1-1-2004

The Earnings Effects of Multilateral Trade Liberalization: Implications for Poverty in Developing Countries

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GTAP Working Paper No. 16
2004

Published in: World Bank Economic Review 18(2):205-236.
2004

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Abstract

Poverty reduction is an increasingly important consideration in the deliberations over multilateral trade liberalization. However, most researchers examining this issue are forced to resort to a discussion of average, or *per capita* effects, suggesting that if *per capita* real income rises, then poverty will fall. As we show in this paper, such an inference can be misleading. Our paper combines results from a new international, cross-section consumption analysis, with earnings data from household surveys, to analyze the implications of multilateral trade liberalization for poverty in Indonesia. We find that, following global trade liberalization, the national headcount measure of poverty in Indonesia is reduced by a small amount in the short run, and significantly more in the long run. The aggregate reduction in Indonesia's national poverty headcount masks a more complex set of impacts among different groups. In the short run, the poverty headcount actually rises slightly for self-employed, agricultural households, as agricultural profits fail to keep up with increases in consumer prices. In the long run, the poverty headcount falls for all earnings strata in Indonesia, as the increased demand for unskilled workers lifts incomes for the formerly self-employed, some of whom move into the wage labor market. We also decompose the poverty changes in Indonesia associated with different countries' trade policies, showing that reform of other countries' policies leads to a reduction in national poverty in Indonesia, but liberalization of Indonesia's own trade policies leads to an increase in the poverty headcount. Finally, while the results reported here focus on Indonesia, the great advantage of the proposed method is that it can be readily extended to the analysis of poverty impacts in any of the other thirteen countries in our sample.

Multilateral Trade Liberalization and Poverty Reduction

Poverty reduction is an increasingly important consideration in the deliberations over multilateral trade liberalization and it has been established as an important part of the Doha Development Round of WTO negotiations.[i] Given this intense interest in the topic of trade policy and poverty, Globkom and the World Bank sponsored a conference in Stockholm in October of 2000 aimed at assessing the state of the art in quantitative policy research on this topic. Accordingly, it drew together economists working with household surveys (Levinsohn, Barry and Friedman, 1999; Case, 1998; Friedman, 2001; Ianchovichina, Nicita and Solaga, 2000, 2002), as well as researchers using computable general equilibrium (CGE) models with a poverty focus (Devarajan and van der Mensbrugghe, 2000; Harrison, Rutherford and Tarr, 2002).[ii] One of the key outcomes of this conference was the realization that, while factor markets are critical to determining the trade-poverty linkage, they have been relatively neglected in much of the poverty research (Harrison, Rutherford and Tarr, 2002; Hertel, Preckel and Cranfield, 2000). This point was also emphasized early on in the path-breaking CGE-based work of Adelman and Robinson (1978), as well as in a recent overview paper by Decaluwé, Patry, Savard and Thorbecke (1999). More recently, the role of labor markets in determining the impact of macro-economic shocks on poverty has been more fully developed by Bourguignon, Robilliard and Robinson (2002).

One reason for the historical neglect of factor markets in much of the research on poverty stems from the preference of poverty researchers to focus on the expenditure side of household surveys. This is due to the relatively greater reliability of spending data for the measurement of poverty (Lipton and Ravallion, 1995). While this is commendable in the case of poverty measurement, when it comes to counterfactual analysis of policies and poverty, it is impossible to proceed without proper treatment of the earnings effects, since the factor price effects of trade policy changes are often quite substantial – particularly in the presence of sector-specific factors owned by households that are not diversified in their income sources. For this reason, it is very important to stratify households, identifying separately those with specialized earnings patterns (see also Decaluwe *et al.*, 1999, on this point).

Of course, in the long run, an increase in returns to labor and capital employed in one sector will attract more resources to this sector – thereby spreading the gains more widely. From the Stolper-Samuelson Theorem, we know that, if the benefiting sector is relatively intensive in unskilled labor, then the long run implications of a rise in the relative price of this sector's output will be to boost economy-wide unskilled wages, benefiting wage earners not directly employed in that sector. This distinction between the short and long run earnings impacts of trade liberalization is a central theme of our paper.

Based on the work presented at the Globkom conference, as well as subsequent publications, another deficiency in current work is also evident.[iii] In order to make the link between multi-lateral trade liberalization and poverty, a multi-region approach to the analysis is required. Yet such studies are very difficult to accomplish, due to the country-specificity of the household surveys, and the fact that these surveys are inevitably inconsistent with the multi-region models used for trade policy analysis. The simplest approach to assessing the poverty impacts of multilateral trade liberalization sidesteps this problem by focusing solely on the average, or *per capita* effects of trade liberalization (e.g., Cline, 2003). Thus the entire income distribution is assumed to shift in parallel, based on the predicted change in *per capita* income. To the extent that this equi-proportionate shift in income following trade liberalization is positive, it will likely lift some households above the poverty line, so the poverty rate is predicted to fall. Decaluwe *et al.* (1999) extend this approach by identifying different household types (e.g., small-holder farmer, landless laborer, etc.) and evaluating the *per capita* income change for each stratum independently. However, they continue to assume a parallel shift in the income distribution for each of these strata. As we will see in this paper, the national, *per capita* approach is unlikely to be satisfactory, particularly in the short run when returns to specific factors are differentially affected by trade liberalization. On the other hand, the Decaluwe et al. approach works fairly well in the short run, but not so well in the long run, when differences in the composition of self-employed earnings across the income spectrum come into play.

Recently there has been a flurry of studies that seek to map the price changes from a CGE model directly to the survey data, thereby circumventing any need to aggregate households. A good example of this type of study is offered by Chen and Ravallion (2002) who study the poverty impacts of China's WTO accession. In this work, the authors combine disaggregated household survey data with trade liberalization results from the Global Trade Analysis Project (GTAP) model of global trade. Thus they are able to make statements about the impacts of accession on individual household type and location. This is very attractive from a policy point of view. However, in doing so, the well-known inconsistencies between survey data and national accounts data (upon which the trade models are based) frequently give rise to contradictory predictions for national *per capita* outcomes. One contribution of the present paper is to show how *per capita* earnings and spending patterns between the two frameworks can be reconciled, thereby giving rise to consistent predictions of national, *per capita* impacts of trade liberalization by both the trade model and the survey-based, micro-simulation analysis.

The methodology developed in this paper has been designed explicitly with multi-region analysis in mind. By capitalizing on a newly available methodology for estimating household spending patterns both across countries as well as across the income spectrum within countries, we are able to summarize spending behavior in a parsimonious manner. This allows us to focus more attention on the earnings side of the problem, which we find to be critical to our results. While our treatment of factor markets is rudimentary when compared to the recent work of Bourguignon, Robilliard and Robinson, it has the virtue of being operational across a wide range of countries and household surveys. To date, we have implemented this approach for fourteen countries, and the same approach could be readily applied to many more countries where income surveys are available.

The paper is structured as follows. We begin by examining the pattern of earnings specialization in our sample of developing countries. Certain systematic patterns emerge and this motivates our subsequent stratification of households. We then turn to the analytical framework employed in this paper. This consists of two parts: a micro-simulation model, built upon the household survey data, and used to assess individual household impacts, and a global trade model used to generate price changes. A key part of the research exercise involves modifying the trade model and adjusting the two data bases so they are mutually consistent and produce the same national, *per capita* outcomes. We then proceed to analyze the impact of global trade liberalization on poverty in one of the economies – Indonesia. The paper concludes with a discussion of strengths and limitations of this approach to linking global trade liberalization and poverty in developing countries.

Specialization of Earnings in a Sample of Developing Countries

As previously noted, a fundamental premise of this paper is that, in the short run, household incomes will be differentially affected depending on their reliance on sector-specific factors of production. For example, a household which earns all of its income from a family run farm will be heavily dependent on the prices of agricultural products. If prices fall, they may eventually be able to find other employment, but this is likely to be difficult in the short run – particularly if they are not currently employed off-farm. This close link between farm household welfare and agricultural prices has also been observed by those working with annual household survey data (e.g., Chen and Wang, 2001).

Given the potential importance of specialized earnings sources in our analysis of short run impacts of trade liberalization, it is instructive to examine its prevalence across a range of developing countries. For this purpose, we draw on a set of 14 national household surveys for a selection of countries in Africa, Latin America and Southeast Asia. This family of surveys has been selected on the basis of: (a) availability through the World Bank, (b) recent coverage, (c) a thorough treatment of household earnings, and (d) matching country coverage in our trade modeling data base: GTAP version 5. The group of 14 is the largest group that could be assembled at the time.[iv]

In working with these surveys, our unit of analysis is the household, and we assume equal sharing of income within the household in order to obtain income on a per person basis.[v] Figure 1 plots the share of households that are specialized in agricultural income against GDP/capita, measured in PPP terms. Here, we define "specialization" as referring to *households* that earn 95% or more of their income from agricultural profits. So, not only do they work full-time in agriculture, they are also self-employed. This means that it is unlikely they will be able quickly switch to other activities if returns to farming were to fall. Likewise, since they are fully employed in agriculture, they are unable to quickly increase the amount of effort devoted to farming if returns were to rise, short of reducing leisure time.

From Figure 1 we see that there is a negative correlation between GDP/capita and the share of households specialized in agriculture. The poorest country in the sample, Malawi, has nearly 40% of its households specialized in farming, whereas the richest country in PPP terms, Chile, has only a fraction of that percentage specialized in agricultural profits. Of course, there are some outliers. For example, Vietnam is a low income country which also appears to have a low level of agricultural specialization. However, it is clear that, for many developing countries, the agriculture-specialized segment of the population is important, and this is generally inversely related to per capita GDP.

But how distinct is this agriculture-specialized group? Does it warrant individualized treatment in our analysis? We address these questions for the case of Indonesia, which falls in the middle of our sample. It is not among the poorest countries, and, while it doesn't have the highest share of agriculture specialized households, it does have a significant proportion of households in this category. Figure 3 plots the distribution of households in the Indonesian survey with the data arranged according to the share of household income derived from agricultural profits (x-axis) and log of income level (y-axis). From this, it is clear that we have a bimodal distribution with respect to agricultural specialization. The majority of households received little or no profit-type income from agriculture. However, a substantial minority receives virtually all its income *from self-employment in farming*. Isolating this group in a specific stratum looks like a very good idea, as this agriculture-specialized group accounts for 21% of the population (Table 1, first row).[vi]

The importance of focusing on the agriculture-profits specialized households is even more pronounced when one looks at the share of the impoverished population in this category. While agriculture-specialized households account for only about one-fifth of the population in Indonesia, they account for more than one-third (34%) of the individuals with per capita income less than one dollar a day (see Table 1, row “share in total poverty”). Clearly the fate of these households under trade liberalization will affect the national poverty rate in an important way.

