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Is the Threat of Food Crisis Over?:
Implications of Rising Food Prices on Central America[1]

Paolo Giordano and Masakazu Watanuki[2]

Preliminary draft for discussion: comments are welcome.

Abstract

Based on the very recent episode of the global food crisis, this paper evaluates the impact of rising food prices on poverty and inequality in Central America, where poverty is chronic and historically high, hindered by inequitable and inflexible distribution of income. Although food prices sharply declined by a third from their record highs reached in the middle of 2008, they are still high for many developing countries, and the threat of another food crisis persists as several agencies warn in their projections and evaluations in the long-term food security standpoints. The study applies the two-stage, top-down CGE-microsimlation approach, imposing the exogenous price shocks from 2006 to mid-2008 on food products.

The study finds that the immediate price shocks have devastating impact on poverty. More than 2 million people will be pushed into poverty, equivalent to 6.4 percent of the region's population. The supply response slightly reduces the negative impact, but is not strong enough to offset the adverse effects. This is due to two factors. First, Central America is a complete importer of staple agricultural products so that the region cannot benefit from rising food prices. Second, adverse effects limit the gains, largely because the vast majority of households are net consumers of foods products and has larger share of food consumption expenditures. Nevertheless, the supply response will lift 182,000 people out of poverty. Finally, the elimination of tariffs has limited effects in mitigating the adverse effects. Since applied tariffs on food products are already low due to large trade openness. Yet tariff elimination contributes to save 217,000 people out of poverty and 176,000 people from indigent poverty. This suggests that Central America needs to formulate well designed combination of policy measures, targeting consumers, producers and trade. The impact on income inequality is marginal, but positive in all experiments narrowing the income gaps.

Keywords: Food Crisis, Central America, Poverty, CGE Model, Microsimulation

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[2] The views expressed in this paper are those of the authors, and do not necessarily reflect views of the Inter-American Development Bank and its member countries. The authors are responsible for remaining errors and omissions. Paolog@iadb.org; masakazuw@iadb.org.

1. Introduction

The second half of this decade, the world saw huge swing in food prices. Since 2006, food prices began to rise sharply. According to the United Nations Food and Agriculture Organization (FAO)[3], food price indices rose by 10 percent in 2006 and jumped by 41 percent in 2007 until reaching the record highs in the middle of 2008. The World Bank (2008a) estimates that the increase in food prices between 2005 and 2007 may have pushed the world population between 73 and 105 million into poverty. Civil protests and riots took place in numerous mostly poor countries, and social unrest and political tensions flared up in many parts of the world. Since the middle of 2008, the world prices declined sharply, as agricultural commodity markets significantly weakened. By the end of the year, the food price indices dropped by a third and remain at the level of early 2007 onwards. Because of the steep price fall, the once critical issue of rising food prices that have dominated headlines in the last couple of years has no longer the forefront of the international policy agendas.

Is the threat of the global food crisis over? At the first glance, lowering food prices are good news for many people in the world. But the answer is certainly not yet for the poor in many developing countries. FAO (2008a) warned against this "false sense of food security", claiming that the recent decline in prices should not be taken to mean that the world's food problems have been fixed, neither in the short-run nor with a view to the long-term challenges. It also cautioned that despite the fall in food prices, the world might face a repeat of another food crisis.[4] Likewise, Chatham House (2009) suggests that the recent falling prices are a temporary respite and the global prices are set to rise again. In fact, the World Bank (2008b) projects that by 2030, world demand for food will increase by 50 percent and for meat by 85 percent. All of these push up world food prices much higher. OECD-FAO (2007) projects that food prices will be kept above historic equilibrium levels during the next 10 years. The updated projection also indicates (OECD-FAO, 2008) that, compared with the average of the previous 10 years, the prices remain fairly high over the next decade.[5] This implies that at some point in the future, there will be a real threat of a "food crunch", which will be hard particularly for food-importing countries and for poor people in developing countries.

Based on the very recent episode of the global food crisis and future prospective, the central objective of this paper is to measure the impact of soaring food prices on poverty and inequality in Central America. The effects of the increase in food prices are heterogeneous, and will considerably differ among households. The spike in food prices has the overall adverse effects, reducing real income and well-being of the large population particularly in the net food-importing countries. Soaring prices will exert severe difficulties for low-income households, pushing them into poverty and forcing the poor to be poorer. However, there will be some, even a small number, households may benefit from rising food prices. An increase in food prices may generate additional income gains for some segments of producers.[6] The second objective is to quantify the effect of tariff elimination, one of the most widely applied policy

[3] Agricultural Food Price Indices (FAO) released in April 2009.

[4] FAO (2008a) reports that the recent financial crisis has amplified downward price pressure on many food products, squeezed credit markets for small farmers and raised greater uncertainty in the world agricultural market, so that many producers may cut back farm production and take very conservative planting decisions. It suggests that, if these situations persist, a new price hike might take place even in 2009/10 harvest season, which would be more severe, once happens, than the recent one.

[5] OECD-FAO (2008) estimates that the projected prices for 2008-2017 will be, in nominal terms, on average around 20 percent higher for beef and port, some 30 percents for raw and white sugar, 40-60 percent for wheat, maize and skim milk powder, more than 60 percent higher for butter and oilseeds and over 80 percent higher for vegetable oils.

[6] FAO (2008b) finds, though, that in the recent food crisis, the hardest hit were actually poor subsistent producers in developing countries. Due to rising input costs, they could not reap the benefits of higher prcies, as their supply response was very small and limited.

measures to stave off rising food prices.[7] At the national level, the effects largely depend on the aggregate consumption patterns and production structure. For each household, the impact greatly hinges on the magnitude of price effects particularly on staple foods and income effects. Thus, the study evaluates how effective tariff elimination would be as policy measures to cope with the increase in food prices.

Central America is the region with high and chronic poverty, with the exception of Costa Rica. In 2004, the poor are recorded at 17 million, equivalent to 50 percent of the region's population. Poverty is still considerably high in rural and backward regions.[8] This situation is aggravated further by inequitable and inflexible distribution of income, common social traits in Latin America. Central America is also the region with huge surplus in agricultural trade account: $2,000 million trade surplus out of $8,150 million exports in 2007.[9] In particular, each country has large surplus in agricultural trade. This suggests that Central America might be better positioned to benefit from high food prices. Ferreira Filho (2008) finds that Brazil with sizable surplus in agricultural trade balance will benefit from the rising food prices in reducing poverty by expanding agricultural production and boosting exports. In the similar vein, FAO (2008a) states that, while rising food prices inflict tremendous hardship and suffer a large number of people in developing countries, they will also stimulate a supply side response, transmitted to increase food production in rural areas. Soaring global food prices will certainly reduce social welfare for many, but they are also expected to provide an opportunity in the efforts of reducing poverty.

Recently several studies evaluate the impact of the soaring food prices on poverty for Central America. Robles et al (2008) examine the poverty impact for 19 countries in Latin America including five Central American countries, applying a uniform 30 percent increase in the global food prices as a central experiment, which is directly passed onto consumers. They find fairly large adverse effects on poverty, ranging from the lowest 4.2 percentage point in Honduras to the worst 8.0 percentage point in Guatemala. Likewise, Zezza et al (2008), based on the so-called "net producer vs. net consumer" approach, examine the immediate impact in the absence of the supply response for 11 developing countries including Nicaragua, and find that the poor lose the most from an increase in staple food prices. On the other hand, Ivanic and Martin (2008) evaluate the effects of high global food prices for selected developing countries, applying the top-down CGE-micromulation approach, combining the concept of agricultural household income model, proposed by Singh, Squire and Strauss (1986) and Deaton (1997).

This study applies the two-stage, top-down CGE-microsimulation methodologies in sequence. The CGE model runs for two experiments in the medium term. First it evaluates the exogenous price shocks, which are transmitted into domestic markets only through trade. This experiment is designed to capture the supply response in production process—changes in factor remunerations and demands, as domestic market responds to the exogenous price shocks. The second experiment evaluates the impact in the presence of tariff elimination on food products as the measure of policy intervention. The impact on poverty is measured in three stages. First, the poverty impact is examined as the immediate price shocks fully passed onto households, with neither supply response nor any policy interventions. The second corresponds to the simulation-1 experiment plus incorporating the supply response in production. Finally the third is concerned with the complete tariff elimination as the selected policy countermeasure on food products in addition to the simulation-2 experiment.

[7] FAO (2008b) reports that a large number of countries have applied more than one policy measure to respond to the rising food prices. But the magnitude and coverage differ significantly among countries. Among the policy tools, however, the most widely used are: (i) reduction or suspension of import tariffs applied for 68 countries; and (ii) support to domestic production with agricultural inputs and credit adopted by 63 countries.

[8] The poverty headcount is 82 percent in rural areas in Honduras, followed by 70 percent in Guatemala and Nicaragua. See table 1.

[9] According to COMTRADE, Costa Rica enjoys the largest trade surplus of approximately 1,400 million in 2007, followed by Guatemala ($600 million). In contrast, El Salvador is the only country with the trade deficit amounting to $200 million in agricultural trade.

The simulation results show that the spike of food prices has huge devastating impact on poverty. The immediate price shock pushes more than 2 million people into poverty, equivalent to 6.4 percent of the region's population. Poverty is harvest on poor people in poorer countries. When the supply response is considered in the medium term, this will lessen the negative impact, but not as strong as expected in other countries in Latin America. This is because Central America is a complete importer of staple foods, despite the fact that the region as a whole has a huge surplus in agricultural trade account. Yet the supply response has a positive effect on domestic agricultural production and wages for unskilled workers. Around 182,000 poor people will be lifted out of poverty; 60 percent are in rural areas. The study also finds that tariff elimination itself has a very limited effect to cope with soaring prices. This is simply because applied tariffs in Central America are very low in effect within the intra-CACM market and with the United States. But this policy measure is expected to lift 217,000 people from poverty and 176,000 from the indigent poverty. In all experiments, the effect on inequality is considerably marginal, but will be positive.

The rest of the paper is organized as follows. Section 2 documents income structure and analyzes poverty and inequality in Central America in 2004 base year, before the global food prices rise. Section 3 briefly presents the analytical methodologies—CGE-microsimulation approaches. The section 4 is the core of the study, analyzing the impact on macroeconomic variables and on poverty as well as income inequality. The section also reports the trend of global food prices, and analyzes the structured of trade, production and demand focusing on the food sectors. Finally, Section 5 summarizes the main findings and conclusions.

2. Structure of Income, Poverty and Inequality in Central America

Structure of Income Generation Process

Based on the recent national household sample surveys, [10] Figure 1 presents per capita income decomposed by deciles for each country in Central America. This provides key information of income structure for different income groups. Income generation process is highly heterogeneous at each household level, depending greatly on skills, experience, education, gender and so on. While showing some common features, it also reveals significant heterogeneities in the composition of income generation over urban-rural zones as well as across countries.

Clearly labor income is the main source of per capita income in all countries, but its importance differs greatly among countries and to a lesser extent over regions. Costa Rica has largest reliance on labor income in a range between 80 and 90 percent with small variations over deciles. The exception is the poorest decile-1 in both urban and rural regions, where labor income constitutes approximately 70 percent. In El Salvador, the share of labor income increases from 60 percent in the lowest decile-1 to 90 percent in the highest decile-10, as income rises. On the other hand, labor income share is less asymmetric over deciles in Guatemala, Honduras and Nicaragua in both urban and rural zones.

<INSERT FIGURE 1>

[10] The source of household survey data is the Program Improving the Surveys of Living Conditions in Latin America and the Caribbean (MECOVI), IDB: Costa Rica, Encuesta de Hogares de Propósitos Múltiples (2004); El Salvador, Encuesta de Hogares de Propósitos Múltiples (2004); Guatemala, Encuesta Nacional de Emploe e Ingresos (2004); Honduras, Encuesta de Condiciones de Vida (2004); and Nicaragua, Encuesta Nacional de Hogares sobre Medición de Niveles de Vida (2005).

However, the composition of labor income decomposed by unskilled and skilled categories greatly differs over income deciles. Unskilled Labor income is the dominant source of income particularly for how income population in rural area. In Honduras, this type of income alone accounts for roughly 80 percent of the per capita income for the lowest half of rural population. Likewise, its share is around 60 percent in rural area in El Salvador, Guatemala and Nicaragua, with exceptions in the highest income deciles in Guatemala and Nicaragua. In sharp contrast, skilled labor income becomes an important source of income for urban households. Furthermore, its share sharply increases, as income level rises. This is true in urban zone across Central America. The most obvious case is in urban area in Costa Rica, where the share of skilled labor income goes up from 20 percent in decile-1 to 75 percent in the highest income decile-10.

In Central America, transfer income, which includes various government subsidies, pensions, transfers among households, also plays a key role in the composition of income. Its share accounts for more than 40 percent for highest income deciles in Guatemala (both in urban and rural zones), and in rural area in Nicaragua, followed by the lowest decile in Guatemala. In Honduras and Nicaragua, the share of transfer income tends to increase, as household income rises. The opposite is the case in Costa Rica and El Salvador. Across Central America, remittance is also an important source of income. In El Salvador, remittance accounts for nearly 10 percent of income for the low income group, much larger than domestic transfers. In Nicaragua, higher income households tend to rely more on remittance than low income groups in both urban and rural areas.

