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Does Agricultural Liberalization Reduce Rural Welfare in Less Developed Countries? The Case of CAFTA

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Abstract

Conventional economic wisdom and findings from aggregate economy-wide models suggest that removing tariffs on agricultural imports is detrimental to rural welfare in less developed countries. This paper explores the rural welfare effects of own-country agricultural liberalization under CAFTA using a disaggregated rural economy-wide model that nests within it a series of micro agricultural household models. Our simulation findings suggest that CAFTA would reduce nominal incomes for nearly all rural household groups in El Salvador, Guatemala, Honduras and Nicaragua. However, compensating variations that take into account rural economy-wide adjustments to policy shocks are mostly negative, implying that current agricultural protection policies are disadvantageous for most rural household groups.

Does Agricultural Liberalization Reduce Rural Welfare in Less Developed Countries? The Case of CAFTA

The impacts of market liberalization on welfare in rural areas of less developed countries (LDCs) have received increasing attention from both researchers and policy makers as relatively poor countries become integrated into world markets and trade pacts. Overwhelmingly, the view of researchers and policy makers alike has been that, in less developed countries (LDCs), urban residents win but rural populations lose from the elimination of own-import tariffs on agricultural commodities. The urban gain results from lower consumption costs, while the rural loss is the consequence of increased competition with imported agricultural and livestock goods, depressing both profits and wages in a sector in which LDCs presumably have a comparative advantage. This raises serious welfare concerns, because many of the world's poor live in rural areas. An interesting corollary to this argument is that agricultural support policies in developed countries adversely affect welfare in rural LDC households by depressing world prices for farm goods (World Bank 2003; an excellent discussion appears in Tangermann 2005).

In this paper we use a disaggregated rural economy-wide modeling approach (Taylor, Yúnez-Naude, and Dyer 2005) to explore the rural welfare impacts of own-country agricultural tariff reforms called for in the Central American Free Trade Agreement (CAFTA) in four Central American countries: El Salvador, Guatemala, Honduras, and Nicaragua (EGHN). Our rural economy-wide model for each country consists of a series of interacting micro agricultural household models. Inasmuch as an agricultural household model can be viewed as a computable general equilibrium model (CGEM) for an individual rural household group (Taylor, Yúnez-Naude, and Dyer 2005), the disaggregated rural economy-wide model (DREM) is really a nested CGEM. To facilitate comparison, we model the same rural household groups in each of the four countries (subsistence grain producers;

small, medium and large commercial producers; and landless rural households). We use the nested rural CGEMs to simulate the impacts of country-specific agricultural provisions in CAFTA on the income of each rural household group. We also perform a welfare analysis in which the economy-wide model is used to estimate the transfers that would be required to maintain all rural household groups at their pre-CAFTA welfare levels. This transfer differs from a conventional compensating variation by taking into account rural economy-wide impacts of the trade policy shock on household resource allocations, rural wages and subsistence production.

Background

Two considerations have tended to reinforce the view that agricultural trade reforms negatively affect rural welfare in LDCs. First, many rural households produce grain, for which high-income countries have a comparative advantage in production. Removing protection on grain imports thus leaves the rural economy vulnerable to competition from foreign grain producers. The combination of generous support programs for grain farmers in high-income countries with LDC tariff reform, from this perspective, inflicts damage on the LDC rural economy. More than two thirds of developing countries are net importers of food products (Valdes and McCalla 2004).

Second, the effects of agricultural reforms in high-income countries are likely to be muted because in many cases LDCs already have preferential access to developed country markets for their agricultural exports. LDCs are net exporters of tropical products, for which competition with developed countries generally is not an issue. Preferential treatment covers a large share of developing country exports to the European Union and the United States, reaching over 90% of all agricultural exports to these regions for some LDCs (Wainio et al. 2005). The most notable preferential agreements include those between the E.U. and its members' former colonies in Africa, the Caribbean and the Pacific, and the Everything but Arms agreement; and between the United States and Africa and Latin America via the Africa Growth and Opportunity Act and the Caribbean Basin Initiative. Because of this, the argument goes, LDCs stand to gain less (in terms of increasing access to high-income markets) than they lose (by exposing their producers to foreign competition) from the liberalization of agricultural trade. In fact, some LDCs may lose from trade liberalization as a result of preference erosion (Tangermann 2005). These considerations have been salient in the contentious debates over agricultural policy that characterized the Uruguay Round in the late 1980s and 1990s and currently plague multilateral trade negotiations under the Doha Development Agenda (Anderson and Martin 2005).