The other type of household specialization that appears to be correlated with national per capita income in our sample is wage and salary specialization. Figure 2 charts the share of total households that are specialized (95% or more of household income) in wage and salary income (in both agriculture and non-agriculture sectors). They work for others. Since these specialized households are wholly reliant on labor income, their earnings will be closely tied to changes in market wages. Figure 2 shows a strong positive correlation with per capita GDP, at PPP prices. The poorest countries tend to have relatively few such households (less than 5% of total households in the case of Uganda and Vietnam), while the richer countries tend to have more than 25% of their households in this category. In fact, Mexico shows nearly 40% of its households as wage-specialized. This positive correlation is hardly surprising. We expect increased specialization, along with the evolution of more efficient formal labor markets as countries become more developed.

Figure 4 shows a second, three-dimensional distribution of households in the Indonesia survey, this time highlighting the share of household income obtained from wages and salaries. Once again we have sharp peaks at the two extremes. While most households are not specialized in this dimension, there is a significant cluster above the 95% earnings share from wages and salaries. From the first row of Table 1, we can see that these households account for about 18% of the population, and comprise about 7% of the population under the poverty line. Thus, in contrast to agriculture-specialized households, the wage-specialized households are *disproportionately non-poor*. This is also evidenced in the modest stratum poverty headcount reported in the last row of Table 1: 5% for wage-specialized vs. 15% for the nation as a whole.

In addition to agriculture- and wage labor-specialized households, we also identify households that are specialized in non-agricultural profits (i.e. self-employed in non-agricultural sectors), those that are specialized in transfers, and those that are non-specialized, i.e. diversified. While the relative size of the transfer-specialized group appears to be positively correlated with per capita income, the household shares for the other two categories do not appear to be systematically related to GDP/capita. In the case of Indonesia, we see from Table 1 that households wholly reliant on non-agricultural profits (95% or more of total income) account for 15% of the population and 11% of the poor, with a poverty rate somewhat below the national average. Households specialized in transfers are a much smaller group (1.3% of the population) but disproportionately poor (2.6% of the national poor). Finally, the diversified group represents about 45% of both the total, and the impoverished, populations in Indonesia.

Imputing Returns from Profit-type Income for Long Run Analysis

As noted in the introduction, in the long run we expect net-of-tax returns to comparable factors of production to be equalized across sectors. This means that the short run boost to self-employed agricultural labor that occurs when world food prices rise will be shared with non-agricultural labor as more workers are drawn into farming (or fewer leave agriculture). Or alternatively, when non-farm wages rise, we expect this improvement to be eventually shared with self-employed farmer labor as they seek off-farm jobs. In order to identify the long run impacts on individual households/groups, it is therefore necessary to assess the underlying factor endowments of the self-employed population. How much of the observed agricultural and non-agricultural “profits” may be attributed to unskilled labor and how much represents returns to land or capital? This type of earnings imputation is notoriously difficult, but it is essential if we are to say anything about the impacts of trade liberalization on poverty in the long run.

The split of reported agricultural and non-agricultural business income into returns to capital, labor and land is done in multiple steps. First, imputed income for each household member was determined as the average wage of all workers in the economy that earned wage income only, and possessed the same personal characteristics, including: age, education level, skill level, and industry of employment (agriculture or non-agriculture). This imputed labor income, for all household members involved in the family business, was then subtracted from the reported profits of the household business. To provide the greatest possible accuracy, labor imputation was done keeping agricultural and non-agricultural business income separate so that only imputed agricultural wages were subtracted from agricultural profits, and only non-agricultural imputed wages were subtracted from non-agricultural profits. If no information on the nature of imputed wage was available, then this was determined by the industrial classification of the head of the household.

The second step in imputation involves splitting the remaining profit-type agricultural income into returns to capital and agricultural land. If the sum total of imputed wages exceeded total reported business income, then all operating surplus was classified as returns to labor, and the capital return for this business was set to zero to avoid negative flows. We then add property rental income directly reported by households into this composite to obtain our estimate of total returns to capital and agricultural land. Since we treat non-farm land as part of the non-farm capital composite, this completes the task of imputation for non-agricultural profits. Ideally we would like to utilize information on the households’ farm land holdings to split this remaining category of income for the agricultural enterprises. However, early attempts to do so met with little success. Therefore, we have opted to apply a simple share-based split of non-wage, profit-type income in agriculture. For this purpose, and in order to be consistent with the trade liberalization simulation analysis later in this paper, we apply the national average share of farmland in total non-labor agricultural earnings from the GTAP version 5 data base.

The results of this imputation procedure for the two groups of self-employed, specialized households in Indonesia are shown in Figures 5 and 6.[vii] Note, for most households employed in agriculture, we estimate that more than 80% of their income represents returns to family labor (Figure 5). The residual share of income attributed to capital and land is greatest at the lowest and highest income levels. The very poorest households clearly have a very poor endowment of human capital, as they have not only low incomes, but also a low share of imputed labor within that low income level.[viii] The same, U-shaped relationship between capital's share of imputed income and per capita household income exists for the non-agriculture households (Figure 6). However, here we see much larger shares for capital income, especially at the higher income levels.

One common problem in all household surveys is the under-reporting of income. In their study of income distribution in the OECD countries, Atkinson, Rainwater and Smeeding (1995) find evidence of systematic income under-reporting on the order of 10 – 20%. This is likely to be larger in the case of developing countries, and it is immediately evident when we compare the share of estimated gross factor income in agriculture vs. non-agriculture for Indonesia.[ix] In the survey, the share of gross factor income earned in agriculture is nearly one-half, whereas in the national accounts of Indonesia it is only about 20%.[x] In order to bring these two data bases into consistency with one another in this key dimension, we adjust for underreporting of capital income by adjusting the non-agricultural profit type income received by the wealthiest households so that the survey reflects the same agriculture/non-agriculture mix of earnings as observed in the GTAP data base. This approach is supported by the work of Mistiaen and Ravallion (2003) who find that underreporting of income is most serious for the rich.[xi] We then adjust the factor composition of GTAP's gross national earnings in-line with that suggested by the survey data (Ivanic, 2003). This has the important consequence of increasing the share of skilled labor in the economy. Also, as a result of the substantial imputed returns to self-employed labor, we reduce the capital intensity of the GTAP data base for Indonesia.[xii] The resulting matrix of gross factor earnings shares for Indonesia is reported in Table 2. From this, we see that more than one-third of profits are comprised of imputed labor income. Total labor earnings are about equally divided between wages and salaries and imputed labor income. In the non-agricultural sector about half the imputed income accrues to skilled labor, whereas this share is virtually zero in the case of agriculture, which relies almost entirely on unskilled labor.

Having set the stage for our earnings-focused analysis of trade liberalization, we now turn to the formal modeling framework used in this study.

Analytical Framework

Micro-simulation Model: Our analysis of the impacts of trade liberalization on the poor begins with the specification of a utility function, and an associated consumer demand system, with which we can determine household consumption, as well as the maximum utility attainable by the household at a given set of prices and income. The utility of the household at the poverty line (the *marginal household* in our terminology), is defined as the *poverty level of utility*. In the wake of trade liberalization, if some households' utility falls below this level, they are deemed to have "fallen into poverty". Conversely, if they are lifted above this level of utility, they are no longer in poverty. The poverty level of utility may also be used to compute the so-called "poverty gap", representing the transfer required to lift those households currently in poverty to the poverty line – i.e. to permit them to achieve the poverty level of utility.

This approach to determining the poverty line appears preferable to that proposed by Decaluwe et al. (1999), who identify a basic needs bundle of goods and implement this in an LES model of consumption. In that case, households below the poverty line cannot substitute amongst consumption items in the face of price changes. In contrast, our approach permits such substitution and does not rely on the somewhat artificial definition of a basket of basic needs.

In this study, we use Rimmer and Powell's (1992a, 1992b, 1996), AIDADS system to represent consumer preferences, due to its capability to capture expenditure patterns across the global income spectrum (see also Cranfield et al., 2000, 2002). AIDADS has now been widely estimated on international cross section data, and it performs well out of sample, when compared to other demand systems (Cranfield et al., 2003). This functional form may be viewed as a generalization of the popular, but restrictive, Linear Expenditure System (LES). Unlike the LES, AIDADS allows for non-linear Engel responses, while maintaining a parsimonious parameterization of consumer preferences.

The following equation gives the budget share form of AIDADS:

$$\lambda_n = \frac{p_n \gamma_n}{y} + \frac{\alpha_n + \beta_n \exp(u)}{1 + \exp(u)} \left(1 - \frac{p' \gamma}{y} \right) \quad \forall \ n \qquad (1)$$

where λ_n is the budget share of good *n*, α_n, γ_n, and β_n are unknown parameters, *u* represents utility, p_n is the price of good *n*, and *y* is income. The following parametric restrictions are used to ensure well-behaved demands: $0 \leq \alpha_n, \beta_n \leq 1$ for all *n*, and $\sum_{n=1}^{N} \alpha_n = \sum_{n=1}^{N} \beta_n = 1$. If $\alpha_n = \beta_n$ for all goods, then AIDADS simplifies to the LES. By replacing the values of the marginal budget shares in the LES with more general terms that are functions of a value that varies with utility, AIDADS allows for marginal budget shares that vary across *per capita* expenditure levels in a fairly general manner. Moreover, the average budget shares from AIDADS also vary non-linearly across expenditure while remaining within the unit interval.

In this paper we draw on recent work by Cranfield et al. (2004) who estimate the parameters of a complete demand system while simultaneously utilizing data on the distribution of expenditure by quintile in order to permit recovery of the unobservable distribution of expenditures for each quintile. This approach requires data typically used in demand system estimation (*i.e.*, prices, *per capita* quantities and expenditures), in addition to survey-based information on the distribution of expenditure (or income). Rather than estimating a model that predicts a budget share for each good on a *per capita* basis in each observation, the framework approximates the distribution of expenditure, estimates demand system parameters consistent with the demand and expenditure data (including the distribution information), and predicts budget shares for each good *across expenditure levels within each national observation*.