Another important aspect regarding per capita income is the sizable income disparity not only between rich and poor households but also between rural and urban areas. The distribution patters of per capita income over the deciles are in common with countries in Central America. The mean per capita income of the poorest deciles is only around 5 percent of the regional mean income in Guatemala, 8 percent in Honduras, and 15 percent in Costa Rica. This ratio progressively rises up to around 1.5 of the regional mean in deciles-9. Yet the striking fact is that the mean per capita income of the highest income docile is far above the regional mean. In El Salvador and Honduras, it is 3.5 times greatest than the regional average, the larger income gaps in Central America. Guatemala and Costa Rica follow with income differentials of 3 times. In Nicaragua, the mean income is 2.5 time higher, the smallest in Central America. In the meantime, there exists huge regional income disparity between urban and rural areas. The worst is Honduras, where the mean income in urban area is 2.9 times greater than that of rural figure. Nicaragua follows with 2.4-time mean income gap. In El Salvador and Guatemala, the urban mean income is around twice as large as rural one. Costa Rica has the lowest regional income disparity with 50 percent per capita income gap.

<INSERT FIGURE 2>

Poverty and Inequality in Central America

Poverty continues to be an important development challenge in Central America. Table 1 presents the profiles of poverty and income inequality along with some social indicators—population, population share and household size. Poverty is estimated on the basis of the national poverty lines in each country with decomposition of urban and rural zones, adjusted by regional sampling weights using national population statistics. Poverty is evaluated by the population.

<INSERT TABLE 1>

In Central America, Costa Rica has the lowest poverty incidence, but nationwide one over every four people still lives under the poverty threshold. This roughly corresponds to 1 million of the population, distributed by 395,000 in urban and 615,000 in rural. The country also has the smallest differentials of

poverty over urban and rural zones. Poverty rate in rural area is 4 percentage-points above the national average, and the same percentage-point lower in urban area. By region, Brunca has the highest poverty rates (45 percent), followed by Chorotega and Huetar, both of which are sparsely populated and with agricultural origin. The incidence of the extreme poor is 7 percent nationwide equivalent to 293,000 people, with slightly higher incidence in rural area. The extreme poverty rate is over 10 percent except Central and Atrantic Huetar, with the highest rates (15-16 percent) in Chorotega and Brunca. Regarding income inequality, Costa Rica is the least inequitable country with 0.51 GINI index in Central America. This is largely attributed to the lowest regional income gap, in spite of the large income differentials of the highest deciles (see Figure 2). Costa Rica is the only country, which shows lower income inequality in urban area, albeit slightly, than rural zone.

El Salvador has the second lowest poverty rate (41.1 percent of the population) in Central America after Costa Rica. This roughly corresponds to 2.8 million people, and equally distributed over urban and rural areas. The rural poverty rate is 8 percentage-points over the national mean, twice as large as that of Costa Rica, but this is relatively low, compared with Guatemala, Honduras and particularly Nicaragua. Nearly half of the population lives below poverty in Occidental, East Central and Oriental regions. In these regions, the headcount of extreme poverty is around 20 percent of the regional population. Due to the population distribution, Occidental and Oriental regions account for approximately half of the nation's poor. This is also true for the extreme poor. Income distribution is fairly inequitable nationally, which is slightly higher than the Latin American average.[11] But this is more serious at regional levels. Within the country, high inequitable distribution of income is correlated with low regional income. Inequality is high in Occidental, East Central and Oriental regions.

In Guatemala, poverty headcount is 55.6 percent, implying that more than half of the population lives below poverty line, corresponding to 5.8 million people. The incidence of the poor is considerably heterogeneous over regions. Approximately a quarter of the people are poor in metropolitan, while the poverty incidence doubles in urban area outside the metropolitan. But the poor heavily concentrate in rural area, which accounts for 67 percent of the poor people in the nation. Extreme poverty is a serious threat for Guatemala. Nationally 23 percent of the population is classified as being extreme poor, or 2.6 million people. The incidence jumps to more than 30 percent in rural area, which accounts for three quarters of the national extreme poor. Income distribution is considerably inflexible in Guatemala, second worst in Central America after Honduras. In contrast with El Salvador, low income rural region is associated with relatively equitable distribution of income, whereas urban region outside the metropolitan area has the highest inequality.

Honduras has the highest incidence of the poor in Central America, and is one of the poorest countries in Latina America. At the national level, poverty measured by headcount reaches 70 percent of the population. In addition, 45 percent of the population is extreme poor or indigent. Poverty is extremely high in Occidental and Oriental regions. Particularly in Occidental region, 86 percent of the people live below poverty, and approximately two-thirds are under extreme poverty. In these two rural regions, poverty gap—income-gap measure—is also extremely high. In contrast, Central region has relatively low poverty rate in the country, but its level is still fairly high, compared with other countries. Regarding the number of poor people, 55 of the national poor live in Central region with the highest income, implying large degree of income inequality. Honduras is the worst in terms of income inequality in Central America with GINI index of 0.635, and one of the worst in Latin America. This is well explained by the fact that the country has highly skewed income distribution in favor of the richest deciles, greatest income disparity between urban and rural zones as mentioned previously and a large number of the poor in high income Central region.

[11] See CEPAL (2006). The simple average of 18 countries is 0.536 for 2003/2005.

In Nicaragua, approximately half of the population lives below poverty line (2.5 million), and 17 percent are classified as extreme poverty (880,000). Poverty is largely dichotomized into east-west geographic divide. Managua and Pacific region with high population density and facing the Pacific Ocean have lower poverty rate than the national average. In constant, rural hinterland (Central and Atlantic) with sparse population has higher poverty rates, more than 10 percentage-points larger than the national average. In these regions, approximately a quarter of the residents are in extreme poverty. By region, 40 percent of the poor in Nicaragua live in Central region. In recent years, Nicaragua has slightly improved inequality, but its level is still high in Latin America (ECLAC, 2006).But compared with other countries in Central America, inequality is relatively low. Interestingly Managua, capital region, has the lowest inequality in the country, despite its mean income is 40 percent higher than the national average.

3. Methodology

This study applies a CGE model-microsimulation methodology in a two-step, top-down sequential approach. At the top tier, a multi-region global CGE model, incorporating five countries in Central America, evaluates the impact of rising global food prices. At the second stage, the microsimulation analysis is carried out to measure the impact on individual households in each country in Central America, simulated by the CGE model.

IDB-INT CACM CGE Model

This study uses a computable general equilibrium (CGE) model to evaluate the economic and distributional impact of soaring global food prices on Central America. The core of the framework and theoretical structure is based on the previous work by Giordano and Watanuki (2007), Giordano, Parra and Watanuki (2008), and particularly Giordano and Watanuki (2008) newly developed to assess the impact of trade policy option for Central America with the European Union on poverty and inequality.[12]

The model is a global, multi-region, static model comprising 27 sectors plus 19 countries and regions identifying all 5 member countries in Central America. [13] All countries and regions are fully endogenized and linked only through trade. Thus, the model only deals with the real side of the economy and does not consider financial or monetary markets. It is built on individual Social Accounting Matrices (SAMs) for each region and country, benchmarked at base year 2004.

Each region in the model traces the circular flows of income through factor payments from producers to institutions—households, firms and government—and back to final demand for goods in commodity markets. These institutions represent the respective economic agents, whose behaviors and interactions are explicitly specified in the model. Private consumption, intermediate use, government consumption and investment are the four components of domestic demand. Households in each region choose the optimal levels of commodity bundles for their consumption by maximizing their utility, which is expressed in Cobb-Douglas function, subject to the budget constraint and given market prices. The model has a representative household, whose structures of income and expenditures are constructed on the basis of sample surveys in each country. On income side, household income comes from various factor incomes—wages, capital and land rents—as well as transfers from government, private, firms and

[12] The model belongs to trade-focused applied general models having been constructed at the Trade and Integration Sector of the Inter-American Development Bank to evaluate trade and integration options for Latin America. It is specifically developed to apply for Central America by incorporating several key features and innovations unique to each country in the sub-region. Therefore, the model is termed as the IDB-INT CACM CGE model.

[13] The model comprises 5 countries in Central America (Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua), 10 hemispheric countries (Canada, United States, Mexico, Colombia, Ecuador, Peru, Venezuela, Argentina, Brazil, Chile) and 4 extra-hemispheric partners (European Union, Japan, China, rest of world).

remittance. On expenditures, household pays taxes but the largest portion of income is spent for consumption. The residuals are spent for household transfers or saved. The government collects various taxes and receives foreign transfers, and allocates for goods and services, earmarks subsidies to domestic institutions (households and firms), and amortizes payments to domestic and foreign lenders.

For each sector, the model explicitly specifies output-supply and input-demand equations. Production consists of intermediate inputs determined by the Leontief fixed IO coefficients, plus primary factors, which are specified in a function of constant elasticity of substitution (CES) with a constant returns-to-scale technology. Domestic producers maximize profits, implying that each factor is demanded in such a way that marginal value product exactly equals its corresponding marginal cost. However, each factor does not necessarily generate a uniform returns (wages, capital rent and land prices) across sectors. Instead, the model incorporates factor market rigidities or distortions, which exogenously fix the ratios of the relative sectoral returns to the economy-wide average return for that factor at benchmark. Primary factors comprise labor, capital, land, and natural resources.

The treatment of international trade follows the standard specifications in common with other trade-focused CGE models. The model specifies a set of export-supply and import-demand equations for traded sectors, allowing national product differentiation. Both exports and imports are modeled in a two-stage nested structure. Exports are modeled in a constant elasticity of transformation (CET) function. The optimal allocation of supply is determined by revenue-maximization choice between domestic sales and aggregate export supply at the upper stage, and among exports destined to different markets at lower stage. At the lower stage, however, the specification of imperfect substitutes for some products in certain regions or countries can be partially or entirely turned off, permitting perfect substitutes. Likewise imports are modeled by a constant elasticity of substitution (CES) function, following the "Armington" assumption.[14] The optimal allocation of demand is determined by cost-minimization choice between domestic demand and aggregate import purchases at the upper level, and imports from different markets at lower stage.

Regarding factor markets, the model applies the standard model treatments for simplicity. Unlike Girodano and Watanuki (2008), labor market is decomposed into unskilled and skilled categories. Labor is modeled to be mobile across the sectors within each region or country, with fixed supply. Yet, to capture wage differentials over sectors, wage payments and the sectoral employment are precisely estimated on the basis of household sample surveys.[15] No international labor migration is allowed. Capital is mobile only within each region, and its aggregate supply is fixed at benchmark as with labor market. Since household sample survey does not capture income from land, this income is omitted for Central America and applied only for countries outside Central America, therefore it is expected that the simulation results will underestimate the potential impact to be generated from land particularly under the simulations with supply response. This is also the case with natural resources, but its effects will not be large.

In the model, there are three key macroeconomic closures: public finance; saving-investment; and external balance. There are a number of different choices available. The choice does not affect the base equilibrium solution, which exactly replicates the SAMs at benchmark, but influences the simulation

[14] Armington (1969).

[15] It is acknowledged that it is crucial to model labor market as precise as possible with high accuracy to reflect the unique labor structure in Central America, because income generation from labor market channel is the determinant factor in the aggregate household income as examined in the previous section. However, it is considerably difficult to achieve feasible solution with high disaggregation in the agricultural sectors and sizable external prices shocks on these sectors. To avoid this difficulty but to capture the optimal solution, the model adopts the standard labor market treatment.

results significantly. The important rationale is which choice will be the most appropriate to meet the objectives and to capture the reality of the countries under study. For government fiscal balance, the model applies endogenous public savings, which are determined residually as the gap between current revenues and expenditures, while all transfers are fixed. This treatment allows fiscal surplus or deficit to adjust to balance public finance.[16] Moreover, to control possible welfare effects arising from variations in public spending, government consumption demand is fixed in real term.

For saving-investment balance, the current amount of nominal investment must be completely financed by the aggregate savings in each country and region. This is because the model is of the static nature and does not allow international capital mobility across countries. The model applies "investment-driven" Johansen closure, so that private saving rates are endogenous to balance the nominal value of investment with the aggregate savings. This is intended to avoid misleading welfare effects arising from changes in foreign savings and investment.

For external market closure, the model applies fixed trade balance, while endogenizing exchange rate in each country. With fixed external capital flows and transfers, changes in the aggregate import demand must be completely financed by changes in exports. Increases in food prices in the global market directly raise domestic prices of imports adjusted by border protections (tariffs and export subsides or taxes) and exchange rate. This in turn reduces import demand of the respective food commodities whose global prices soar. As a result, the sectoral outputs producing these products will expand domestic production, driving an increase in employment into these industries, while replacing workers in other sectors, once supply response is considered.

Microsimulation Analysis

The essence of the microsimulation analysis for poverty and inequality is to model the behavior and to measure the impact of exogenous shocks at each individual household level. Hence, this methodology enables us to capture heterogeneity in income generation and expenditures, arising from family structure, occupation, education, gender, marital status, age, location and so on. As shown already in the composition of income, labor income is by far the dominant source for the majority of households, particularly for the rural poor in Central America.

