	-0.06	-0.15	-0.06	0.10
Beer	0.12	0.05	0.12	0.00	-0.10	0.05	0.16
Cashew	-0.02	0.03	0.00	-0.02	0.01	-0.01	-0.02
Cheese	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cigarettes	0.61	0.17	0.61	0.00	0.31	0.70	0.39
Citrus	0.00	0.06	0.04	-0.04	-0.04	-0.01	0.02
Cloves	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cocoa	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coconut	-0.01	0.01	0.00	-0.01	0.00	-0.01	-0.01
Coffee	-0.15	0.12	0.03	-0.18	0.01	-0.13	-0.14
Corn	-0.13	0.15	0.01	-0.14	-0.35	-0.36	-0.01
Cotton	-0.00	0.00	0.00	-0.00	-0.00	-0.00	-0.00
Eggs	0.04	0.06	0.09	-0.05	0.04	0.06	0.02
Fish	0.37	0.12	0.50	-0.13	0.16	0.42	0.26
Grapes	-0.00	0.01	0.00	-0.00	-0.00	-0.00	0.00
Greens	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Milk	0.02	0.01	0.02	-0.00	-0.01	0.01	0.02
Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Dairy	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Processed Food	0.92	0.26	0.92	0.00	-0.66	0.55	1.22
Other Spices	0.09	0.08	0.13	-0.04	0.17	0.18	0.01
Other alcohol	0.17	0.07	0.17	0.00	0.18	0.26	0.08
Other cereals	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other crustaceans	-0.02	0.06	0.03	-0.05	-0.04	-0.03	0.01

Notes: Authors' calculations based on HIT data.
The table presents the gains associated with the elimination of Vietnam's own agricultural import tariffs.

Table 5 (cont.)
The Gains From Agricultural Tariff Liberalization
Across Commodities
Vietnam

Product	Aggregate Gains	St.Dev. Gains	Consumption Effects	Income Effects	Pro-Poor Bias	Gains Poor	Gains Rich
Aggregate	1.99	0.82	5.52	-3.53	-1.70	1.04	2.74
Other fruit	0.05	0.13	0.22	-0.17	-0.20	-0.05	0.15
Other meat	-0.06	0.06	0.05	-0.11	-0.07	-0.09	-0.02
Other non-staple	0.06	0.01	0.06	0.00	-0.00	0.06	0.06
Other nuts	-0.03	0.05	0.02	-0.06	-0.05	-0.04	0.00
Other oil seeds	-0.00	0.00	0.00	-0.00	-0.00	-0.00	-0.00
Other oils/fats	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other staple foods	-0.00	0.00	0.00	-0.00	-0.00	-0.00	-0.00
Other tobacco	-0.00	0.03	0.01	-0.01	0.01	0.00	-0.01
Other vegetables	-0.00	0.10	0.19	-0.19	-0.12	-0.07	0.05
Pepper	-0.05	0.07	0.00	-0.05	0.04	-0.02	-0.06
Pork	0.28	0.12	0.56	-0.28	0.20	0.37	0.18
Potato	0.00	0.02	0.01	-0.01	-0.01	-0.01	0.00
Poultry	0.03	0.05	0.09	-0.07	-0.08	-0.02	0.05
Qat (chat)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rice	-1.57	0.73	0.04	-1.61	-1.77	-2.35	-0.58
Saffron	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shrimp	-0.05	0.05	0.00	-0.05	-0.01	-0.04	-0.03
Soya	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sugar	0.09	0.11	0.19	-0.10	-0.04	0.04	0.08
Tea	0.13	0.06	0.18	-0.04	0.07	0.15	0.08
Tomato	0.03	0.02	0.04	-0.00	0.01	0.03	0.02
Vanilla	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vegetable oils	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wheat	0.01	0.00	0.01	0.00	0.00	0.01	0.01
Wine	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes: Authors' calculations based on HIT data.
The table presents the gains associated with the (country by country) elimination of Vietnam's own agricultural import tariffs.