We use consumption, price and expenditure data from 113 countries in the 1996 International Comparisons Project (ICP) data set for the demand system portion of the model (Kravis *et al.,* 1982). Survey data from all 14 of the countries in for which we have this formation are supplemented with quintile data from the Deininger and Squire (1996) database and the World Bank's *World Development Reports*.[xiii] It is important to note that the recovered expenditure distribution aggregates back to the *per capita* expenditure levels in the ICP data, as well as reproducing the observed distribution of total expenditure. The ICP consumption and price data are aggregated up to six goods: staple grains, livestock products, other food products, other non-durable goods, durable goods, and services. The emphasis on food products is appropriate for this poverty-focused study, since poor households spend a large share of their income on food products.

The estimated AIDADS parameters are reported in Table 3a. Note that these parameters are not country-specific, and may therefore be used to predict spending patterns across the income spectrum, even in countries where household expenditure surveys are not available. This makes it particularly well-suited to a multi-country analysis of trade and poverty. A few observations about these parameters are in order. Firstly, the estimated subsistence budget shares ($\hat{\gamma}_n$) for all products except for staple grains are zero. Secondly, the parameters: $\hat{\alpha}_n$ and $\hat{\beta}_n$ represent estimates of the bounds of the AIDADS marginal budget shares. So, in the case of grains, $\hat{\alpha}_n$ indicates that at low income levels, this category accounts for as much as 23.3 cents of each additional dollar of expenditure. However, the corresponding value of $\hat{\beta}_n$ = 0 suggests that at high income levels, an increase in expenditure brings about negligible changes in expenditure on staple grains. Livestock and Other Food also show values of $\hat{\alpha}_n > \hat{\beta}_n$, suggesting that marginal expenditures fall with income, while the opposite is true for Non-durables, Durables and Services.

As in generally done in micro-simulation studies, we follow international estimation of the AIDADS parameters with a calibration step in which the values of $\hat{\alpha}_n$ and $\hat{\beta}_n$ are altered in order to ensure that predicted demands equal observed demands for the country in question.[xiv] These calibrated values are given in Table 3b. While some of the parameters change quite a bit (most notably grains and livestock products), they retain the same qualitative relationships as were observed in the cross-section estimates reported in Table 3a.

Figure 7 charts the predicted expenditure patterns for households in Indonesia, across the full spectrum of expenditure. As expected from the parameters in Table 3, the grains budget share follows a monotonically declining pattern, as do the budget shares for livestock and other food, -- albeit at a slower rate. The budget shares for non-food goods, including non-durables, durables and services, follow an increasing pattern.

A natural alternative to using the AIDADS function would be to predict expenditure patterns from the survey data, either by econometrically estimating a demand system (although it would be difficult without obtaining separate price data) or by using budget shares to create a local measure of welfare changes as in Chen and Ravallion (2003). This would not be possible in six of our 14 focus countries, since expenditure data are not available in the surveys for those countries. However, such data are available for Indonesia and preliminary comparisons indicate that our predicted pattern of expenditure is quite consistent with that from the survey.[xv] Given the convenience of working with an explicit demand system, as well as the consistency obtained by using this same demand system in the global trade model, we believe this is a sound choice.

Having specified the form of the *per capita* utility function, which is common across all individuals within each country, we are now in a position to specify the household micro-simulation model, which involves maximizing per capita utility, subject to a per capita budget constraint, based on the households' overall endowments:

Choose $(x_{1k},...,x_{ik},...,x_{nk})$, where *i* indexes the commodities and *k* households,

To maximize u_k

subject to: $$\sum_{i=1}^{n} U_i(x_{ik}, u_k) = 1, \qquad (2)$$

$$U_i(x_{ik}, u_k) = \varphi_{ik}(u_k)\ln\left(\frac{x_{ik} - \gamma_i}{A\exp(u_k)}\right) \quad \forall i \qquad (3)$$

$$\varphi_{ik}(u_k) = [\alpha_i + \beta_i \exp(u_k)]/[1 + \exp(u_k)], \text{ and} \qquad (4)$$

$$\sum_{i=1}^{n}(p_i x_{ik}) = Y^k = \sum_f W_f \overline{E}_f^k - \sum_f \delta_f P_f \overline{E}_f^k + T^k Y \qquad (5)$$

In this formulation, (2) – (3) define the implicitly additive AIDADS utility function with parameters $\alpha_i, \beta_i, \gamma_i$ and *A*, and marginal budget share as defined by (4). Equation (5) is the *per capita* budget constraint, with income defined net of depreciation and inclusive of any transfers.[xvi] The notation for the income expression is as follows: W_f is the wage paid to endowment $\overline{E}_f^k$, δ_i is the geometric rate of depreciation for endowment $\overline{E}_f^k$ (zero for non-capital items), P_f is the cost of replacing depreciable endowment *f* (the capital goods price), and T^k is the transfer rate for household *k*, which is assumed to be a constant share of net national income, *Y*.

In our subsequent analysis, we use the survey-based observations on endowments and transfers. The depreciation rate for capital stock is obtained from the national accounts. Trade liberalization will alter the wages associated with each endowment, the price of capital goods and transfers. The resulting level of income for household *k* can be computed using equation (5). Once we know the new income level, it may be combined with the new vector of commodity prices to compute expenditure on each good, and hence individual demands, using (1). We then use equations (2) – (4) to compute per capita utility. Based on the post-liberalization utility level, we are in a position to compute the change in poverty headcount. We can also use (1) – (5) to compute the transfer necessary to bring a given impoverished household up to the poverty line.

Modeling Trade Liberalization: In theory, the preceding micro-simulation model could be used in conjunction with any policy simulation framework capable of producing the requisite price changes. However, in practice, there are substantial challenges involved in marrying the two analytical frameworks. Most importantly, the two models must be consistent in their characterization of earnings and spending. Obtaining such consistency is no small task, as evidenced in the preceding discussion of the earnings data in Table 2.[xvii]

In this paper, we use a modified version of the GTAP global trade model (Hertel, 1997) to generate the price changes to be fed into the micro-simulation analysis. The modifications undertaken are aimed at obtaining national per capita consumption consistency between the global trade model and the micro-simulation framework. Building on the GTAP model has several advantages. First, this is a global model, so it is capable of producing results from global trade liberalization scenarios – an important objective of the present paper. Second, it is a relatively standard CGE model, assuming perfect competition and differentiated products in international trade. Owing in part to this simplicity, GTAP is the most widely used trade model available, with more than 2,000 users around the world. By demonstrating how this can be modified and rendered consistent with our micro-simulation model, we open the door to those users interested in addressing distributional issues in their analyses. A final reason for using this framework is the regional disaggregation in the GTAP data base, which is large and is continually expanding (13 regions in version 1 vs. 66 regions in version 5, and a projected 85 regions in version 6).

Having reconciled gross factor earnings in the micro-simulation and GTAP models (see above), several further adjustments are required to bring these analytical frameworks into consistency. Firstly, we modify the specification of consumer demand in the GTAP model, replacing the Constant Difference of Elasticities (CDE) demand system with the econometrically estimated AIDADS demand system discussed previously.[xviii] This ensures that the specification of consumer demand in the two frameworks is fully consistent for all of the countries where we have survey data. Of course, since the ICP-based consumer expenditure shares are evaluated at consumer prices, and the GTAP consumption vector is evaluated at producer prices, we are also required to explicitly model wholesale/retail/transport margins applied to goods destined for private consumption. These are modeled using a Cobb-Douglas production function, which combines the producer good with margins services in order to produce the consumer good. This is important, since such margins can perform an important insulating role when world prices (and hence domestic producer prices) are altered due to trade liberalization (Winters, *et al.*, 2003).

Several further steps are also required in order to ensure consistency between the GTAP data base and the micro-simulation model. Depreciation is a critical component of the macro-economic accounts, but it is absent from the survey data. This makes it impossible to reconcile the net income effects of trade liberalization between the two frameworks. Therefore, national depreciation is shared out among the households in the micro-simulation model in proportion to estimated gross earnings from capital.[xix] A final problem relates to transfer payments, which are unobserved in the GTAP data base, but which are assumed to be proportional to net national income. Accordingly, government spending, tax revenues and foreign borrowing, which are explicitly modeled in GTAP, are also tied to net national income in the model closure adopted in our subsequent simulation analysis.[xx] We follow Harrison, Rutherford and Tarr (2002a, 2002b) in replacing the foregone tariff revenue with a value-added tax to maintain taxes' share in net national income. [xxi]

Protection Estimates and the Price Effects of Multilateral Trade Liberalization

The version 5.0, GTAP data base is documented in Dimaranan and McDougall (2002), and it incorporates relatively recent information for merchandise trade and agricultural protection. Agricultural tariffs are derived from the AMAD data base and are for 1998. The non-agricultural tariff data are for 1997, or the most recent year, and come from the WITS system maintained by UNCTAD and the World Bank. The only non-tariff trade barriers in the data base relate to export measures. Agricultural export subsidies for 1998, reported to the WTO, are incorporated, as are the quota rents associated with restrictions on textile and apparel exports to North America and Europe.[xxii] In our trade liberalization experiment, we remove the tariffs and quotas. We do not attempt to capture the impact of prospective liberalization of direct trade in services or barriers to international investment or the movement of people in the services sectors. Also, we leave domestic agricultural subsidies in place. Modeling of these subsidies requires considerable care – given the decoupled nature of many of these programs. We will tackle this in future work.

A summary of the average merchandise tariffs used in this study of multilateral trade liberalization is provided in Table 4. Indonesia's tariff profile shows relatively low tariffs in primary agriculture, when compared to other developing countries, and far lower than for the developed economies. Indonesia's processed food imports face higher tariffs, particularly beverages and tobacco products, putting her on a par with other developing countries for this combined category of imports. Average tariffs on textiles and apparel products are relatively high, as are tariffs on motor vehicles.