This study follows the two-step, "top-down" CGE-microsimulation approach. This sequential approach is intended to translate soaring global prices of the food products into the changes in household income. No rigorous attempt is made to capture feedback effects from changes at individual households back through returns of factor markets at macro level. A major advantage of this top-down approach is that the analysis based on household survey data can be carried out separately from the top-tier CGE analysis.

The microsimulation analysis requires several procedures and assumptions. The CGE simulation results are used to update the new income following income components at each individual level. One of the key procedures is how to deal with the impact on labor market. The changes in global food prices affect labor market in several ways, but largely on wages and employment. Economywide wages will presumably decline in the short-term, but may rise particularly for unskilled labor largely absorbed in agriculture upon supply response being incorporated in medium term. In the meantime, some workers will move from sluggish industries to booming ones, while others may be displaced. All of these influence labor income, which is the dominant source of household income.

[16] Fiscal neutral assumption adopted by, for instance, van der Mensbrugghe (2005) or Harrison, Rutherford and Tarr (2003), may not be necessarily appropriate for some countries. See Taylor and von Arnim (2006).

First, new wages are applied to workers being employed in each labor class. Labor is ranked, based on individual's attributes: skill, education, gender, age, household head, and location. Following the changes in sectoral employment measured by the CGE model, new labor demand in each sector is estimated, given the fixed labor supply. Workers who will shift from one industry to other are identified, using ranked labor. The assignment is given the following priority: labor shift within agriculture in the first place, followed by non-agriculture to agriculture. This process is carried out to match the outcomes in the CGE model simulations. In the whole process, it is assumed that changes in factor remunerations including wages are uniform over regions (urban-rural zones).

Finally per capita income is updated by aggregating new income of all family members, divided by household size. This is the key reference parameter to evaluate poverty and inequality. Poverty is measured by the familiar Foster-Greer-Thorbecke (FGT) indices[17] of additively decomposable measures. Income inequality is measured by GINI index and the mean income ratio.

4. CGE Simulation and Microsimulation Analysis

Trend of Global Food Prices

Global food prices steadily increased in recent years and particularly since the early 2006 until the middle of 2008, before declining sharply and swiftly in the second half of the year. According to FAO[18], food price indices rose 11 percent in 2006, led by cereals—rice, wheat, barley and maize combined—with an increase of 34 percent, followed by vegetable oils (29 percent) and dairy products (5 percent). On the other hand, prices of meat (bovine, poultry and pork) remained unchanged. In sharp contrast, prices of sugar actually declined by 13 percent after reaching its peak in early 2006. Figure 3 displays the recent trend of the global price indices of key food products between January 2005 and March 2009.

<INSERT FIGURE 3>

The speed of rising food prices accelerated throughout 2007, with an increase in food price indices by more than 40 percent. Dairy products, whose prices were stable in 2006, underwent the sharpest spike of 87 percent in 2007. Prices of vegetable oils and fats also sharply soared by 65 percent, followed by cereals with the rise of 50 percent. In contrast, prices of meat products rose modestly (7 percent), while those of sugar fell by 7 percent. Food prices continued to rise in the first half of 2008 with a slightly decelerating speed, until reach the record highs in August 2008, where the food price indices more than doubled in less than 5 years from the 2002-04 reference period. In the first half of 2008, prices of vegetable oils and fats rose by another 30 percent and cereal grains by 27 percent. Prices of meat increased by 16 percent, and sugar by 13 percent.

The second half of 2008 saw the dramatic reversal of food prices. The global food price indices sharply and swiftly dropped in the period, due to rapid deterioration of international prices of staple food commodities as a result of weakening food demand triggered by the slowdown of the global economy. Food price indices fell by 30 percent in December 2008 from the peaks. Vegetable oils underwent the largest drop by 55 percent decline, followed by dairy (40 percent) and cereals (36 percent). Since then, food prices remain unchanged, staying at the levels of early 2007.

Structure of Food Trade, Production and Demand

[17] Foster, Greer, and Thorbecke (1984).
[18] FAO Food Price Indices for April 2009.

Central America as a whole is a net exporter of food products, generating the surplus of $5 billion in 2006 in bloc's exports of $6.9 billion. El Salvador is the only exception, with food trade deficit of $3.6 million. In Central America, Costa Rica is by far the largest exporter amounting to $3.2 billion of food exports; this accounts for 46 percent of the bloc's aggregate food exports, followed by Guatemala with $1.9 billion. On the other hand, exports from El Salvador and Nicaragua are relatively small with $470 million each. Table 2 presents trade flows and their composition of key food products in 2006.

<INSERT TABLE 2>

The structure of food trade is fairly similar in Central America, concentrating only on a couple of products. On exports, coffee and cocoa are one of the main export products in Central America. These products alone account for a half of food exports in Honduras, and some 40 percent in El Salvador and Nicaragua. They are ranked in the second in Costa Rica with 8.6 percent share in exports, but the value of exports slightly exceed El Salvador and Nicaragua. Fruits and vegetables are also main export items in Guatemala and Honduras, while sugar is an important product in El Salvador and Nicaragua. Costa Rica is the least diversified, and its structure of trade is completely differentiated from the rest of Central America. Fruits and vegetables are the single most important export produce, accounting for 83 percent of the country's food exports, and Costa Rica constitutes 70 percent of Central America's exports of fruits and vegetables. On the other hand, none of countries in Central America has exports of rice and wheat as well as cereal grains.

Trade surplus suggests that rising food prices benefit Central America except El Salvador, thanks to the improvement of terms of trade. But the magnitude depends on trade balance position, individual commodity trade and corresponding prices. The rising prices of coffee and cocoa, main agricultural export commodities in the region, contribute to Nicaragua and Honduras to a larger extent than to Guatemala, as these products have a greater share in GDP. Likewise, an increase in prices of vegetables and fruits benefits Costa Rica the most, and to a lesser extent Guatemala and Honduras. Conversely El Salvador suffers the spikes in any food prices, as the country has imports more than exports in food trade.

The structure of imports is more monotonous than that of exports over the countries. Cereal grains are the single largest import product across Central America. These products account for nearly a half of food imports in Nicaragua, and 45 percent in Guatemala and Honduras. Since cereal grains are by far the net imports in all countries in Central America, the recent sharp spikes in prices deteriorate trade balance position, contributing to worsen terms of trade and social welfare. The second important commodities vary country by country. Dairy products account for roughly 20 percent in food imports for Nicaragua, followed by Guatemala (16 percent), and Honduras (13 percent). Vegetable oils and fats constitute 17 percent in Costa Rica, while fruits and vegetables are the second important food products after cereals in El Salvador.

Table 3 shows the structure of the sectoral production and demand focusing on food products, used in the INT CACM CGE model. Tables 2 and 3 are intended to provide background understanding of transmitting mechanism how soaring food prices affect domestic economy through trade flows. Rising prices give clear signal for both producers and consumers. On the supply side, domestic producers—farmers in agriculture in particular—expand outputs essentially targeting exports. This will in turn raise factor returns, mostly wages in agriculture, and offer more employment opportunities. This implies that the underlying economic rationale would provide the opportunity of enhancing social welfare raising income, once domestic economy responds to the global price shocks in the medium- to long-run, called supply response. The demand side has completely opposite impact and response. Demand of intermediate inputs and final demand will decline. In the face of rising prices, households are forced to cut back their consumption particularly staple foodstuffs. The overall impact on individual households depends on

income generation process as well as consumption patterns of food products, beyond the generic net producer-consumer arguments.

<INSERT TABLE 3>

The structure of production clearly demonstrates Central America's comparative advantage in trade. Coffee and cocoa, key food export products across Central America, have fairly high ratio of exports out of production. In Nicaragua almost 90 percent of domestic outputs are exported, followed by 71 percent in Costa Rica. High export orientation is seen in other countries as well, but at smaller degrees: 47 percent in Honduras, 32 percent in Guatemala and 20 percent in El Salvador. Vegetables and fruits, another key product, also show high export orientation with varied magnitudes. The export/output ratio exceeds 70 percent in Costa Rica, the largest exporter in Central America, followed by Honduras with 47 percent. While Central America produces rice, wheat and cereal grains, key foodstuffs and sensitive agricultural products, it has barely competitiveness in exporting these products even in sub-regional market. The export ratios are relatively low in the rest of agricultural products and most of the processed foods, implying Central America does not have strong edges penetrating the global market. Table 4 suggests the exceptions seem to be processed meat and dairy products in Nicaragua, and to a lesser extent beverages and tobaccos in Honduras and Nicaragua. But they are actually sold within common market with free access. This is also the case with high ratios of other food products across Central America.

The share of imports in absorption (total domestic demand) shows completely different picture. All country in Central America greatly rely on imports for rice and wheat, main staple foodstuffs, as each country has low production base to meet domestic consumption. Roughly 30 percent of domestic demands are supplied by imports in Honduras, followed by 20 percent in Guatemala and Nicaragua. Import reliance is modest for cereal grains with the range of 6-10 percent in Central America, with exception for Costa Rica, which has 38 percent of reliance on imports. These products are almost exclusively imported from the United States primarily for household consumption. In general, the rest of food products has relatively low import reliance ratios, suggesting that domestic demand is supplied by domestic production. There are seen some high reliance on imports particularly in other food product categories. This is the mirror image of intra-sub-regional trade originated from other members in Central America.

Table 3 also presents the global food price variations from January 2006 to mid-2008 reported in the FAO food price indices, supplemented by the International Financial Statistics (IMF). They are aggregated into the sectors in the CACM CGE model, using the average trade weights in the same period. As seen the the table, there are three products, which show sizable changes in global prices: rice and wheat by 130 percent; cereal grains by 127 percent; and oilseeds and soybeans by 132 percent. Prices also sharply rise in dairy products by 85 percent, followed by beverages and tobaccos by 40 percent. A wide variety of other products also experience a substantial increase in prices (67 percent).

Macroeconomic Results

The impact of soaring global food prices is measured in two steps. Simulation 1 evaluates the impact of exogenous price shocks on food products, observed between January 2006 and May 2008, as presented in Table 3. The simulation results are considered as the impact in the medium term with supply response reflecting both changes in the sectoral factor demand and factor returns. Following the simulation 1 experiment, simulation 2 attempts to examines the impact of tariff elimination on food products. This is basically designed to assess the effectiveness of the elimination of tariffs, as a part of broader complementary policy measures. In order to mitigate or lessen the negative impact, a variety of policy

options are contemplated and proposed for many different developing countries.[19] Their applications should be carefully devised and country-specific, as effectiveness depends on many factors in each country. This paper is not intended to examine these policy measures. But reducing or eliminating import duties is one of readily available options for many particularly in the short-run to cope with rising prices in domestic economy.

Table 4 reports the impact of soaring of the global food prices under the two simulations. The direction of the overall impact is in line with what is expected. Under the simulation 1, domestic food prices jump on average approximately 20 percent in Central America, with the highest by 25 percent in Honduras and the lowest by 15 percent in Guatemala. CPI also substantially rises with the lowest by 4.3 percent in Guatemala and by 7.3 percent in Honduras and Nicaragua.

<INSERT TABLE 4>

The impact on trade has sharp contrast between exports and imports. The volume of exports of food products increase, but it is relatively moderate except El Salvador.[20] This is primarily because countries in Central America do not exports such products as experience huge spikes in prices in global market, notably rice and wheat, cereal grains as well as oil seeds and soybeans. Compared with exports, the impact on imports is far greater, ranging from the lowest 24 percent in Honduras to the highest 48 percent in Guatemala. This outcome is obvious, reflecting the structure of imports, as explained in the previous section. The sharp rises in prices of rice and wheat as well as cereal grains substantially reduce imports of these stable foodstuffs. Imports drop by more than 50 percent in Costa Rica, and nearly 80 percent in Guatemala.

Exchange rates appreciate substantially, ranging from 8.7 percent in El Salvador to 14 percent in Nicaragua. This is because food exports substantially increase induced by the surge in global food prices. As the model applies balanced trade, assuming that countries in Central America have capacity and flexibility to absorb external shocks, exchange rates need to appreciate in order to balance trade account at base. Sluggish economic activities lead to modest decline in real GDP, and reduced government finance.

Regarding the impact on factor markets, rising food prices have positive effects to raise wages in unskilled labor, who are largely engaged in agriculture and food industries. Wages for this labor category in Guatemala increase the most by 3.8 percent. But the opposite is clearly the case with skilled workers across Central America, who work in manufacturing and services sectors with higher value-added and high technology content industries. While the decline in skilled labor wage is marginal in El Salvador, it drops by 2.5 percent in Nicaragua. The impact on capital returns is mixed, but the magnitude of negative effects would be larger, as the rising food prices dampen the domestic economy activities.

In comparing the impact of the simulation 1, the results under the simulation 2 clearly suggest that policy intervention of tariff elimination have positive, but very limited effects. It is far from reducing the negative shocks incurred by the rising prices. The effects of tariff elimination on food products exactly

[19] See World Bank (2008b) ADB (2008). FAO (2008c) reports that a large number of countries adopted a combination of several policy measures, and the magnitude and coverage of the interventions differ greatly from one country to another.