Table 6
The Gains From Cereals Tariff Liberalization

Country	Aggregate Gains	St.Dev. Gains	Consumption Effects	Income Effects	Pro-Poor Bias	Gains Poor	Gains Rich
Developing world	0.42	0.26	0.67	-0.25	0.53	0.30	0.23
Armenia	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Azerbaijan	0.38	0.13	0.46	-0.08	0.44	0.24	0.20
Bangladesh	0.03	0.03	0.08	-0.05	0.01	0.05	-0.04
Benin	0.30	0.20	0.58	-0.28	0.07	0.46	-0.39
Bhutan	1.83	0.73	2.39	-0.56	2.61	0.90	1.71
Bolivia	0.89	0.28	0.99	-0.11	1.19	0.53	0.66
Burkina Faso	0.63	0.15	0.79	-0.16	0.67	0.62	0.05
Burundi	-0.22	0.33	0.13	-0.35	-0.34	-0.02	-0.32
Cambodia	0.07	0.13	0.28	-0.21	0.15	0.07	0.08
Cameroon	0.96	0.45	1.36	-0.41	1.31	0.46	0.85
Central African Republic	-0.99	0.37	0.30	-1.28	-1.03	-0.72	-0.31
Comoros	-0.36	0.25	0.03	-0.39	-0.55	-0.17	-0.38
Côte d'Ivoire	0.54	0.18	0.72	-0.17	0.37	0.45	-0.08
Ecuador	1.07	0.64	1.34	-0.27	2.04	0.30	1.73
Egypt, Arab Rep.	-0.00	0.00	0.00	-0.00	-0.00	-0.00	-0.00
Ethiopia	0.49	0.09	0.49	-0.01	0.59	0.44	0.15
Gambia, The	0.81	0.38	0.86	-0.05	0.41	0.94	-0.53
Georgia	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ghana	-0.02	0.18	0.32	-0.34	-0.10	0.10	-0.20
Guatemala	0.75	0.26	0.85	-0.10	1.09	0.41	0.68
Guinea	0.54	0.21	1.07	-0.52	0.55	0.43	0.12
Guinea-Bissau	1.92	0.70	1.97	-0.05	2.31	1.00	1.31
Indonesia	-0.00	0.03	0.03	-0.03	-0.02	0.00	-0.03
Iraq	-0.03	0.08	0.16	-0.20	-0.17	0.03	-0.20
Jordan	0.00	0.00	0.00	-0.00	0.00	0.00	0.00
Kenya	0.26	0.59	2.23	-1.97	-0.28	0.55	-0.83
Kyrgyz Republic	0.08	0.04	0.11	-0.03	0.12	0.05	0.07

Notes: Authors' calculations based on HIT data.
The table presents the gains associated with the (country by country) elimination of import tariffs on cereals.

Table 6 (cont.)
The Gains From Cereals Tariff Liberalization

Country	Aggregate Gains	St.Dev. Gains	Consumption Effects	Income Effects	Pro-Poor Bias	Gains Poor	Gains Rich
Developing world	0.42	0.26	0.67	-0.25	0.53	0.30	0.23
Liberia	0.38	0.09	0.43	-0.06	0.43	0.30	0.13
Madagascar	0.04	0.09	0.12	-0.09	0.00	0.13	-0.13
Malawi	-0.01	0.07	0.07	-0.08	-0.07	0.09	-0.16
Mali	0.39	0.38	0.72	-0.33	0.74	0.06	0.68
Mauritania	1.05	0.33	1.16	-0.12	1.39	0.61	0.78
Moldova	0.22	0.08	0.26	-0.04	0.31	0.15	0.15
Mongolia	0.78	0.18	0.79	-0.00	1.04	0.56	0.49
Mozambique	0.07	0.15	0.20	-0.13	-0.06	0.26	-0.33
Nepal	0.63	0.32	0.81	-0.18	1.06	0.24	0.82
Nicaragua	1.03	0.52	1.33	-0.30	1.75	0.43	1.31
Niger	1.17	0.34	1.25	-0.08	0.72	1.44	-0.72
Nigeria	0.40	0.24	0.78	-0.38	0.11	0.59	-0.48
Pakistan	0.33	0.55	0.60	-0.28	1.03	-0.37	1.41
Papua New Guinea	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rwanda	0.37	0.29	0.71	-0.33	0.66	0.19	0.46
Sierra Leone	0.67	0.21	0.95	-0.28	0.79	0.52	0.27
South Africa	0.00	0.00	0.00	-0.00	0.00	0.00	0.00
Sri Lanka	0.52	0.21	0.61	-0.09	0.74	0.21	0.53
Tajikistan	0.69	0.19	0.69	-0.01	0.66	0.65	0.00
Tanzania	1.29	1.03	1.73	-0.44	2.61	0.42	2.18
Togo	0.53	0.11	0.69	-0.16	0.55	0.46	0.10
Uganda	0.29	0.60	0.81	-0.52	1.19	0.01	1.17
Ukraine	0.46	0.10	0.47	-0.01	0.60	0.33	0.26
Uzbekistan	0.34	0.08	0.55	-0.21	0.34	0.33	0.01
Vietnam	-1.70	0.83	0.05	-1.75	-2.70	-0.59	-2.11
Yemen, Rep.	1.11	0.34	1.13	-0.02	1.47	0.67	0.80
Zambia	1.66	0.19	1.78	-0.12	1.82	1.48	0.33

Notes: Authors' calculations based on HIT data.
The table presents the gains associated with the elimination of import tariffs on cereals.