In this paper, we explore the impact of trade liberalization using both short run and long run closures. As noted previously, in the short run we assume that wage and salaried laborers are mobile across sectors, but capital, land and self-employed labor are immobile and the returns to the latter factors are combined into sectoral “profits”. The latter correspond to the agriculture and non-agriculture profits reported in the household surveys. The long run closure assumes that self-employed labor is perfectly mobile, and perfectly substitutable with wage labor of the same skill category. It also assumes that capital is perfectly mobile across sectors, while farm land is partially mobile across uses within the agricultural sector.[xxiii]

Aggregated price changes for global trade liberalization are reported in Table 5.[xxiv] All of these changes are relative to the numeraire in this model, which is the average price of primary factors, worldwide. Consider first the total effects. A rise in the primary factor prices in Indonesia (both short and long run) means that this country experiences a real appreciation as a result of this liberalization experiment. That is, increased demand for their exports bids up Indonesia’s prices, relative to the world average. On the commodity side, Indonesian food prices rise, as developed countries reduce their protection and the EU and the US curb their exports of subsidized products. This price hike is not offset by the reduction of relatively modest Indonesian agricultural tariffs. In contrast, the producer prices of both durables and non-durables fall substantially in the short run, so there is a change in relative prices between food and non-food merchandise. Not surprisingly, the price of services moves very closely with wage rates, which rise strongly in Indonesia, relative to the rest of the world as a whole. The rise in the services price means that the (consumer) price changes for margin-inclusive non-food goods are moderated. Since the AIDADS demand system employed in the post-simulation analysis is estimated at consumer prices, it is the vector of consumer price changes in the bottom panel of Table 5 that is pertinent for our evaluation of household welfare.

Table 5 also decomposes the total short run price impacts of global trade liberalization into the components attributable to Indonesia’s own liberalization, as well as liberalization in other developing and developed countries using the method of Harrison, Horridge and Pearson (1999). For each country group, we distinguish between the effects of farm and food liberalization (agriculture) and other merchandise trade liberalization (non-agriculture). The most striking thing about this decomposition is the dominance of developed country trade liberalization in Indonesian earnings impacts. Agricultural profits are largely driven by developed country agricultural liberalization, while non-agricultural profits are dominated by the elimination of trade barriers in these same countries' non-agricultural markets. These effects are much stronger than the impact of Indonesia's own-liberalization on earnings. Furthermore, while trade liberalization in other developing countries has an ambiguous effect on factor returns in Indonesia, all of these Indonesian earnings respond positively to developed country liberalization.

Turning to the decomposition of aggregated commodity price effects of trade liberalization in Table 5, we see that developed country trade liberalization accounts for the majority of the food price increase. In the case of the durable and non-durable prices, the opposite is true. Here, developed country liberalization results in modest producer price increases, but this is more than offset by the price-depressing effect of own-liberalization on non-food commodities. In the case of services, both own- and developed country liberalization contribute to the price rise.

The long run price impacts are also reported in Table 5. With self-employed labor and capital mobile across sectors, their returns increase somewhat more than in the short run, and the increase in agricultural profits is concentrated in land rents. Food prices rise more evenly in the long run, with the movement of land, labor and capital encouraging increased product supplies, particularly for staple grains (i.e., rice). Non-durable producer prices now rise slightly, rather than falling. The producer price of durables falls somewhat more in the long run and the rise in the price of services is somewhat larger when factors are fully mobile.

Poverty Impacts

Summary Measures of Poverty: Table 6 reports both the short and long run headcount poverty impacts associated with the global liberalization scenario, by stratum. In the short run, the number of poor is projected to fall for the non-agriculture-, labor-, transfer-specialized, and diversified strata, with the sharpest percentage decline (-2.8%) in the labor-specialized stratum.

The short run poverty headcount among the agriculture-specialized households actually increases as a result of trade liberalization. While agricultural profits rise, they rise less than the prices for staple grains and other food products, due to the sharp increase in wages. Services prices also rise at a faster rate. However, this slight increase in poverty among the agricultural specialized households is offset by the declines in other strata and consequently national poverty falls by 0.3% as a result of global trade liberalization.

The short run, head-count poverty impacts by stratum are disaggregated by policy type in the body of Table 6, which shows that the impacts of different types of trade liberalization have rather different effects on poverty in the various strata. Liberalization of Indonesia's own trade policies (first two rows in Table 6) increases poverty in Indonesia. Here, the commodity price declines following own-tariff cuts are insufficient to offset the declining incomes, as Indonesia experiences the real depreciation required to restore external balance in the wake of increased imports.

On the other hand, the largest reductions in national poverty (-0.5% and -0.7%, respectively) result from Developed Country agricultural and non-agricultural trade liberalization. The first of these serves to lower poverty among the agriculture-specialized and diversified households. Together, these two groups account for nearly 80% of the poor in Indonesia, so these poverty reductions dictate the overall outcome and poverty falls despite the rise in poverty among the other household groups. In contrast, non-agricultural trade liberalization by the developed countries lowers poverty in every group *excepting* the agriculture-specialized households. Thus, non-agricultural liberalization by the developed countries is complementary to agricultural liberalization. Indeed, from the point of view of obtaining broad-based reductions in poverty, economy-wide trade liberalization is preferable to narrow sector-specific measures, as the latter tend to benefit one group at the expense of others.

Liberalization of other LDC agricultural trade policies does not affect the short run national poverty rate as these trade policies have a negligible impact on prices in Indonesia.

However, due to the high manufacturing tariffs in other developing countries, LDC non-agriculture trade liberalization has a more significant poverty impact. In fact, it reduces poverty across all strata in Indonesia.

The long run poverty headcount impacts, by stratum, are reported in the bottom row of Table 6. The most striking thing about these impacts is the greater degree of uniformity across strata. Whereas the total short run impacts include both poverty increases and reductions, and the reductions vary by a factor of four (-0.5% to -2.8%), the long run impacts show relatively similar poverty reductions across all groups, with the non-transfer dependent household poverty rates falling by between -1.1% and -1.6%. This is due to the fact that, once we have accounted for imputed returns to self-employed labor, poor households are essentially reliant on unskilled wages (recall Figure 5). If real unskilled wages rise, then poverty falls. This is a point that has been emphasized in the long run analysis of Harrison, Rutherford and Tarr (2002b) for Brazil.

Impacts Across the Income Distribution: Having analyzed the impact of alternative trade liberalization measures on the poverty headcount, by stratum, and nationally, we now turn to a more comprehensive analysis of the impacts of such policy reform on household welfare across the income spectrum. We do so by computing the Equivalent Variation (EV) of the ensuing price and income changes. This involves solving the system of equations (2) – (5) for the transfer required to give each household the post-reform level of utility, at the pre-reform prices. This EV is subsequently normalized by initial income to show the proportionate gain across the income spectrum. If this curve is rising, then it indicates a regressive effect – i.e., proportionately larger gains for the wealthy. On the other hand, if it is falling, then it indicates that trade liberalization benefits the poor more than the rich.

Figure 8 reports the relative EV impacts across the income spectrum in Indonesia. Here, all households have been arranged along the horizontal axis from poorest to richest, and a line has been drawn connecting the households in each stratum. For example, note that the richest agriculture specialized household appears in the 87th percentile, so the EV line for this stratum terminates there. The richest households in the survey are in the non-agriculture-profit specialized group. Also note that the poverty line has been superimposed on this figure in the 15^{th} percentile, based on the poverty head count information reported in Table 1.

The results displayed in Figure 8 show a clear upward slope for all strata, indicating that the rich benefit more from trade liberalization than do the poor. In fact, as anticipated from the poverty results above, the poor households in the agricultural stratum are hurt in the short run by global trade liberalization. Only the wealthiest households in this group gain. In contrast, the wage-labor specialized households benefit across the entire income spectrum as wages rise, relative to commodity prices. Members of the other three strata also gain, albeit more modestly.

It is interesting to note that the EV curves in Figure 8 all share the same shape. We will now demonstrate that this is inherited from the consumption side of the story. First of all, recall that the consumption parameters in our micro-simulation model are independent of stratum. In fact, all households in Indonesia share the same parameters. What distinguishes their consumption bundle (given common prices) is their per capita income, and hence their utility level. Furthermore, based on the estimated parameters, household spending at the lowest income levels is dominated by staple grains and other food products, while at the highest income levels, durable goods and services are more important. With these facts in mind, turn to Figure 9, which reports the consumption component of the relative EV measure (line labeled “total”), as well as the component parts derived from purchases of each of the six aggregate commodities. At the lowest income levels the consumption-based EV amounts to about -4% of income. The bulk of this is due to higher prices for staple grains and other food products. These products experience the highest consumer price increases (5.4% and 6.1%, respectively), in addition to claiming a large share of the poorest consumer’s budget. As we move to the right along the horizontal axis, we find the relative contribution of these food price increases to the relative EV diminishing, due to the smaller budget share devoted to them at high income levels (recall Figure 7). The change in livestock price is more modest, as is its budget share in Indonesia, so its contribution to the consumption price EV is smaller. And the prices of durables and non-durables are little changed under trade liberalization. The main non-food price impact is in the services aggregate, which rises strongly due to the higher wages. The services impact on the consumption component of EV is small at the lowest income levels, due to its relative lack of importance in the consumers' budgets. However, it is quite important at the highest income levels – dominating the total impact on wealthy consumers. Overall, one can see that the shape of the "total" consumption component of EV takes its cue from the food prices, although their effect is offset somewhat by the services price increase.

Next, turn to the factor earnings contribution to households' EV. In the case of the specialized households, the short run earnings story is nearly invariant across the income spectrum. Thus the self-employed, non-agricultural total EV curve shown in Figure 8 is essentially a parallel upward shift of the agricultural households' EV line, with the difference owing to the differential change in non-agricultural vs. agricultural profits. Similarly the transfer-dependent household represents another incremental shift upwards. However, this is not the case with the diversified household EV curve. At the lowest income levels in Figure 8, these households fare less well than their non-agricultural, self-employed, counterparts. However, at the highest income levels, the diversified households gain much more – indeed they gain more than the wealthy, transfer dependent households. This suggests a change in the mix of diversified household income as per capita household earnings rise.

Figure 10 explores this issue further by disaggregating the income side of the relative EV results in Figure 8 for the diversified stratum. Note that, at low income levels, agricultural profits contribute the most to the relative change income. However, this declines steadily and, just after the 50th percentile, it is superceded in importance by the contribution of unskilled wages and non-agricultural profits. At the highest income level, this component of the relative change in diversified household income has nearly become the least important one. Overall, the relative income change is increasing as the income percentile rises. This follows from the interaction between the relative importance of the different sources of earnings with their respective factor prices. As incomes in this stratum rise, earnings shift towards factors that are more favorably affected by trade liberalization.

The final earnings-related figure (Figure 11) explores the change in mix of contributing factors to the labor specialized households' relative earnings changes. Since these households have a blend of skilled and unskilled labor, it is hardly surprising to see that as incomes rise, the relative importance of skilled labor also rises. Since unskilled wages rise slightly more than skilled wages, then slope of the total earnings curve in Figure 11 is slightly downward sloping. This, in turn, explains why the total EV curve for the wage specialized households in Figure 8 loses some of its dominance over the transfer and non-agricultural strata as incomes rise.