[20] To be clear, exports sharply increase in value terms. For instance, the value of exports jumps by 120 percent in El Salvador, the highest in Central America. But the impact measured by value terms may not be necessarily accurate, because it includes huge price effects. This is more pronounced on imports. While import volume declines for all countries, its value increases from the benchmark. This is because the magnitude of increases in prices far exceeds the negative impact on volumes. To avoid this misleading outcome, this paper uses volume measurement in this analysis.

follow the workings of unilateral commitment of liberalizing trade regime focusing on agriculture and the food industries. This limited outcome is due to two factors related to the structures of trade and protection, unique features across Central America.

First, staple foodstuffs (rice, wheat, cereal grains, oil seeds and soybeans) are almost exclusively imported from the United States. In fact, 95 percent of these products originate from the United States in Central America as a whole, and the rest is from Canada. Although tariff cuts for sensitive products are either exempted or back-loaded at initial stages, tariffs of most products are already eliminated or reduced following the CAFTA commitment schedule.

Second, significant portion of processed foods (meat, dairy products, beverages, tobaccos and other food products) are traded within Central America. The share of intra-bloc origin is almost 60 percent in Nicaragua, followed by 53 percent in El Salvador. The lowest is Costa Rica with the share of 20 percent. Since intra-CACM trade is already liberalized, essentially products traded in Central America do not face any tariffs. In addition, tariffs are structured, based on domestic sensitivity. Higher protection is imposed on products with high sensitivity, hence low imports, while low tariffs are charged on low sensitive products and large imports. As a result, even the complete tariff elimination does not generate sufficiently large and beneficial effects.

Yet the changes in border protection have significant impact on trade, which in turn spreads to the rest of the economy. Compared with the impact in simulation 1, the reduction of import volume is lessened by around 10 percent in Guatemala and Honduras, followed by 8 percent in Nicaragua. Exports further increase: 5 percent in Nicaragua and 4 percent in Honduras. Again the impact is the smallest in Costa Rica. The elimination of tariffs also modestly contributes to stave off rising domestic prices. In Honduras, food price index drops by 2.2 percent from the laisser-faire situation under the simulation 1, and 1.8 percent in Nicaragua. This positive price effects then contribute to mitigate the decline in economic activities largely in agriculture and food industries, further pushing up wages for unskilled labor. The negative effects on GDP and other economic variables are reduced.

Impact on Per Capita Income

Figure 4 presents the impact on per capita income for two simulations, decomposed by deciles and demarcated by urban vs. rural zone. This is particularly important, since income generation process is quite different over different income groups and the majority of the poor live in rural area. Clearly the patterns of the impact show some common features across countries, zones as well as over deciles, but they also reveal some differentiated outcomes. Note that, for simplicity, these exercises only consider the changes in wage, but not the sectoral labor shifts and the changes in the aggregate employment.

<INSERT TABLE 4>

First, the impact on per capita income is positive in rural households in all deciles and in all countries. The only exception is the highest rural income group in Costa Rica. The positive income growth effect is always greater in rural area than in urban zone in all corresponding deciles. This applies without exception. Namely income in rural households rises faster than income in urban households, implying that income inequality will narrow.

Second, the impact is closely synchronized with the structure of per capita income particularly labor income, and the magnitude of changes in wages. The larger the share of unskilled labor income is, the greater the positive income effect is. The opposite is the case with skilled labor income, as wages decline for this labor type.

Third, due to the composition of labor income and the changes in wages, the impact on per capita income over deciles is roughly grouped into 3 patters: (i) reversed flat U-share; (ii) downward-sloping; and (iii) flat U-shape. The reversed flat U-shape is seen in rural area in Costa Rica and Honduras, as well as in Guatemala for both urban and rural zones. The second patter appears in urban area in Costa Rica, Honduras and Nicaragua. In Nicaragua, rural region also follows this patter with higher impact on low income deciles and lower impact on higher income groups. In urban areas in Costa Rica, Honduras and Nicaragua, the positive impact in lower income deciles is reversed to the negative for higher income groups. The U-shape pattern is the only case in urban zone in El Salvador, whereas the rural area exhibits almost flat or reversed flat U-shape with shallow depth.

Fourth, tariff elimination of food products in the simulation 2 contributes to raise income. Compared with the simulation 1, this policy measure further pushes up per capita income from 0.2 percentage-points in Guatemala to 0.5 percentage-points in Honduras and Nicaragua. The additional impact over deciles is mixed. The reversed U-shape is seen in Guatemala, Honduras, and rural region in El Salvador. In Costa Rica, the incremental changes of the impact is in a upward sloping pattern, with smaller impact on lower income groups but larger gains on large income deciles. In Nicaragua, the additional gains are almost evenly shared among all households in both urban and rural deciles. The pattern in El Salvador is very different from the one in other countries. While rural region shows the reversed flat U-shape, it is in a kinked pattern in urban region, with additional gains in lower deciles but the negative effects in higher deciles.

Impact on Poverty and Inequality

The impact on poverty and income inequality is measured in three stages: (i) pure price shocks of increased food products; (ii) price shocks and supply response in simulation-1; and (iii) supply response plus tariff elimination in simulation-2. The price shocks experiment is intended to measure the pure price effects of rising commodity prices passed on to households. In the experiment, households do not change their preferences and tastes in consumption. In addition, supply response from production (changes in factor remunerations) is also not considered. Thus, this experiment examines the impact of the immediate price shocks in the very short run. The simulation 1 is concerned with measuring the impact of price changes in global food markets, incorporating supply response in the production process. To be precise, the experiment takes into account the changes in factor remunerations, but not changes in sectoral labor demand and the aggregate labor supply. This is the experiment considered in the medium run. Finally the simulation 2 measures the impact considering supply response plus policy intervention of the complete tariff elimination on food products. Table 5 reports the impact on poverty and inequality under the three experiments.

<INSERT TABLE 5>

To be clear, the impact on poverty and inequality is evaluated on the basis of per capita income, not per capita expenditures. This is due to two technical and data constraints. Household survey 2004 has a large number of data enough to trace income channel and decompose the structures, but it has limited sampling on expenditures only for Honduras and Nicaragua. In addition, they are sparse and incomplete. In order to capture the impact from supply response, the study needs to focus on the changes in income side in some detail rather than on expenditures, although admittedly it is the best approach to combine both responses in the analysis. Due to these limitations and different methodologies, the impact reported below is not necessarily directly comparable to other studies, including Robles et al. (2008) or Zezza (2008), both of which use expenditures to measure the impact on poverty.

Pure Price Shock Experiment

The surge in the global food prices exerts devastating impact on poverty in Central America. Rising food prices force more than 2.1 million of people—who were on the verge of poverty, but not the poor—into poverty. This corresponds to 6.4 percent of the region's population. Honduras and Nicaragua, poorer countries in Central America, are the hardest hit. The headcount poverty rate increases the most by 8.3 percentage-points in Nicaragua, followed by 6.7 percent in Honduras. In these countries, poverty worsens in urban zone faster than in rural area, where poverty is already extremely high (see Table 1).[21] In addition, poverty gap and severity both rise in urban and rural region in all countries, with larger increases again in Honduras and Nicaragua, implying that the poor become poorer. Due to the large population, Guatemala accounts for 30 percent of the new poor in Central America, followed by 20 percent share by El Salvador, Honduras and Nicaragua.

Compared with the impact on poverty, the effects on extreme poverty are considerably asymmetric among countries. Extreme poverty aggravates the worst in Honduras, with an increase of 9.3 percentage-points headcount. This accounts for 38 percent of the new indigent poor of 1.6 million in Central America, who are forced to live below the extreme poverty threshold. In most countries, the population of the indigent poor rises faster in rural areas than in urban region, except in Honduras. Again, poverty gap worsens the most in Honduras by 5.5 percentage-points rise from the base. In contrast, the situation is the least aggravated in Costa Rica, with considerably low incidence of extreme poor. While the headcount rises by 2.2 percentage-points nationwide, the impact on poverty gap and severity is marginal.

Robles et al (2008) examines the impact of rising food prices in Latin America. They apply a 30 percent uniform price hike (international and national) as the main exercise plus two variant experiments. Their impacts are relatively high, as they assume that price increases estimated from the selected food commodities are directly passed onto households in the aggregate basket of food consumption. Under the experiment of international price increase, which is closer to the underlying assumption in this study, they find poverty rises by 8.1 percentage-points in Guatemala, and 7.7 percentage-points in Nicaragua. On the other hand, the impact is the lowest in Honduras with an increase of 4.2 percentage-points. Although these results are not directly comparable due to different methodologies, assumptions and dataset in different survey years, they can be used as well-specified references, particularly for cross-section analysis.

Ivanic and Martin (2008) examine the effects of high global food prices for poverty in selected low-income developing countries, including Nicaragua in Latin America. They find that, under the non-wage scenario, the increases in global food prices raise the poverty rate by 7.8 percentage-points in Nicaragua, while urban poverty rises by 10.7 percentage-points. Despite the "dollar-a-day" expenditure-based measurement and 2001 year sampling dataset, their estimation is fairly consistent with the impact examined in this study. In the meantime, poverty gap rises by 4.5 percentage-points, again with larger adverse impact for urban households. Zezza et al (2008) analyze the household level impact of rising food prices on poverty for 11 developing countries with the use of household expenditures, including Guatemala (2000 data) and Nicaragua (2001). Instead of measuring the changes in poverty indices, they evaluate the impact of household median welfare in the "before-response" effects, as the immediate impact. They find that the poor lose the most from an increase in staple food prices, primarily because the poor have a larger portion of consumption of staple foods in total expenditures. In Guatemala, the median welfare of the lowest quintiles in rural households decline the most by 1.8 percentage, whereas it drops by 1.5 percentage for urban households in the lowest quintiles in Guatemala and Nicaragua.

[21] The impact of poverty might be larger in rural area than in urban region, when analyzing the effects based on poor person's price index (PPPI), suggested by the World Bank (2008b). This is because the poor have consumption patterns, which tend to significantly deviate from the average population. In addition, the poor have a larger share of food consumption in total expenditures. As a result, the increases in food prices will have a greater impact on the poor, and the majority of them lives in rural area.

Simulation-1: Price Shocks and Supply Response

When supply response in the production process is consider in the medium term, this is likely to reduce the adverse effects incurred by the rising food prices. In the face of increased prices, domestic resources will shift from depressed industries to the booming sectors, obviously to agriculture and food industries. This in turn changes factor returns, as reported in the macroeconomic impact. In the aggregate, labor income, which is the dominant factor in household income, increase—albeit not always the case, depending upon the changes in wages and the composition of labor market (unskilled vs. skilled). In Costa Rica, El Salvador and Guatemala, an increase in wages for unskilled labor outpaces decline in wages for skilled labor. In Honduras and Nicaragua, the magnitude of wage increases for unskilled labor is smaller than the wage drop for skilled labor, but the number of workers in the former far outnumbers the latter, given the fact that unskilled workers are grossly engaged in agriculture in rural areas and food industries.

As a result, compared with the impact under the price shock experiment, poverty incidence declines in all regions, although being modest. Note that the impact on poverty in this section is evaluated in comparison with the results in the pure price shock experiment, unless otherwise noted. The magnitude of amelioration is larger in rural region than in urban area across Central America. The poverty headcount improves the most by 1 percentage-point in Guatemala. This corresponds to 103,000 people, and accounts for more than half of the people, who may have a chance of getting out of poverty in Central America. El Salvador follows, with the decline in poverty by 0.7 percentage-point nationwide, while rural poverty deduces by 1 percentage-point. Smaller effects are seen in urban zones in Nicaragua, Honduras and Costa Rica in this order, due to relatively small income gains as examined in Figure 4.

The impact on extreme poverty follows the similar patterns to poverty, but at much smaller magnitude in all regions in Central America. Headcount declines by approximately 0.35 percentage-point in Guatemala, Honduras and Nicaragua, followed by 0.3 percentage-point improvement in El Salvador. In Guatemala, around 40,000 people—nearly 80 percent are in rural area—will be lifted from the indigent poverty. Poverty gap and severity also improve at modest pace.

Robles et al (2008) also find the improvement of poverty in Central America, when incomes from agricultural earnings are captured. Despite simple methodologies and imperfect assumptions as the authors claim, the magnitudes of the impact do not much deviate, but are slightly larger than the results reported here in most countries. The poverty headcount declines by 0.78 percentage-point in El Salvador and 0.63 percentage-point in Costa Rica, whereas it improves by the smallest 0.08 percentage-point in Guatemala. Likewise, indigent poverty ameliorates across Central America: 0.83 percentage-point in Honduras and 0.5 percentage-point in Costa Rica and El Salvador. Nicaragua is the only country, showing extremely large decline in the incidence of poverty; the headcount poverty falls by 2.5 percentage-points and 2.8 percentage-points for extreme poverty. In all countries, poverty and extreme poverty decline faster in rural area than in urban region. On the other hand, Ivanic and Martin (2008) find that, when wage impacts are considered, the incidence of poverty falls by 0.1 percentage-point in Nicaragua due to the increases in labor income in rural region, while it remains unchanged in urban area.

Income inequality also improves in all countries, but its positive impact is fairly small. GINI index falls by a tiny 0.36 percentage-point in Guatemala, the largest improvement in Central America, followed by 0.3 percentage-point in Costa Rica. The improvement of the national income disparity is seen in two patterns. The first concerned with decline in income in urban households—in the aggregate or measured in terms of mean per capita income—versus income gains in rural households. This pattern appears in Costa Rica, Honduras and Nicaragua. The second is the pattern in which income gains by rural households outpace urban households, as seen in El Salvador and Guatemala (see Figure 4). These results

may contradict with some recent relevant studies.[22] It is reminded, however, that this study only considers changes in factor remunerations, but not disruption in the sectoral labor demand and the aggregate labor supply in the economy. If these factors are taken into account as the economy's full adjustment in the longer term, the impact on income inequality might be reversed.

Simulation-2: Supply Response plus Tariff Elimination

Compared with the results measured under the simulation-1, the elimination of tariffs on food products modestly improves poverty situation in Central America, as wages for unskilled labor further increase, and wage decline for skilled labor is reduced. To clarify the incremental effects of tariff elimination, the impact on poverty in this section is evaluated in comparison with the results reported under the simulation-1. The effects of eliminating tariffs are transmitted largely through two main channels—change in demand and production in supply side—both interact each other at the sectoral levels as well as economywide. Domestic demand increases, as prices of imports decline due to the removal of tariffs adjusted by exchange rate. This leads to efficient resource reallocation as well as an increase in factor returns including labor wages or reducing the negative effects, as reported in Table 5. The crucial element on poverty is the heterogeneity and the composition of labor income particularly generated from unskilled labor.

In short, tariff elimination contributes to reduce the adverse effects on poverty incurred by the rising food prices. But the effects are limited in the context of Central America, due to already low protection even on sensitive staple food products. Despite the relatively small effects, the elimination of tariffs will lift approximately 217,000 people out of poverty in Central America as a whole. The poverty headcount drops the most in Nicaragua (1 percentage-point), whereas 90,000 people will be out of poverty in Guatemala. In contrast, poverty improvement is the smallest in Costa Rica, simply because the effects of eliminating tariffs are very limited.

Extreme poverty also decline in Central America, where approximately 176,000 people will be rescued from the indigent poverty. This positive impact is most pronounced in Honduras and Nicaragua, with an additional decline of the indigent poverty rate by 1 percentage-point. Poverty gap and severity also decline in all countries, but by the largest magnitude in these countries. This implies that policy intervention of tariff elimination would be more effective in countries with initially high poverty rates, although this is not conclusive.

Essentially the tariff elimination has very little impact on distribution of income. The impact is almost unchanged in Guatemala and Nicaragua. Income inequality might be improved in El Salvador particularly in urban region, and to a lesser extent in Honduras. On the contrary, the elimination of tariffs may have adverse effects of widening inequality in Costa Rica, though being very small.

5. Summary and Conclusion

Global food prices declined sharply and swiftly from the record highs reached in the middle of 2008 due to the slackened agricultural demand, partly contributed by the recent financial crisis worldwide. But food prices stay at the level of early 2007, which are yet still high in many developing countries. Because of

[22] ADB (2008) finds that an increase in food prices tends to intensify income inequality. Without supply response, GINI indices slightly rise in the Philippines and Pakistan. When supply response is taken into account, however, the national inequality slightly declines due to the income increases in rural households, while food price inflation leads to an increase in income inequality in urban area. Ferreira Filho (2008) reports that the rising food prices worsens the GINI index by 0.17 percemt in Brazil, when labor market adjustment is fullly captured: the sectral labor demnad adjustments, changes in wages and aggregate employment altogether.

the steep drop in prices far off the peaks, the topic of food crisis is now out of headlines in the international policy agendas and policy makers in developing countries alike. Is the food crisis no longer the development issue for developing countries? It may not be imminent, but remains a potent challenge for many developing countries in coming decades, taking into account resource-scarcity trends in the long term.

Based on the very recent episode of soaring food prices observed between 2006 and mid-2008, this study examines the impact of the rising food prices on poverty and income inequality in Central America, with persistent and high incidence of poverty and income inequality. The study applies the familiar two-stage CGE-microsimulation analysis, based on household survey decomposing urban and rural areas in each country. Although using a simple and straightforward methodology, it would give good insights and policy evaluations enough to measure the magnitude of the potential effects as well as to causal linkages and underlying mechanisms of the rising prices on poverty.

The soaring food prices have devastating impact on poverty. The pure immediate price effects are negative in a grave magnitude, pushing more than 2 million of people into poverty, corresponding 6.4 percent of the population in Central America. Poverty worsens in low-income countries, where it is already considerably high: Nicaragua by 8 percentage-points, and 6.7 percentage-points in Honduras. Aggravating indigent poverty is extremely serious in Honduras with the rise by more than 9 percentage-points. The poor lose the most from rising food prices and become much poorer. In general, given the fact that urban households are net food consumers and unlikely to be food producers, poverty intensifies faster in urban areas than in rural zones.

When the supply response in the production process is considered in the medium term, it will reduce the negative impact in all countries (both urban and rural areas). But the positive effects are not as strong as expected, unlike other countries in Latin America. This is because of the fact that Central America is a complete importer of staple products—rice, wheat, cereal grains, oil seeds and soybeans—all of which underwent the sharpest spikes in prices in the global markets. The region's advantage of huge agricultural trade surplus is compromised by the asymmetric trade structure. In addition, given the fact that the vast majority of households are net consumers of the basket of foods products and has larger share of food consumption in total expenditures across Central America, the adverse effects of rising food prices reduces the gains from rising wage income arising from the supply response.

Nevertheless the supply response generates positive chain effects. Domestic producers expand production in agriculture and food industries increase exports. This attracts domestic resources and eventually leads to raise factor returns, particularly wages. The impact on wages differs country by country; but wages always rise for unskilled workers, while falling for skilled workers. Given the fact that (i) unskilled labor is grossly engaged in agriculture in rural areas and food industries, and (ii) unskilled workers outnumber skilled workers in Central America, household income of the poor in rural areas, who heavily rely on unskilled labor, rises relative to middle and high income households in urban zones. As a result, the positive effects of reducing the rising poverty are larger in rural areas than in urban regions. Compared with the outcome under the pure price shock experiment, more than 182,000 poor people will be lifted out of poverty in Central America, and 60 percent account for in rural areas.

The study also finds that the complete elimination of tariffs has a fairly limited effect and far from mitigating the adverse effects. This is primarily because tariffs on food products are already fairly low: zero due to intra-CACM trade for processed foods and low for staple foods (rice, wheat, cereal grains) originating from the United States under CAFTA. To respond to rising food prices, Central America needs the well designed combination of consumer oriented, producer oriented and trade oriented policy measures. Nevertheless, the complete tariff elimination will save around 217,000 people out of poverty

and 176,000 people from the indigent poverty. In all experiments, the impact on income inequality is considerably marginal, but positive in narrowing the income gaps, when changes in wages are considered.

Finally, as FAO (2008c) and Chatham House (2009) suggest, the world continues to face a major challenges in the global food security. There is a real risk of "food crunch" at some point in coming decades. This will be again serious on countries with high import dependency on foods and particularly poor people in developing countries including Central America, as history and this study shows. For the region, the current moment, in which food prices are eased, would be a good opportunity to devise comprehensive strategies from the standpoint of the national food security in the medium- and long-term perspective.

References

Asian Development Bank (ADB) (2008) *Food Prices and Inflation in Developing Asia: Is Poverty Reduction Coming to an End?*, Special Report, Economics and Research Department, ADB: Philippines.

CEPAL (Comisión Económica para América Latina y el Caribe) (2005) *Panorama Social de América Latina 2005*, Documento Informativo, CEPAL: Santiago, Chile.

CEPAL (2006) *Social Panorama of Latin America 2006*, CEPAL: Santiago, Chile.

Chatham House, (2009) *The Feeding of the Nine Billion: Global Food Security of the 21st Century*, reported by Alex Evans, London: Chatham House.

Deaton, A. (1997) *The Analysis of Household Surveys: A Microeconometric Approach to Development Policy*, Baltimore and Washington DC: World Bank and Johns Hopkins University Press.

Food and Agriculture Organization (FAO), (2008a) *Food Outlook: Global Market Analysis*, November, Rome:FAO.

FAO, (2008b) *Crop Prospects and Food Situation*, No. 4, December, Rome:FAO.

FAO, (2008c) "*Soaring Food Prices: Facts, Perspectives, Impacts and Actions Required*", Paper presented in the High-Level Conference on World Food Security: the Challenges of Climate Change and Bioenergy, Rome.

Ferreira Filho, J.B.S., "*The World Food Price Increase and Brazil: Opportunity for All?*", Paper presented at the Second Regional meeting on CGE Modeling: Contribution in the Formulation of Political Economy in Latin America and the Caribbean, San Jose, Costa Rica, November 24-25, 2008.

Foster, J., J. Greer and E. Thorbecke (1984) "A Class of Decomposable Poverty Measures", *Econometrica* 52(3), 761-766.

Giordano, P., and M. Watanuki (2007) *Andean Countries at a Crossroads: Evaluating Pro-Poor Trade Integration Options*, Paper presented at the 10th Annual Conference on "Assessing the Foundations of Global Economic Analysis", June 7-9, 2007. Indiana, United States.

Giordano, P., and M. Watanuki (2008) Evaluating the impact of trade agreement for Central America: Does trade integration improve poverty and inequality? Paper presented at the GTAP 11TH Annual Conference in Helsinki, Finland, June 12-14, 2008.

Ivanic, M., W. Martin (2008) "Implications of Higher Global Food Prices for Poverty in Low-Income Countries", *World Bank Policy Research Working Paper* 4594.

Inter-American Development Bank (2007) *Central American Report*, No. 3 INT-INTAL, IDB: Washington, D.C.

OECD-FAO, (2007) Agricultural Outlook, 2007-2016, OECD Publication, Paris, France.

OECD-FAO, (2008) Agricultural Outlook, 2008-2017, OECD Publication, Paris, France.

Rpbles, M., J. Cuesta, S. Duryea, T. Enamorado, A. Gonzales, and V. Rodriguez (2008) Rising Food Prices and Poverty: Effects of the 2006-2008 Price Surge, mimeo.

Singh, I., L. Squire and J. Strauss (1986) *Agricultural Household Models: Extensions and Applications*, Baltimore: Johns Hopkins University Press.

Von Braun, J. (2007) *The World Food Situation: New Driving Forces and Required Actions*, Food Policy Report, International Food Policy Research Institute: Washington, D.C.

World Bank (2005) *DR-CAFTA: Challenges and Opportunities for Central America*, Central America Department and Office of the Chief Economist, World Bank: Washington, D.C.

World Bank (2008a) *World Development Report 2008*, World Bank: Washington, D.C.

World Bank (2008b) *Rising food prices: Policy options and World Bank response*, World Bank: Washington, D.C.

World Bank (2008c) *Rising Global Food Prices: The World Bank's Latin America and Caribbean Region Position Paper*, World Bank: Washington, D.C.

Zezza, A., B. Davis, C. Azzarri, K. Covarrubias, L. Tasciotti, and G. Anriquez (2008) *The Impact of Rising Food Prices on the Poor*, mimeo.

Table 1. Poverty and Inequality in Central America

	Population (1,000)	Population Share (%)	Household Size	Poverty			Extreme Poverty			GINI Index	Mean Per Capita Income Ratio
				Headcount (P_0)	Gap (P_1)	Severity (P_2)	Headcount (P_0)	Gap (P_1)	Severity (P_2)		
Costa Rica											
Urban	1,983.2	47.5	3.76	0.199	0.076	0.044	0.054	0.024	0.016	0.496	1.236
Rural	2,190.7	52.5	3.97	0.281	0.107	0.058	0.086	0.032	0.017	0.499	0.786
National	**4,173.9**	**100.0**	**3.87**	**0.242**	**0.092**	**0.051**	**0.070**	**0.028**	**0.016**	**0.510**	**1.000**
El Salvador											
Urban	4,176.8	59.7	4.10	0.351	0.141	0.077	0.091	0.033	0.018	0.545	1.296
Rural	2,813.8	40.3	4.68	0.498	0.222	0.133	0.226	0.084	0.048	0.563	0.561
National	**6,990.7**	**100.0**	**4.37**	**0.411**	**0.173**	**0.100**	**0.145**	**0.054**	**0.030**	**0.580**	**1.000**
Guatemala											
Urban	5,184.8	46.1	4.80	0.387	0.198	0.133	0.130	0.064	0.044	0.573	1.432
Rural	6,052.4	53.9	5.45	0.700	0.411	0.295	0.317	0.172	0.122	0.587	0.630
Natioal	**11,237.2**	**100.0**	**4.88**	**0.556**	**0.313**	**0.220**	**0.231**	**0.122**	**0.086**	**0.610**	**1.000**
Honduras											
Urban	4,200.8	64.3	4.59	0.637	0.325	0.211	0.349	0.157	0.097	0.588	1.336
Rural	2,334.6	35.7	5.30	0.817	0.523	0.388	0.639	0.363	0.250	0.609	0.396
National	**6,535.3**	**100.0**	**4.81**	**0.701**	**0.396**	**0.274**	**0.452**	**0.231**	**0.152**	**0.635**	**1.000**
Nicaragua											
Urban	2,920.2	56.8	6.00	0.316	0.106	0.051	0.071	0.020	0.009	0.509	1.292
Rural	2,221.9	43.2	6.42	0.703	0.355	0.222	0.305	0.114	0.061	0.519	0.616
National	**5,142.1**	**100.0**	**6.21**	**0.483**	**0.214**	**0.125**	**0.172**	**0.061**	**0.031**	**0.541**	**1.000**

Sources: MECOVI Households Survey Database, IDB.