Summary and Conclusions

Assessing the impact of multilateral trade liberalization on poverty is a challenging assignment. As Alan Winters (p. 43) notes: "Tracing the links between trade and poverty is going to be a detailed and frustrating task, for much of what one wishes to know is just unknown. It will also become obvious that most of the links are very case specific." Winters then proceeds to lay out a general framework for thinking about the impact of trade policy on poverty. Our paper is similar in spirit to the Winters effort. We recognize that the definitive assessment of the impact of trade liberalization on poverty must be done on a case-by-case basis. However, there is also a need for a set of internationally comparable estimates of the global impact on poverty in a range of different countries, and our paper develops a tractable methodology for providing this. The keys to our approach are: (1) detailed earnings data from household surveys, (2) an econometrically estimated demand system that reflects the changes in consumption patterns across the income spectrum and provides a natural vehicle for analysis of household welfare and poverty – particularly in the context of multi-country analyses, and (3) a micro-macro consistent framework for projecting the price impacts of global trade liberalization.

The approach is applied to the assessment of the consequences of global liberalization of merchandise tariffs, agricultural export subsidies and quotas on textiles and clothing. In order to fully develop our analysis, we focus on the consequences for Indonesia, although this approach could also be readily applied to any of the other thirteen countries for which we have assembled micro-consistent data bases. We find that the national headcount measure of poverty in Indonesia is reduced following global trade liberalization, in both the short and the long run.

However, the aggregate reduction in Indonesia's national poverty headcount masks a more complex set of impacts among different groups. In the short run, the poverty headcount rises slightly for self-employed, agricultural households, as the rise in farm profits is outpaced by consumer prices. Therefore, we echo Kanbur's (2000) call for disaggregated analysis of poverty impacts. However, in the long run, the poverty headcount falls for all strata in Indonesia, since the increased demand for unskilled workers lifts incomes for the formerly self-employed, some of whom move into the wage labor market.

We also decompose the headcount poverty change in Indonesia associated with different countries' trade policies. We find that liberalization in other countries' trade policies leads to a reduction in the national poverty headcount in Indonesia. In contrast, liberalization of Indonesia's own trade policies – particularly those protecting the non-agricultural sectors -- leads to an increase in national poverty.

In summary, we believe that our framework fills an important gap in researchers' toolkits for analysis of the poverty impacts of multilateral trade liberalization. By stratifying households according to earnings specialization, we are able to capture a great deal of the diversity relevant to trade policy impacts, while preserving analytical tractability and comparability across countries. Another important contribution of this work is to show how consumer spending across the income spectrum can be characterized using a single, econometrically estimated demand system. Once calibrated to match observed national spending patterns, this demand system provides a unique poverty level of utility which provides an ideal benchmark for evaluating changes in poverty rates using any member of the class of poverty measures proposed by Foster, Greer and Thorbecke (1984). While we have illustrated this approach by providing an analysis of the Indonesian poverty impacts of trade liberalization, it can be readily applied to other countries. In this way we hope to enrich traditional analyses of multi-region trade liberalization, making them more relevant for policy makers who are increasingly concerned about the consequences of such actions for poverty in developing countries.

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Figure 1. Share of Households that are Agriculture Specialized vs. GDP/capita