Table 2. Trade Flows and Composition of Key Food Products (2006)

Value of Exports

($million)

	Exports						*Imports*					
	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua	**Central America**	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua	**Central America**
Cereals	0.2	1.3	12.3	1.3	0.6	15.8	157.0	117.0	242.9	127.3	84.0	728.2
Fruits and vegetables	2,686.3	19.3	731.2	360.1	49.8	3,846.7	49.9	92.5	55.8	31.1	9.8	239.0
Coffee and cocoa	277.9	211.0	615.3	435.0	205.9	1,745.1	16.7	11.8	12.6	8.5	7.4	57.0
Meat	32.7	1.2	10.9	2.1	67.0	113.9	9.3	17.6	51.0	23.9	1.6	103.4
Dairy products	33.9	13.5	5.9	10.5	12.5	76.3	15.5	55.5	85.3	36.7	32.9	225.9
Vegetable oils and fats	13.9	1.1	45.6	2.6	46.9	110.1	73.6	4.2	27.8	15.8	5.8	127.1
Sugar	73.9	109.1	424.9	52.4	74.5	734.9	19.2	16.5	28.7	19.8	14.3	98.5
Beverages and others	96.1	117.2	43.7	2.5	17.7	277.2	89.9	162.2	30.6	19.2	14.0	315.9
Total	**3,215.1**	**473.6**	**1,889.9**	**866.6**	**474.9**	**6,920.0**	**431.2**	**477.2**	**534.7**	**282.2**	**169.7**	**1,895.0**

Composition of Trade

(%)

	Exports						*Imports*					
	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua	**Central America**	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua	**Central America**
Cereals	0.0	0.3	0.7	0.1	0.1	0.2	36.4	24.5	45.4	45.1	49.5	38.4
Fruits and vegetables	83.6	4.1	38.7	41.6	10.5	55.6	11.6	19.4	10.4	11.0	5.7	12.6
Coffee and cocoa	8.6	44.5	32.6	50.2	43.3	25.2	3.9	2.5	2.4	3.0	4.4	3.0
Meat	1.0	0.2	0.6	0.2	14.1	1.6	2.2	3.7	9.5	8.5	0.9	5.5
Dairy products	1.1	2.8	0.3	1.2	2.6	1.1	3.6	11.6	16.0	13.0	19.4	11.9
Vegetable oils and fats	0.4	0.2	2.4	0.3	9.9	1.6	17.1	0.9	5.2	5.6	3.4	6.7
Sugar	2.3	23.0	22.5	6.1	15.7	10.6	4.4	3.5	5.4	7.0	8.4	5.2
Beverages and others	3.0	24.7	2.3	0.3	3.7	4.0	20.9	34.0	5.7	6.8	8.2	16.7
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Food Share in Total Trade (%)	**46.67**	**15.10**	**31.23**	**16.69**	**19.31**	**29.2**	**4.91**	**8.53**	**5.98**	**4.67**	**6.56**	**5.9**

Source: COMTRADE.

Note: Total trade deals with merchandise trade only, excluding trade in services.

Table 3. Structure of Production and Demand of Food Products (2004)

(%)

Commodities	Price Variations	Costa Rica		El Salvador		Guatemala		Honduras		Nicaragua	
		Exports/ Output	Imports/ Absorption	Exports/ Output	Imports/ Absorption	Exports/ Output	Imports/ Absorption	Exports/ Output	Imports/ Absorption	Exports/ Output	Imports/ Absorption
Rice and Wheat	130.1		14.17		14.19		21.88		28.02		19.90
Cereal Grains	127.7		38.22		5.99	0.63	6.59		9.56		5.94
Vegetables and Fruits	29.1	72.39	9.18	0.74	6.86	9.03	0.59	47.28	2.58	17.40	1.22
Oil seeds and Soybeans	131.8		40.49		2.62	5.37	5.39	0.00	0.00	4.23	1.99
Sugar	-11.7	22.16		12.56		10.08		9.91		20.15	
Coffee and Cocoa	29.1	71.38	11.37	19.84	0.41	31.99	1.19	47.01	6.95	89.41	
Livestock	29.1	0.64	0.32	0.87	1.42	1.25	1.51		4.65	9.50	3.44
Other Agriculture	29.1	13.82		0.14	1.93	2.12	2.03	2.56	1.42	6.68	
Processed Meat	18.7	3.77	0.58		8.08	1.76	19.96	1.34	11.26	33.06	4.74
Dairy Products	85.4	2.74	1.25	0.92	12.33	2.44	33.31	5.14	11.09	20.52	4.57
Beverages and Tobaccos	39.6	5.98	7.48	4.94	6.31	7.57	5.41	15.83	8.60	12.65	9.09
Other Food Products	67.1	28.87	14.32	9.73	12.32	24.32	22.58	33.88	33.25	22.92	31.17

Note: 1. Price variations cover the period from January 2006 to the middle of 2008, when food price indices reach their record highs. The average global trade flows are used as weights for the sectoral aggregation.

2. The sectoral shares of exports/output and imports/absorption are based on INT CACM CGE model, benchmarked in 2004.

Table 4. Impact on Major Macroeconomic Variables
(percentage change from base)

	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua
Simulation 1: Price Shocks and Supply Response					
Price Indices (%)					
Food Prices	18.64	17.81	14.79	25.23	17.85
CPI	6.71	4.86	4.32	7.35	7.35
Trade[/1]					
Exports	12.24	45.41	26.03	16.68	9.65
Imports	-30.85	-40.79	-48.25	-24.07	-38.44
Exchange Rate[/2]	-12.11	-8.68	-9.54	-12.84	-14.06
Real GDP (expenditure)	-0.42	-0.77	-0.97	-0.70	-1.52
Government Revenue	-3.48	-2.95	-2.32	-5.10	-7.63
Factor Returns					
Labor					
Unskilled	1.74	2.05	3.83	1.64	1.29
Skilled	-1.19	-0.32	-0.97	-1.99	-2.58
Capital	1.17	-3.87	-2.34	0.15	-2.69
Simulation 2: Supply Response plus Tariff Elimination					
Price Indices (%)					
Food Prices	18.52	16.36	13.64	23.05	16.07
CPI	6.67	4.46	3.99	6.71	6.61
Trade					
Exports	12.63	46.43	29.05	21.08	14.92
Imports	-28.80	-33.69	-38.50	-14.45	-30.37
Exchange Rate	-12.04	-8.34	-8.88	-11.93	-12.85
Real GDP (expenditure)	-0.42	-0.52	-0.87	-0.57	-1.14
Government Revenue	-3.59	-4.69	-4.20	-6.86	-9.82
Factor Returns					
Labor					
Unskilled	1.81	2.93	4.17	2.31	1.99
Skilled	-1.12	1.57	-0.74	-1.18	-1.50
Capital	1.20	-2.60	-2.02	1.45	-0.76

Source: IDB-INT CACM model exercises.

Notes: /1: Volume and covers food products only.
/2: Price-level-deflated exchange rate.
/3: Equivalent variations.

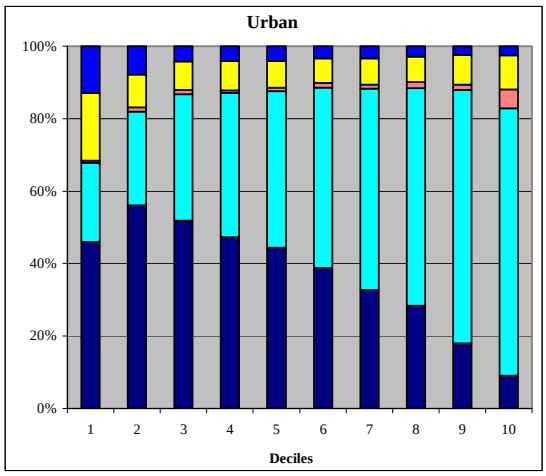
Table 5. Impact on Poverty and Inequality in Central America (percentage-point change from base)

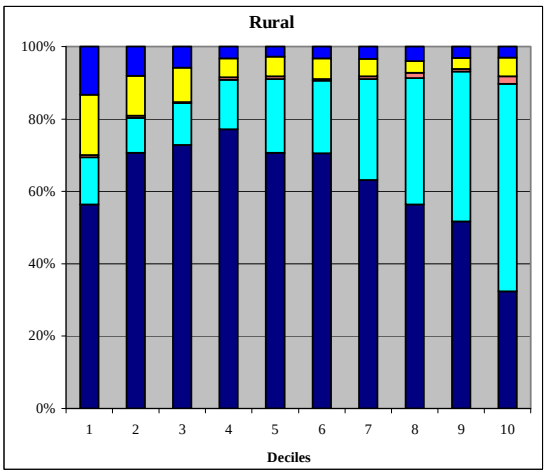
		Poverty			Extreme Poverty			GINI	Mean Per*
		Headcount (P_0)	Gap (P_1)	Severity (P_2)	Headcount (P_0)	Gap (P_1)	Severity (P_2)	Coefficient	Capita Income
	Costa Rica								
	Urban	5.85	2.40	1.29	1.92	0.59	0.33		
	Rural	6.07	3.18	1.89	2.43	1.04	0.58		
	National	**5.96**	**2.81**	**1.60**	**2.19**	**0.83**	**0.46**		
	El Salvador								
	Urban	6.65	3.64	2.31	3.91	1.17	0.58		
	Rural	5.83	4.60	3.16	4.15	2.43	1.37		
	National	**6.32**	**4.03**	**2.65**	**4.00**	**1.68**	**0.90**		
Price	**Guatemala**								
Shocks	Urban	5.26	2.75	1.91	2.03	0.98	0.61		
	Rural	5.91	4.11	3.30	3.96	2.12	1.45		
	National	**5.61**	**3.48**	**2.66**	**3.07**	**1.59**	**1.06**		
	Honduras								
	Urban	7.95	7.16	5.54	10.08	4.90	3.12		
	Rural	4.45	6.35	6.15	8.00	6.47	5.36		
	National	**6.70**	**6.87**	**5.76**	**9.34**	**5.46**	**3.92**		
	Nicaragua								
	Urban	8.94	3.84	2.09	3.81	1.01	0.46		
	Rural	6.84	5.77	4.58	6.88	3.36	1.97		
	National	**8.03**	**4.67**	**3.17**	**5.14**	**2.03**	**1.11**		
	Costa Rica								
	Urban	5.74	2.34	1.26	1.76	0.57	0.32	-0.20	-0.79
	Rural	5.68	2.98	1.77	2.18	0.99	0.55	-0.22	0.08
	National	**5.71**	**2.68**	**1.53**	**1.98**	**0.79**	**0.44**	**-0.30**	**-0.43**
	El Salvador								
	Urban	6.13	3.41	2.14	3.67	1.07	0.53	-0.05	0.71
	Rural	4.87	4.21	2.88	3.73	2.22	1.25	-0.01	1.32
	National	**5.62**	**3.73**	**2.44**	**3.70**	**1.53**	**0.82**	**-0.07**	**0.85**
SIM-1	**Guatemala**								
	Urban	4.45	2.31	1.60	1.87	0.82	0.53	-0.35	0.61
	Rural	4.91	3.32	2.67	3.44	1.72	1.19	-0.26	1.81
	National	**4.69**	**2.86**	**2.17**	**2.72**	**1.31**	**0.88**	**-0.36**	**1.02**
	Honduras								
	Urban	7.86	7.05	5.41	9.79	4.76	3.01	-0.24	-0.39
	Rural	4.17	6.05	5.83	7.59	6.12	5.05	-0.17	0.68
	National	**6.54**	**6.69**	**5.56**	**9.00**	**5.24**	**3.74**	**-0.25**	**-0.24**
	Nicaragua								
	Urban	8.93	3.80	2.06	3.49	1.00	0.45	-0.22	-0.60
	Rural	6.44	5.52	4.36	6.49	3.17	1.85	-0.12	0.45
	National	**7.85**	**4.54**	**3.06**	**4.79**	**1.93**	**1.05**	**-0.24**	**-0.32**
	Costa Rica								
	Urban	5.56	2.27	1.23	1.74	0.56	0.31	-0.20	-0.19
	Rural	5.62	2.92	1.73	2.17	0.97	0.54	-0.22	0.52
	National	**5.59**	**2.61**	**1.49**	**1.97**	**0.77**	**0.43**	**-0.24**	**0.10**
	El Salvador								
	Urban	5.58	3.10	1.93	3.35	0.96	0.45	-0.11	0.50
	Rural	4.27	3.72	2.54	3.16	1.95	1.10	-0.04	1.68
	National	**5.05**	**3.35**	**2.17**	**4.10**	**1.72**	**0.91**	**-0.15**	**0.77**
SIM-2	**Guatemala**								
	Urban	3.71	2.05	1.42	1.61	0.73	0.47	-0.35	0.77
	Rural	4.04	2.95	2.37	3.02	1.52	1.06	-0.26	2.00
	National	**3.89**	**2.54**	**1.93**	**2.37**	**1.16**	**0.79**	**-0.36**	**1.19**
	Honduras								
	Urban	7.36	6.30	4.81	8.69	4.20	2.65	-0.24	0.15
	Rural	3.50	5.42	5.20	7.09	5.44	4.48	-0.18	1.20
	National	**5.98**	**5.99**	**4.95**	**8.12**	**4.65**	**3.30**	**-0.25**	**0.30**
	Nicaragua								
	Urban	7.81	3.24	1.76	2.71	0.84	0.38	-0.22	0.02
	Rural	5.63	4.80	3.78	5.27	2.72	1.59	-0.13	0.92
	National	**6.87**	**3.92**	**2.63**	**3.82**	**1.65**	**0.90**	**-0.23**	**0.26**

Sources: Author's estimation based on IDB-INT CACM CGE model and MECOVI Households Survey Database (IDB).
Note: * The impact on mean per capita income is measured in terns of percentage change from base.

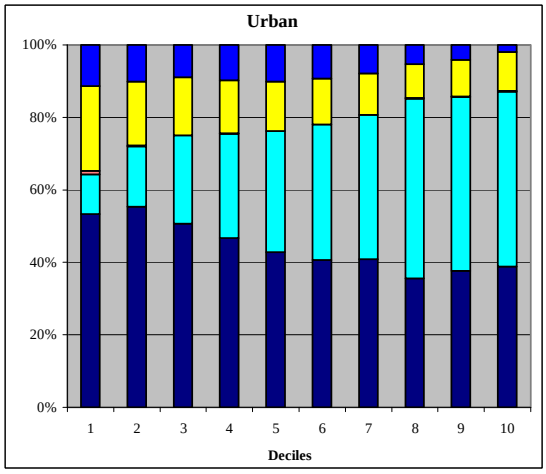
Figure 1. Composition of Per Capita Income by Deciles

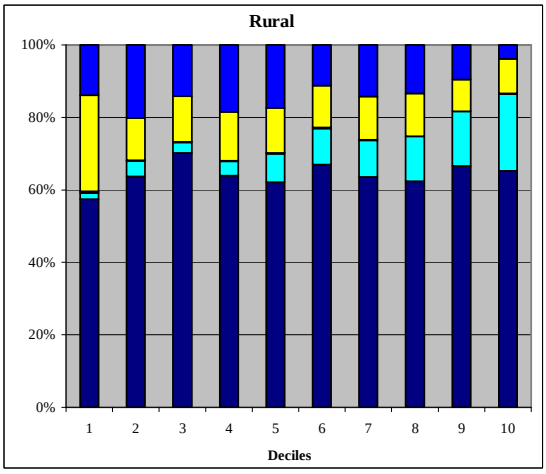
Costa Rica



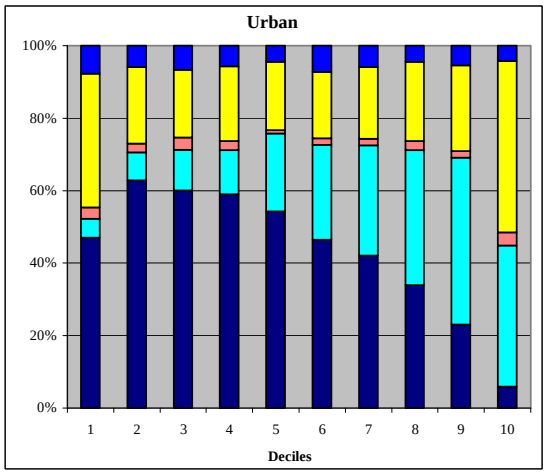


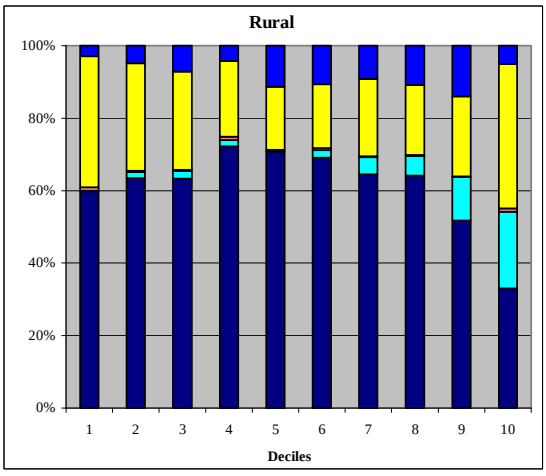
El Salvador





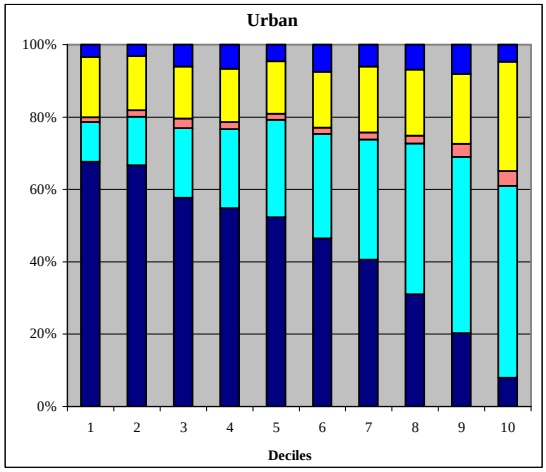
Guatemala

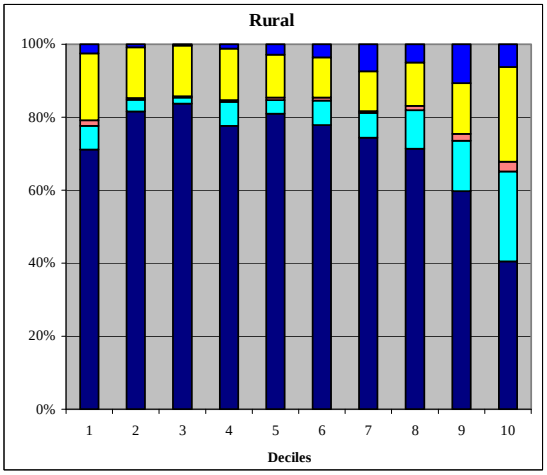




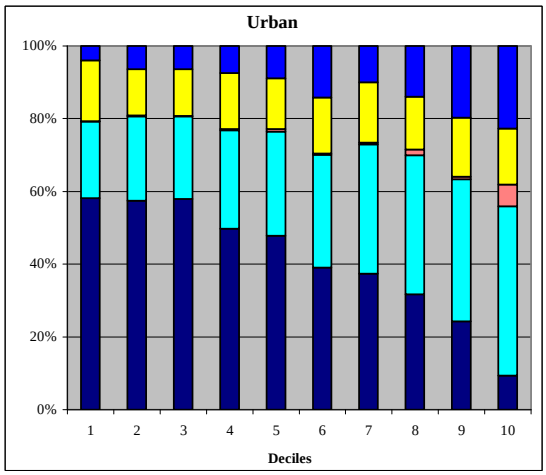
(Figure 1 continued)

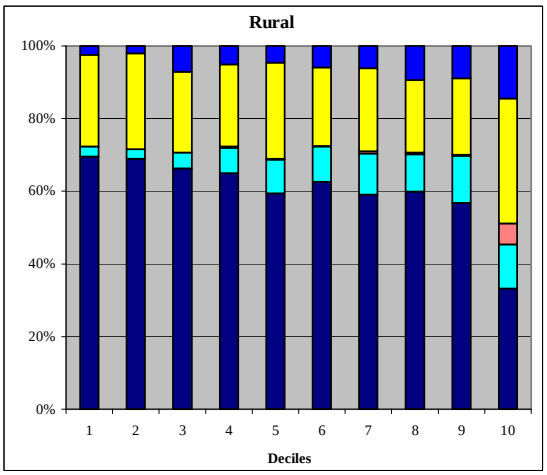
Honduras





Nicaragua





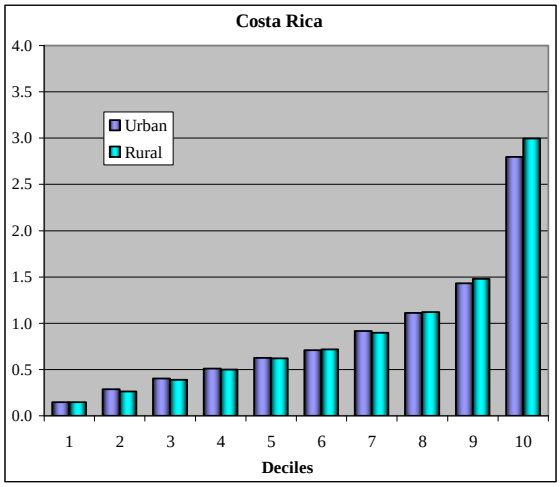
Legend:

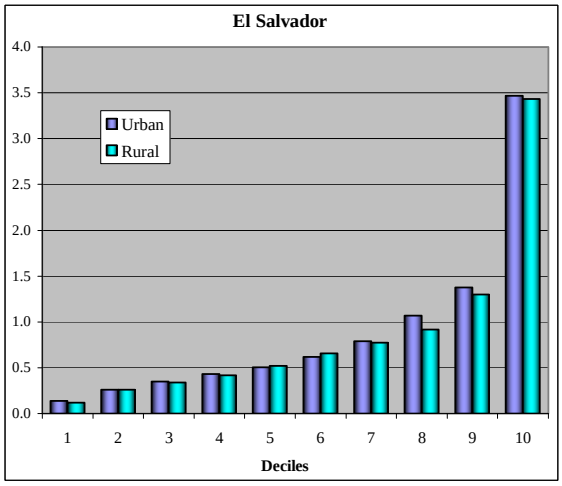
Unskilled Labor | Skilled Labor | Capital
Domestic Transfers | Remittance

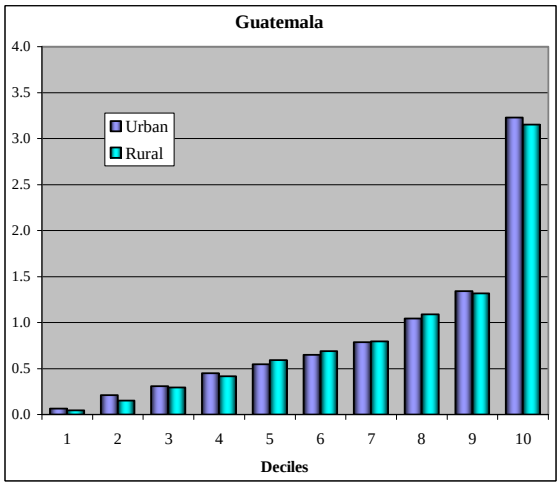
Sources: MECOVI Households Survey Database, IDB.
Costa Rica: Encuesta de Hogares de Propósitos Múltiples (2004).
El Salvador, Encuesta de Hogares de Propósitos Múltiples (2004)
Guatemala, Encuesta Nacional de Emploe e Ingresos (2004)
Honduras: Encuesta de Condiciones de Vida (2004).
Nicaragua: Encuesta Nacional de Hogares sobre Medición de Niveles de Vida (2005).

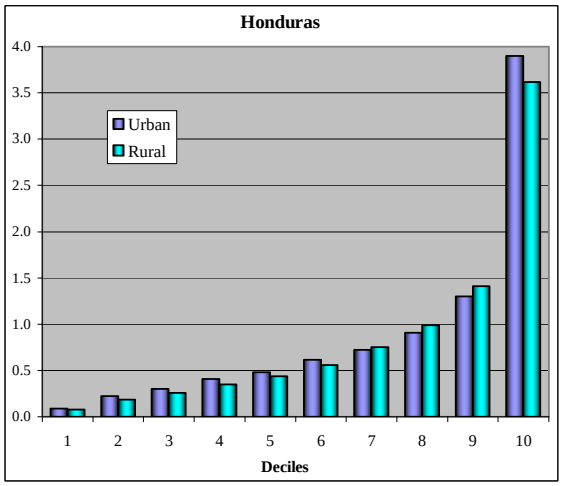
Note: Decile 1 is the poorest 10 percent population, while declice 10 is the richest 10 percent.