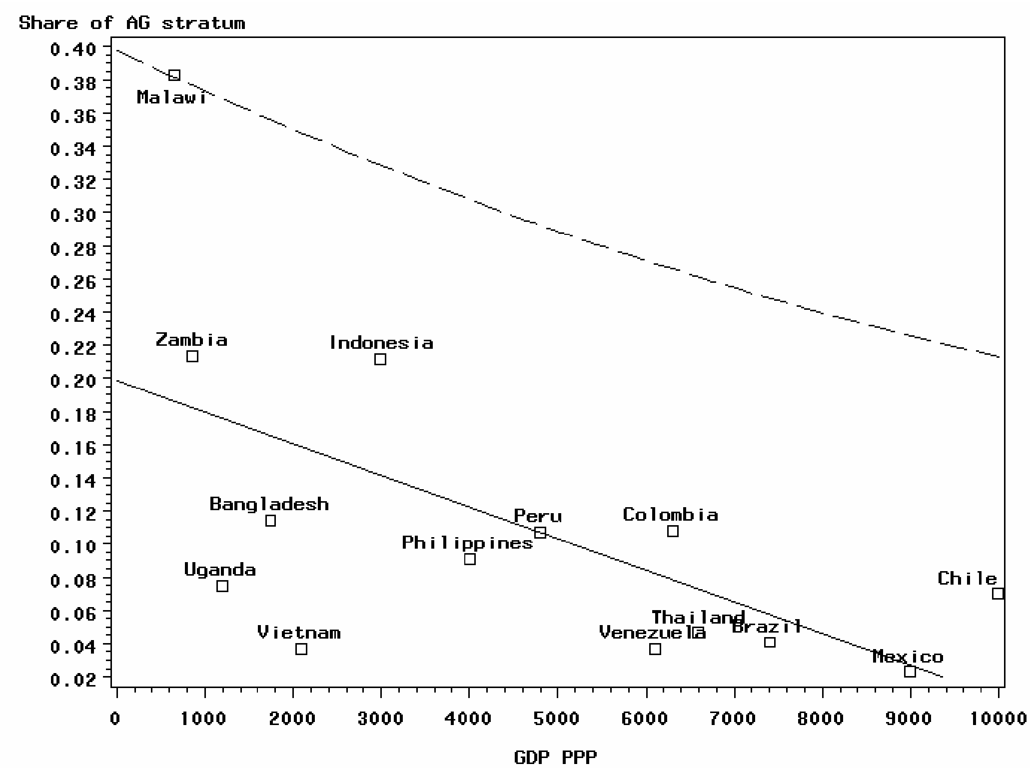

Figure 2. Share of Households that are Labor Specialized vs.GDP/capita

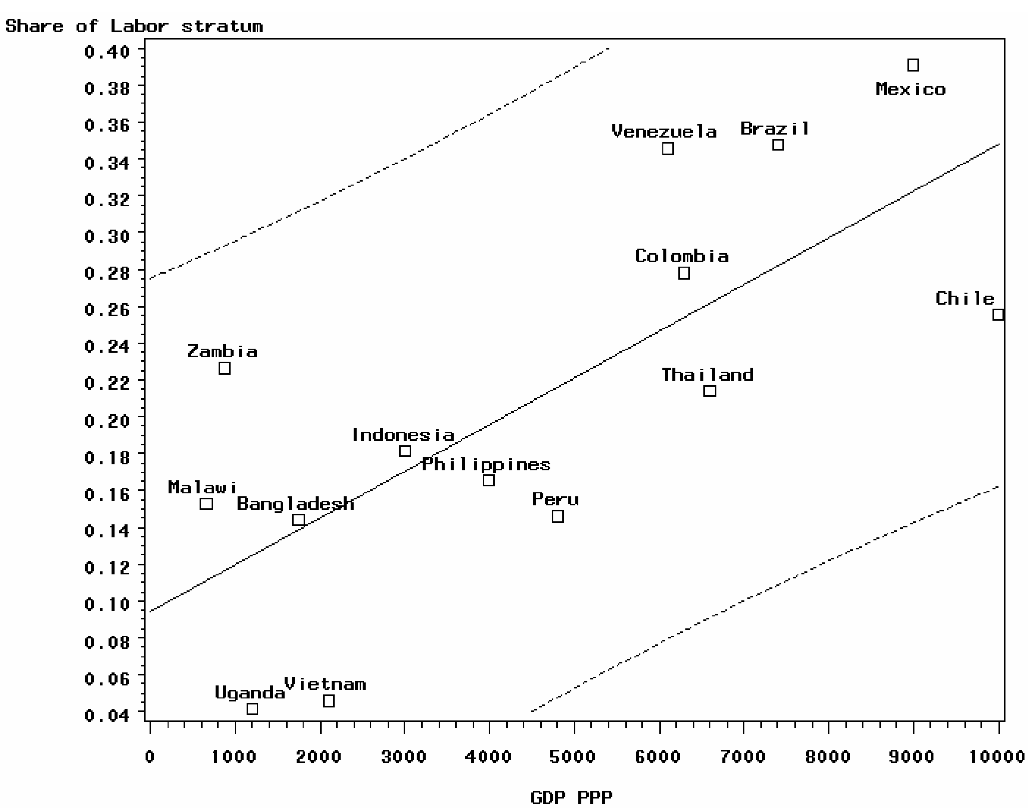

Figure 3. Agricultural Earnings Specialization in Indonesian Households

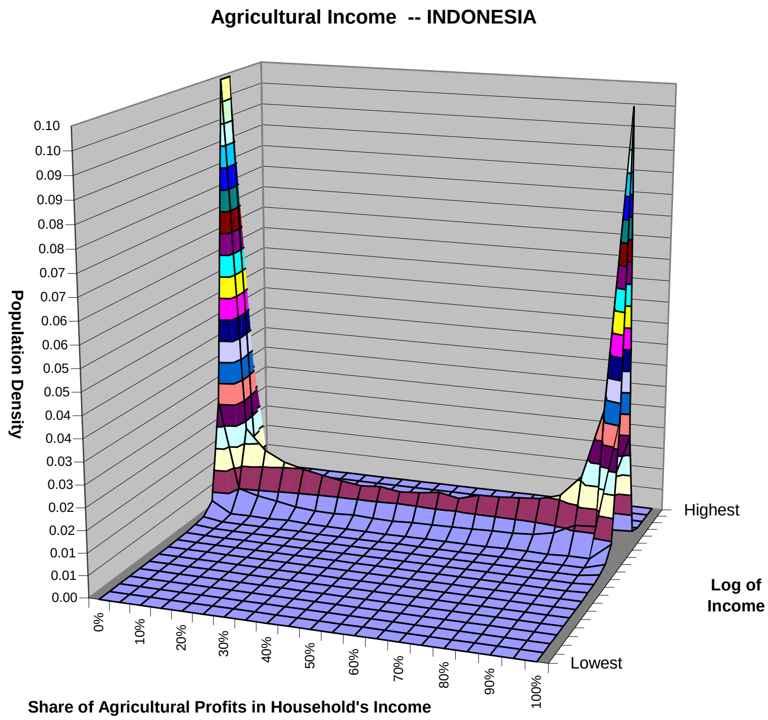

Figure 4. Labor Earnings Specialization in Indonesian Households

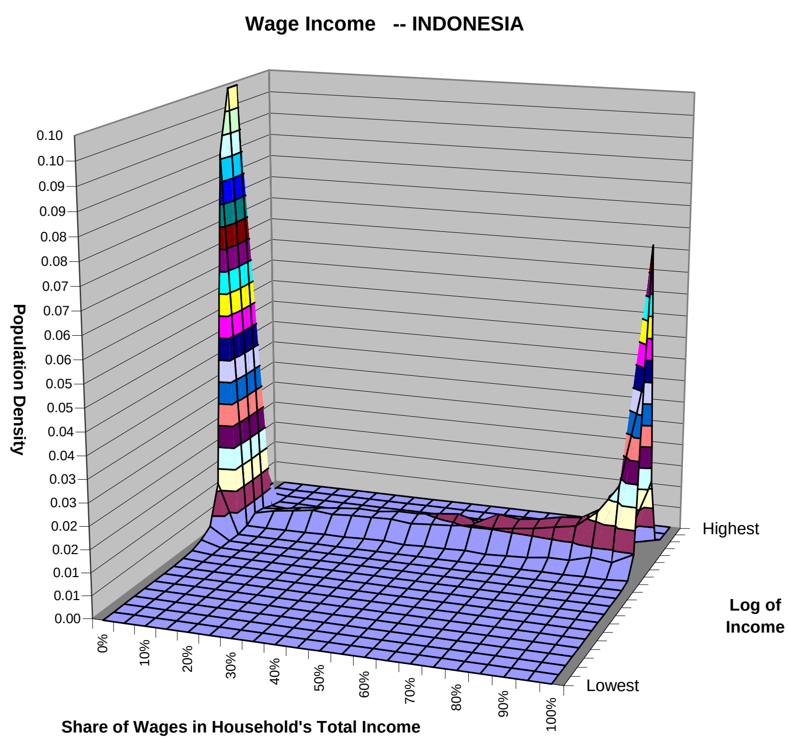

Figure 5. Imputation of Labor Earnings for Self-employed, Agriculture Households

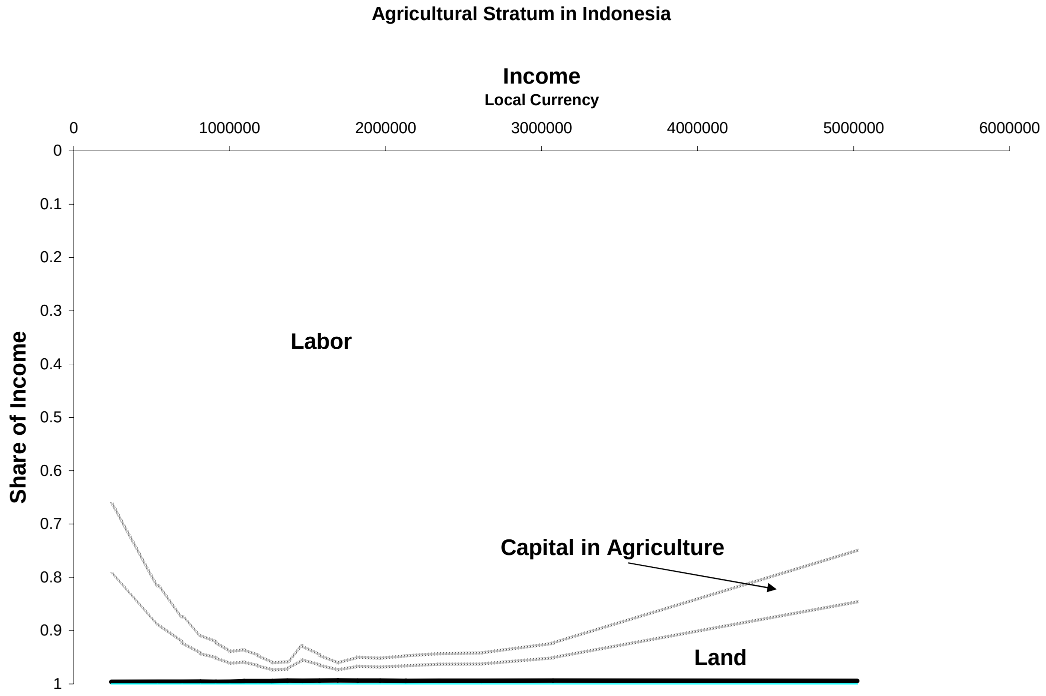

Figure 6. Imputation of Labor Earnings for Self-employed, Non-agriculture Households

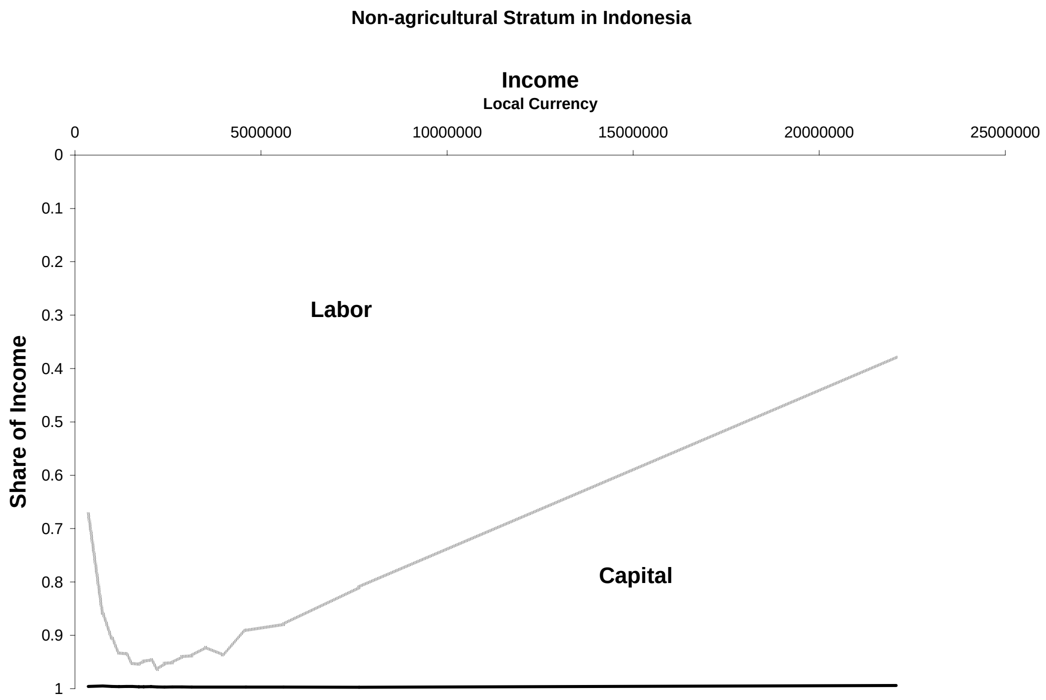

Figure 7: Predicted budget shares for Indonesia in 1997 using calibrated parameters

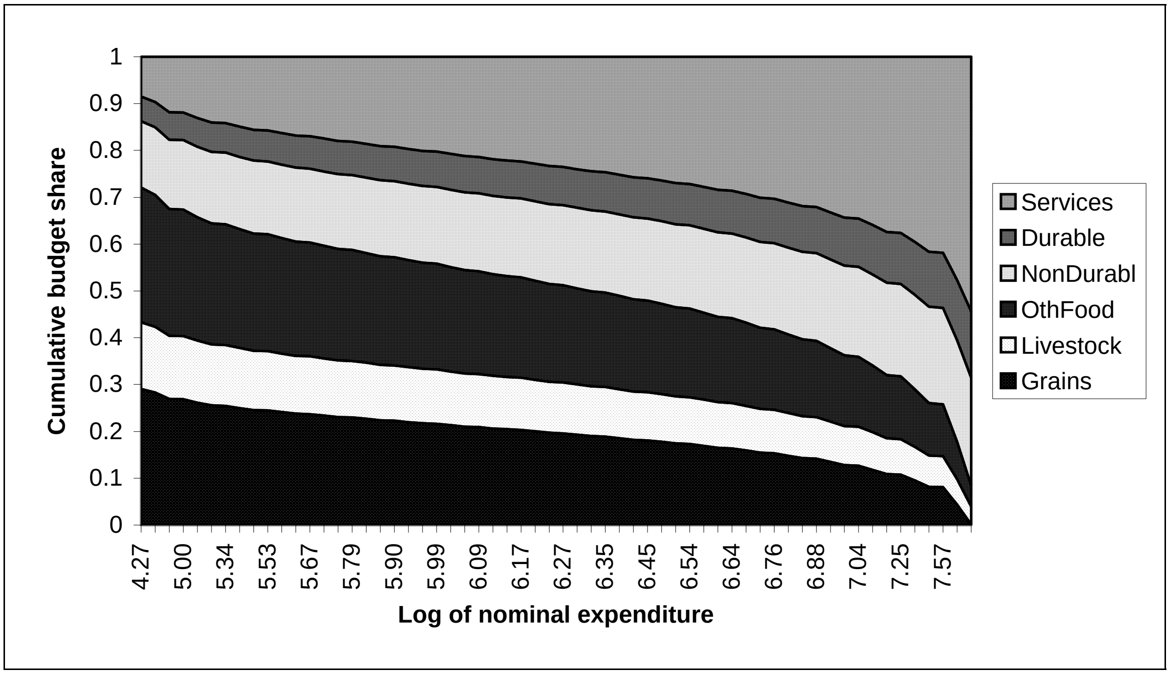

Figure 8. Equivalent Variation (relative to initial income) due to Global Trade Liberalization, by Stratum

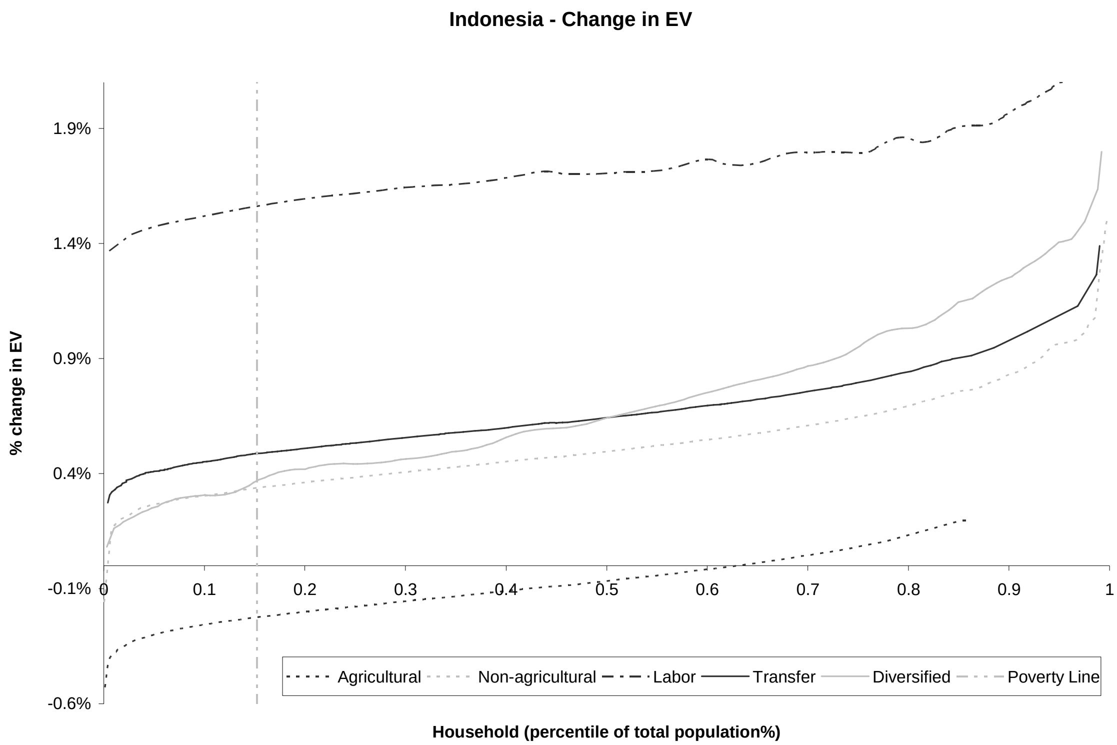

Figure 9. Consumption Impacts (relative to initial income) of Global Trade Liberalization, by Stratum

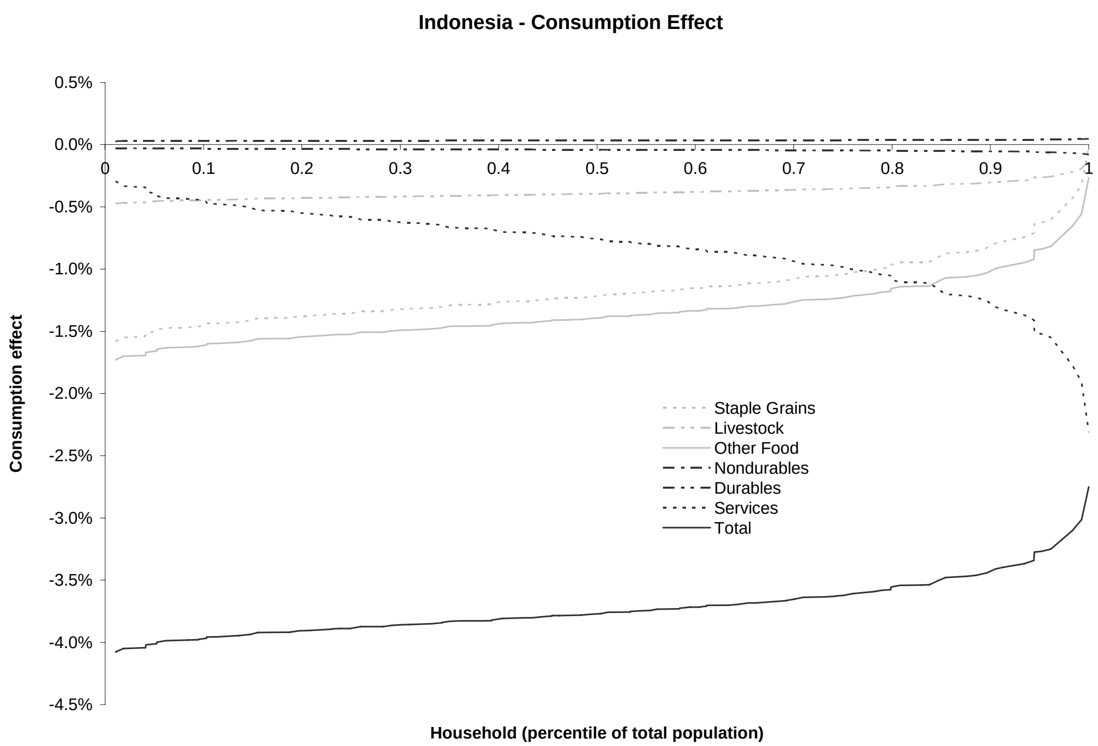

Figure 10. Composition of Earnings Price Effects within The Diversified Stratum.

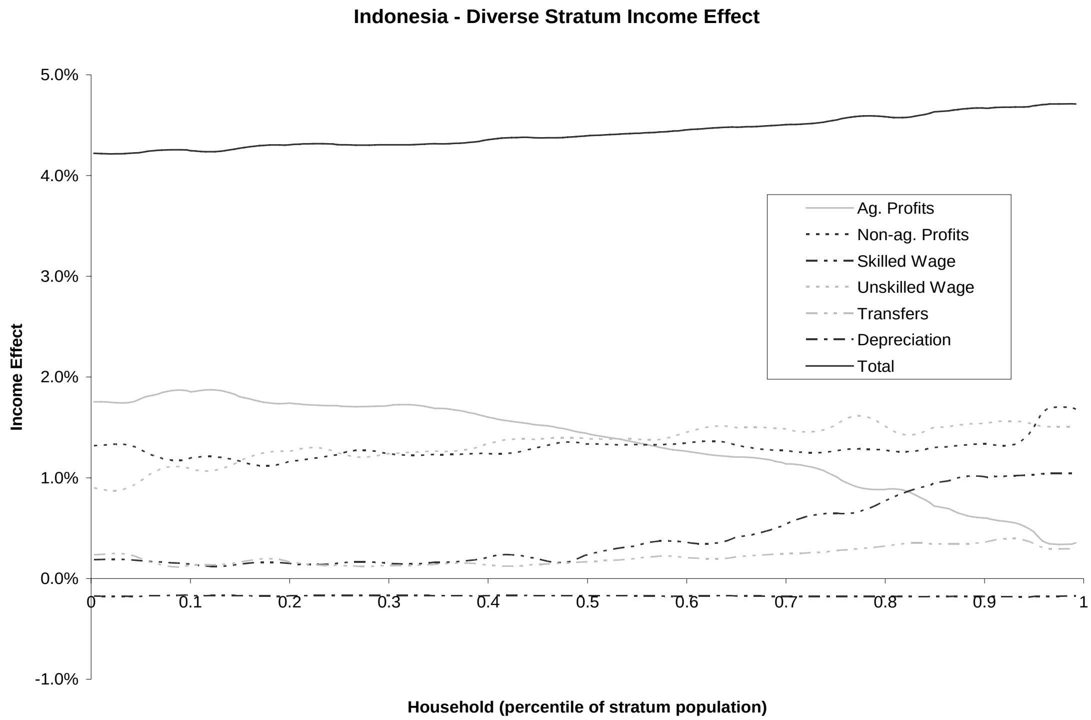

Figure 11. Composition of the Earnings Price Effects within the Wage Labor Specialized Stratum.

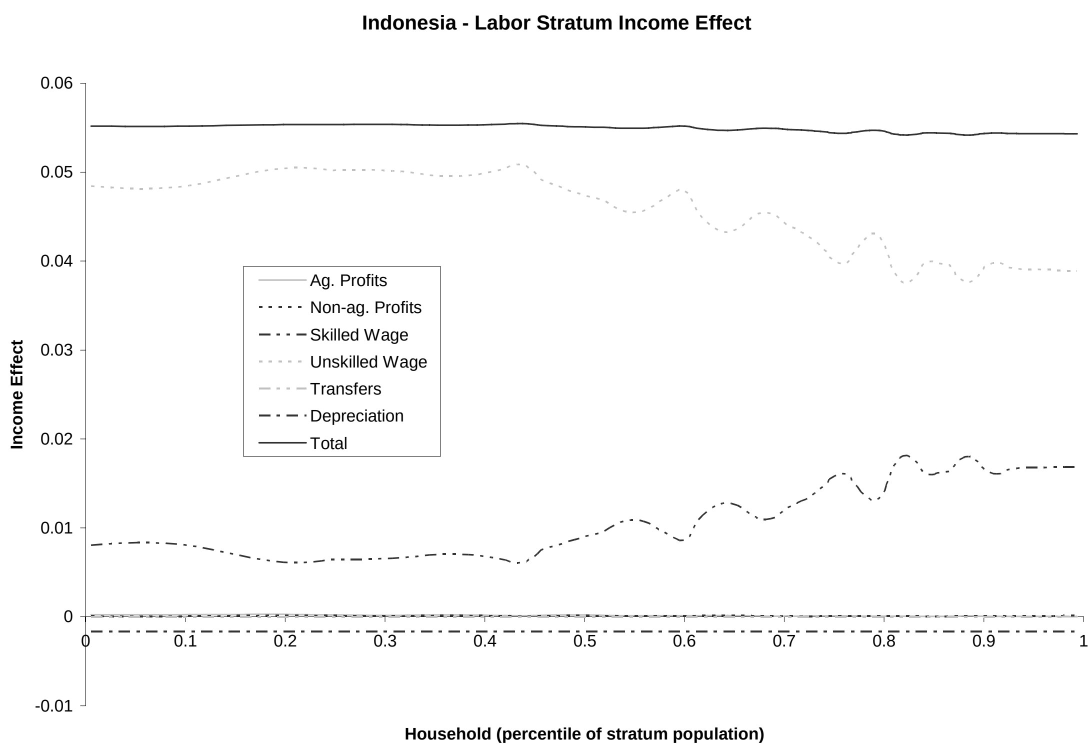

Table 1. Structure of Poverty Headcount in Indonesia, by Earnings-based Stratum

	Ag	Nag	Labor	Trans	Diverse	Total
Share in total population	0.21	0.15	0.18	0.01	0.44	1
Share in total poverty	0.34	0.11	0.07	0.03	0.45	1.00
Poverty rate in stratum	0.25	0.11	0.05	0.30	0.16	0.15

Table 2. Estimated Shares of Gross Factor Earnings

	Factor	**Ag**	**NonAg**	**Total**
	UnskWag	5.1%	12.7%	17.8%
	SklWag	0.0%	7.8%	7.8%
	Profits	14.5%	59.9%	74.5%
Profits	*Land*	*1.5%*	*0.0%*	*1.5%*
	Capital	*5.3%*	*37.9%*	*43.2%*
	NatRes	*0.9%*	*2.0%*	*2.8%*
	ImpUsklab	*6.9%*	*9.6%*	*16.5%*
	ImpSklab	*0.0%*	*10.4%*	*10.5%*
	Total	19.6%	80.4%	100.0%