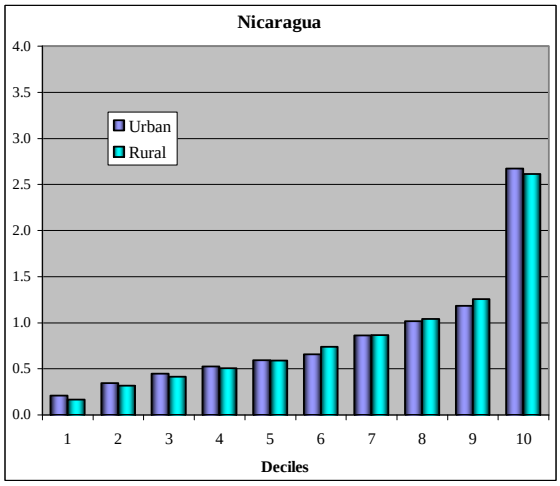
Figure 2. Per Capita Income Ratios by Deciles





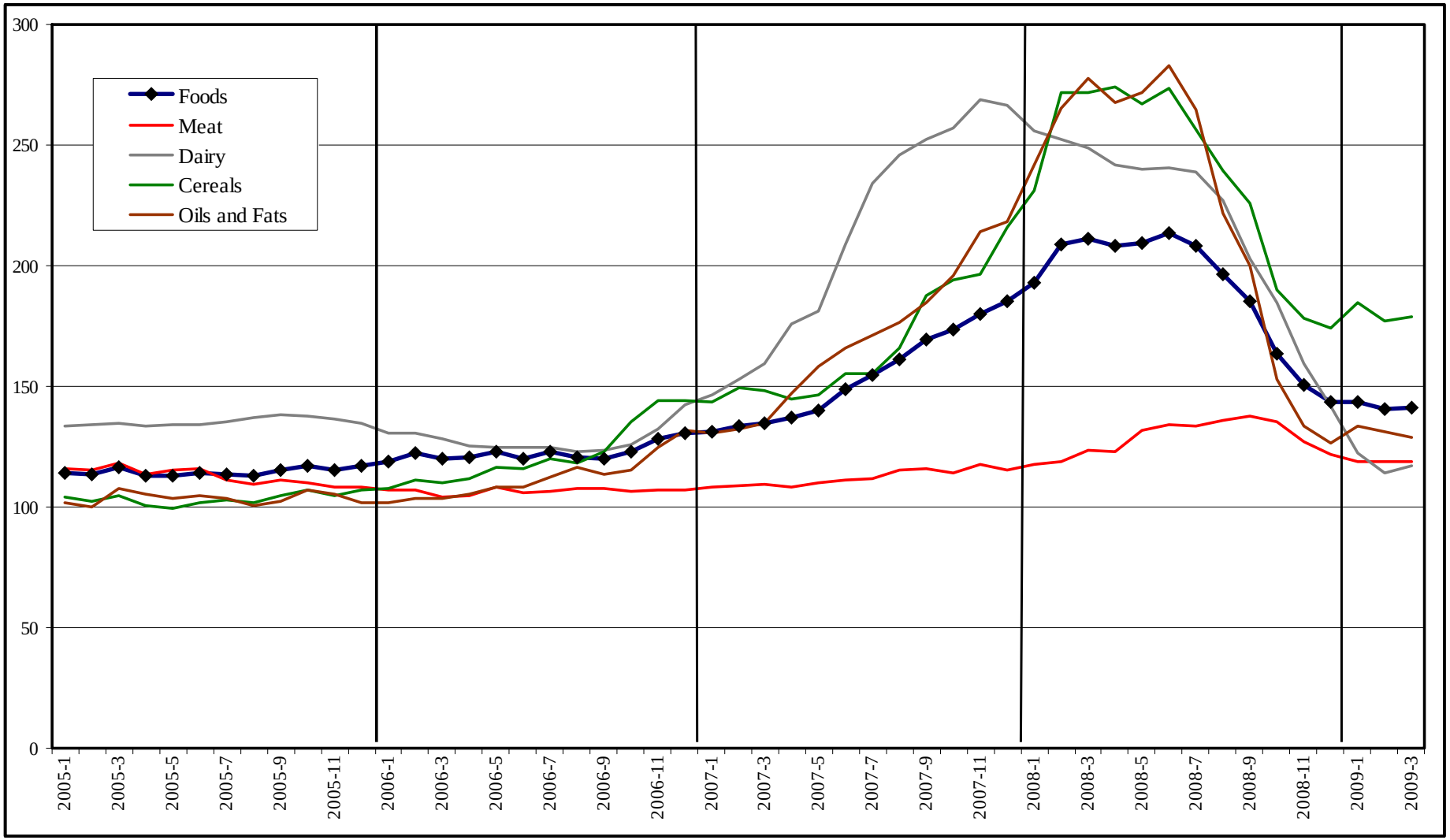






Sources: MECOVI Households Survey Database, IDB.
Note: Decile 1 is the poorest 10 percent population, while declice 10 is the richest 10 percent.

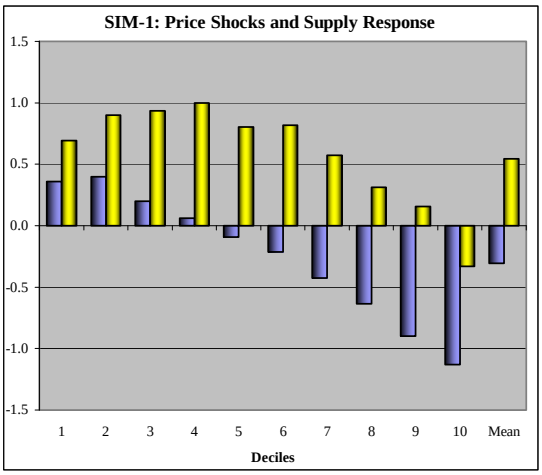
Figure 3. Global Price Indices of Key Food Products (January 2005 – March 2009)
(2002-2004=100)

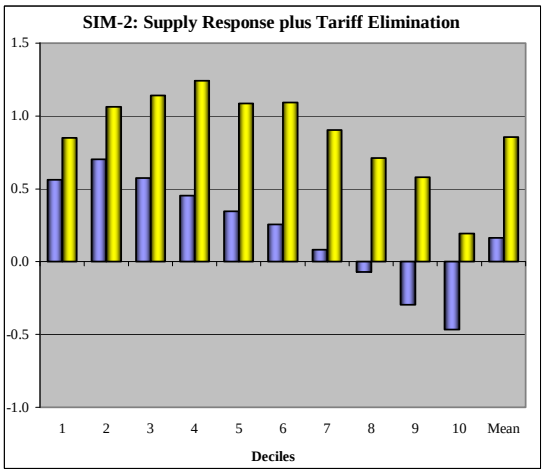


Source: FAO Food Price Indices, FAO, April 2009.

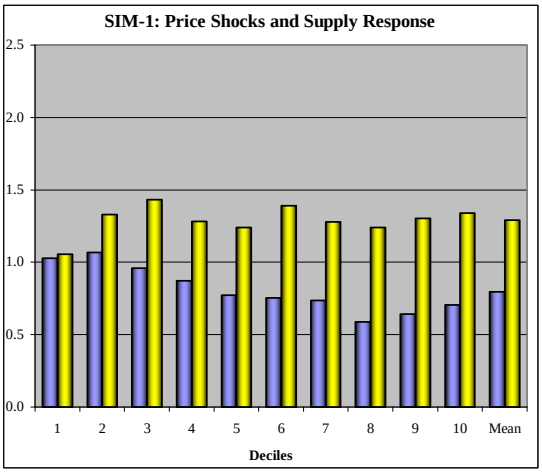
Figure 4. Impact on Per Capita Income decomposed by Deciles (percentage change from base)

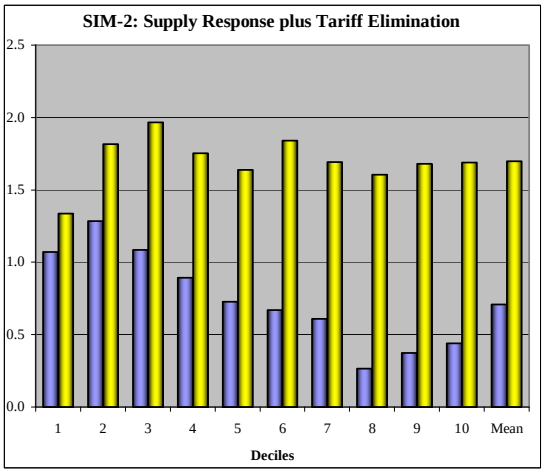
Costa Rica



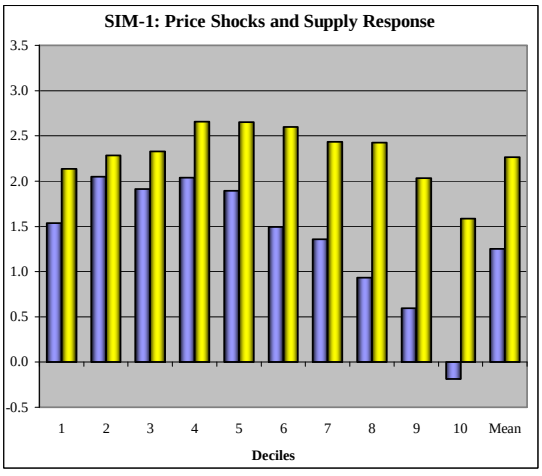


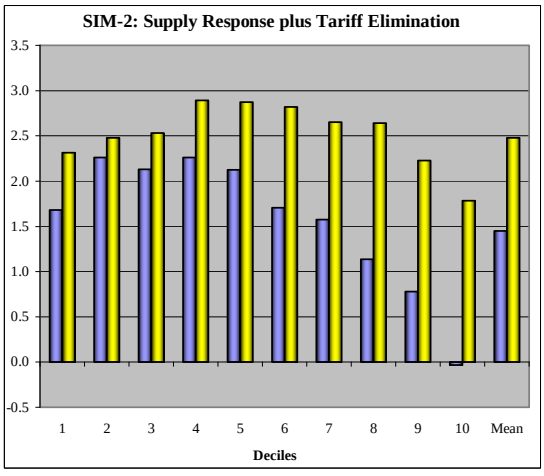
El Salvador





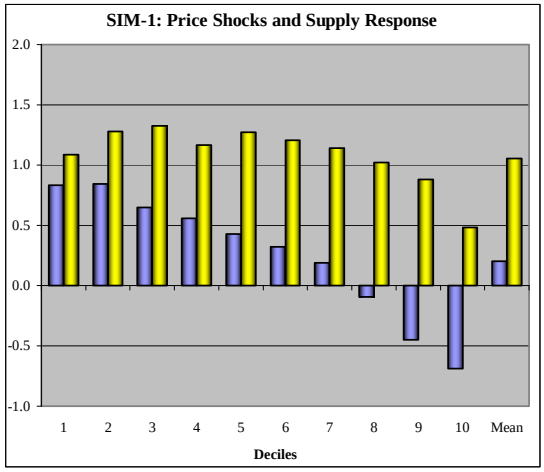
Guatemala

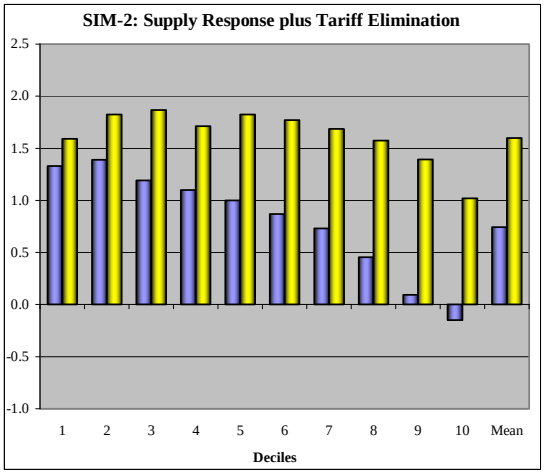




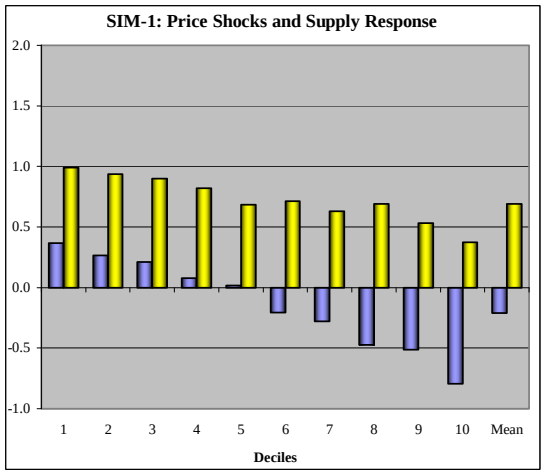
(Figure 4 continued)

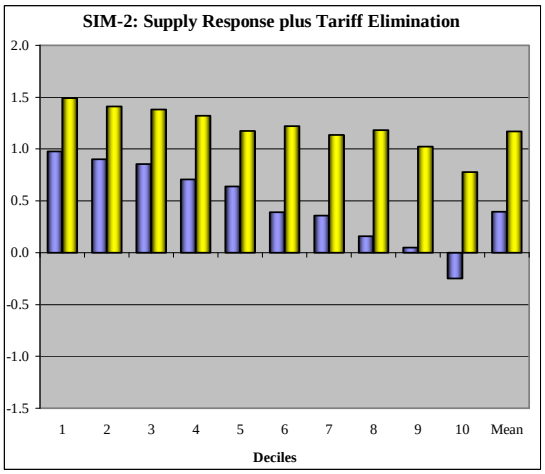
Honduras





Nicaragua





Legend:

Urban Rural

Sources: Author's estimation based on IDB-INT CACM CGE model and MECOVI Households Survey Database (IDB).