Table 3a. Estimated AIDADS Parameter Values

	Grains	Livestock	Other Food	Non-durables	Durables	Services
α	0.233	0.203	0.333	0.151	0.035	0.044
β	0.000	0.051	0.047	0.262	0.113	0.528
γ	0.002	0.000	0.000	0.000	0.000	0.000

Table 3b. Calibrated AIDADS Parameter Values for Indonesia

	Grains	Livestock	Other Food	Non-durables	Durables	Services
α	0.314	0.151	0.308	0.135	0.045	0.046
β	0.000	0.038	0.043	0.231	0.142	0.547
γ	0.002	0.000	0.000	0.000	0.000	0.000

Table 4. Average tariff rates

	Indonesia	**Developed Countries**	**Less Developed Countries**
rice	6	91	14
wheat	2	64	24
feedgrains	4	14	60
othagr	8	11	23
oilseeds	7	25	37
rawsugar	n.a.	n.a.	n.a.
meatlstk	n.a.	n.a.	n.a.
rawmilk	2	3	25
forestry	1	1	3
fishing	8	3	9
fatsoils	10	9	28
Primary AG	**7**	**13**	**27**
procmeat	17	23	35
procdairy	7	25	30
procrice	0	72	19
procsgr	1	38	8
othprfood	16	18	25
bevtobac	86	11	47
Proc food	**15**	**20**	**30**
textiles	16	7	16
wearapp	25	14	15
Textiles, apparel	**16**	**11**	**16**
autos	42	2	20
electronics	9	2	5
othmnfcs	5	2	9
other manuf	**10**	**2**	**9**
woodpaper	6	1	9
mining	3	0	4
pchemineral	8	2	10
metals	9	2	9

Table 5. Aggregated Market Price Changes in Indonesia

	Short Run								Long Run	
	Indonesia's own liberalization		Trade liberalization by developed countries		Trade Liberalization by developing countries					
	in agricultural commodities	in non-agricultural commodities	in agricultural commodities	in non-agricultural commodities	in agricultural commodities	in non-agricultural commodities	Total			LR Total
Factors									**Factors**	
Agricultural Profit	-0.8	-1.7	3.9	2.0	0.1	0.0	3.5		Land	5.3
NonAgricultural Profit	-0.3	-0.1	1.5	3.2	0.1	-0.3	4.1		Capital	5.0
Unskilled labor	-0.4	0.0	2.1	3.4	0.1	0.1	5.3		Unskilled wage	6.1
Skilled labor	-0.4	0.1	1.6	3.3	0.1	0.1	4.8		Skilled wage	5.3
Public Transfers	-0.5	-0.2	2.0	3.1	0.1	-0.2	4.4		Public Transfers	5.7
Private Transfers	-0.5	-0.2	2.0	3.1	0.1	-0.2	4.4		Priv Trans	5.7
				Producer Prices						
Commodities										
Staple grains	-0.5	0.1	3.4	2.6	0.1	-0.3	5.4		Staple grains	7.1
Livestock	-1.4	0.2	2.5	2.3	-0.3	-0.3	3.0		Livestock	5.3
Other food	-1.3	0.8	5.0	1.7	0.5	-0.7	6.1		Other food	6.3
Nondurables	-0.1	-3.7	0.7	2.8	-0.1	-0.7	-1.2		Nondurables	0.7
Durables	0.0	-9.8	0.1	1.3	-0.1	-0.4	-8.8		Durables	-9.7
Services	-0.2	0.8	1.3	2.4	0.0	-0.1	4.2		Services	5.8
Margin services	-0.2	0.8	1.3	2.4	0.0	-0.1	4.2		Margin services	5.8
				Consumer Prices						
Commodities										
Staple grains	-0.4	0.2	3.1	2.5	0.1	-0.3	5.2		Staple grains	6.8
Livestock	-1.2	0.3	2.3	2.3	0.1	-0.6	3.2		Livestock	5.4
Other food	-1.1	0.8	4.5	1.8	0.2	-0.3	5.9		Other food	6.2
Nondurables	-0.1	-3.0	0.8	2.8	0.0	-0.7	-0.3		Nondurables	1.6
Durables	-0.1	-2.2	1.0	2.1	0.1	-0.2	0.5		Durables	1.4
Services	-0.2	0.8	1.3	2.4	0.1	-0.1	4.2		Services	5.8

Table 6. Poverty Head-Count Impacts of Global Trade Liberalization in Indonesia: Short-run (by Stratum and Liberalizing Sector/Region) and Long-run (by Stratum only)

		Indonesia: Percentage Change in Poverty, by Stratum					
		Agriculture specialized	Non-agriculture specialized	Labor specialized	Transfer specialized	Diversified	Total
Country's own liberalization	in agricultural commodities	0.4	-0.6	-0.4	-0.3	-0.1	0.0
	in non-agricultural commodities	3.1	-0.2	-0.4	0.1	1.3	1.6
liberalization by DC's	in agricultural commodities	-2.4	2.6	1.5	1.2	-0.1	-0.5
	in non-agricultural commodities	0.4	-2	-2.4	-1.4	-1	-0.7
liberalization by LDC's	in agricultural commodities	-0.1	0.1	0	0	0	0.0
	in non-agricultural commodities	-0.8	-0.3	-1	-0.4	-0.7	-0.7
Short Run Total Change in Poverty Headcount		0.7	-0.5	-2.8	-0.9	-0.6	-0.3
Long Run Total Change in Poverty Headcount		-1.1	-1.2	-1.6	-0.8	-1.2	-1.2

[i] See also the survey paper by Alan Winters (2000), and the handbook on trade liberalization and poverty by McCullogh, Winters and Cirera (2001).

[ii] Other good examples are offered by Löfgren (1999) and Evans (2001).

[iii] See also the recent survey of papers in the trade and poverty area authored by Reimer (2002).

[iv] These surveys were collated at the World Bank during the summers of 2001 and 2002.

[v] The equal sharing assumption is clearly problematic, as it is only a special case of what would be found in a more general bargaining model of intra-household behavior (Bourguignon and Chiappori, 1994). This assumption will tend to understate income inequality, although the impact on poverty measures is less clear (Haddad and Kanbur, 1990).

[vi] Note that, while Figures 1 – 4 utilize households as the unit of observation, in Table 1 we have converted to population, assuming the equal-sharing of income among household members. Thus this table reports that 21% *of the population* resides in the agriculture-specialized stratum.

[vii] This imputation has also been undertaken for the other countries in our sample. The results are available, upon request, from the authors.

[viii] Since children under 12 years of age are typically excluded from the employment questions of the household survey, it is also possible that these apparent returns to non-labor inputs are really returns to child-labor. In fact, we find this pattern in many of the other countries as well.

[ix] In order to match up with the survey data definitions, we define agriculture as including fisheries and foresty.

[x] This figure comes from the 1997 version 5 GTAP data base for Indonesia. It is based on an updated version of the 1993 Indonesia Input-Output table (Biro Pusat Statistik).

[xi] An alternative would be to increase all non-farm profit-type income by the same proportion. However, when we have done so, the income adjustment is sufficient to lift most of the affected households out of poverty. We do not believe this is realistic, and given our focus on poverty, we choose to make the adjustment for the richest households.

[xii] The apparently excessive capital intensity of the GTAP data base for developing economies, particularly those in Southeast Asia, points to a pervasive problem of under-estimating returns to self-employed labor. Utilizing the survey data in this way promises to improve the GTAP data base for these countries.

[xiii] In the cases where we don't have original survey data and only quintile data are available, we approximate a finer distribution of expenditure across fifteen expenditure levels for each observation in the ICP data set. These fifteen expenditure levels are equally allocated across the five quintiles (i.e., there are three expenditure levels within each quintile).

[xiv] After estimating a common AIDADS demand system across all countries in the ICP sample, we adjust them on a country-by-country basis so that they match observed per capita spending patterns. This adjustment takes two steps. The first step takes the subsistence budget share as fixed and uses the ratio of the actual discretionary budget share to the fitted discretionary budget share to rescale the remaining parameters of the AIDADS demand system. In the second step, the level of utility and a scaling parameter in the AIDADS utility function are calibrated to match the observed expenditure pattern in each country. The result is a country specific AIDADS utility function and demand system that matches actual consumption.

[xv] Since the base years and commodity definitions differ between the ICP data and the survey, the per capita expenditure shares also differ.

[xvi] The only taxes that we model explicitly are indirect taxes. These are reflected in the difference between consumer prices and gross factor earnings.

[xvii] Note that our *post-simulation* incidence analysis abstracts from the potential impact that the resulting changes in income distribution might have on relative prices. Given the relatively modest shifts in income, coupled with modest differences in consumption shares, we do not believe the resulting approximation error to be very severe. This issue could be resolved if the disaggregated households were directly incorporated into the trade policy model (e.g., Cogneau and Robilliard, 2000). This, however, is a major undertaking and is beyond the resources available in a relatively detailed CGE model of the global economy.

[xviii] Since the AIDADS parameters are modified to replicate observed *per capita* consumption in each region, the AIDADS parameters differ by country. (See also previous discussion of this.)

[xix] National depreciation is obtained from the GTAP data base. This estimate comes originally from the World Bank. We compute the share of depreciation in gross capital income and apply this to the micro-simulation data base.

[xx] This fixed share assumption for government spending is not strictly true in the standard closure for version 6.1 of the GTAP model – due to non-homotheticity of private consumption. Therefore, since we want this to hold exactly, we introduce a preference shift for regional household utility function such that the shares of private and public consumption and savings in net national income are fixed.

[xxi] GTAP users will recognize that the MFA quota rents are treated as export taxes in the model. However, these rents rarely accrue in full to the government price, so we have omitted them from the tax replacement equations.

[xxii] For ease of comparison, these have been placed on a *cif* basis and combined with the average import tariffs on textiles and apparel in Table 3.

[xxiii] In this long run closure, the elasticity of transformation of agricultural land across uses is set at -1.0, the default value in the GTAP parameter file.

[xxiv] Note that the model generates these price changes for all of the regions in the model. Due to space limitations, we explore only the implications for Indonesia in this paper. However, the analysis could be easily extended to the other 13 countries for which survey data have been incorporated into the model.