Some evidence from aggregate economy-wide models suggests that the impact of agricultural trade reforms in LDCs would be positive; however, the reasons lie mostly in the effects that such reforms would have on the nonagricultural sector. Tangermann (2005) reports the finding from a GTAP model that full agricultural liberalization by high-income countries would enhance the nonagricultural terms of trade for developing countries, thus leading to income gains. However, Anderson and Valenzuela (2007), using a GTAP model, find negative effects of own-country agricultural trade reforms on agricultural value-added in all the developing countries they considered. The implication of these findings would seem to be that the more narrowly one focuses on the LDC rural economy and on own-country tariff reforms, the greater the likelihood of finding negative welfare impacts of agricultural trade liberalization.

Micro agricultural household theory suggests that the impacts of agricultural market liberalization on LDC rural welfare are not clear cut, even if LDC producers do not acquire greater access to high-income markets for their agricultural output. As producers or suppliers of factors (e.g., labor) to farms, rural household lose when the price of goods they produce decreases. However, rural households also are consumers, and it is not uncommon to find that most producers of protected goods in LDCs are not net sellers of these goods prior to reforms. Like urban households, they stand to benefit as consumers. Whether the negative production or positive consumption effect dominates is an empirical question, and the answer is likely to be different for different rural household groups.

Even on the production side, a decrease in price (e.g., of food grains) may benefit households that are engaged in other crop activities (e.g., fruits and vegetables) if factor prices (e.g., wages) decrease. Even the impacts of agricultural trade reforms on factor prices are ambiguous; they depend on the relative factor intensities of the directly and indirectly affected activities.

Understanding the impacts of agricultural trade reforms on LDC rural economies thus requires an economy-wide modeling approach that embeds within it a microeconomic focus capturing both the heterogeneity of rural households and the diversity of activities in which these households participate. GTAP and other economy-wide models are useful to explore aggregate impacts of trade policy reforms; however, their high level of aggregation precludes a rural micro focus.

CAFTA and Central American Agriculture

CAFTA represents an ideal case for studying the potential impacts of agricultural trade reforms on rural welfare. In EGHN, the majority of farm households cultivate food grains. All benefit from preferential access to U.S. markets for their agricultural exports, and all are net importers of grain. Prevailing tariffs on grain imports range from 15% (yellow maize) to 40% (rice) in El Salvador, from 20% (white maize, beans) to 35% (yellow maize) in Guatemala, from 15% (beans) to 45% (other grains) in Honduras, and from 10% (white maize) to as high as 62% (rice) in Nicaragua. Tariffs on livestock products in the four countries range from 15% (pork, fluid and dry milk, and cheeses in Guatemala and Honduras; pork and fluid milk in Nicaragua) to 164% (chicken meat, all four countries). With the exception of white corn, all of these tariffs would be phased out, either immediately or gradually, under CAFTA.[1]

The stakes are high from a rural welfare point of view. Rural poverty ranges from 62% of all rural residents in El Salvador to 86% in Honduras. CAFTA would be implemented in a context of generally deteriorating agricultural trade balances. Between 1990 and 2003, both Guatemala and Honduras experienced a decrease in their positive agricultural trade balances while in El Salvador a surplus gave way to a steep deficit (table 1). Only in Nicaragua did a positive surplus increase, due primarily to increases in bean and meat exports. In all four countries, maize and rice imports and fruit and vegetable exports increased sharply. Sugar exports increased, but in two out of the four countries (El Salvador and Honduras), traditional agricultural exports as a whole contracted.[2] Maize production decreased in Guatemala and Honduras, increased slightly in El Salvador, and rose sharply in Nicaragua. Rice production contracted in El Salvador, Guatemala and Honduras while rising in Nicaragua. Beef output stagnated in El Salvador and Guatemala, fell in Honduras, and rose in Nicaragua; beef imports increased (particularly in El Salvador and Guatemala) as did imports of poultry (particularly in Guatemala and Honduras). Milk production rose in all four countries, and except in Nicaragua, milk imports increased, as well. Changes in land use mirror these trends (table 2). Between 1978 and 2001, the land area cultivated in basic grains (maize, rice, beans, and sorghum) decreased in Honduras, did not change significantly in El Salvador and Guatemala, and increased in Nicaragua. In contrast, land in other crops, including non-traditional fruits and vegetables, increased in all four countries. Only in Nicaragua did the number of cattle increase.[3]

CAFTA would be implemented in a context of demographic transformation, as migration shifts rural population internally, to cities, and internationally, mostly to the United States.[4] Nevertheless, rural population shares remain high by international standards. In 2003, the rural share of the economically active population was 56% in Guatemala, 46% in Honduras, 42% in Nicaragua and 38% in El Salvador. The shares of population living in rural areas ranged from 43% in El Salvador to 60% in Guatemala. (In comparison, the rural shares were 25% in Mexico and 23% in the United States.) According to the U.S. Census of Population, the number of EGHN-born persons living in the United States nearly doubled from 1990 to 2000, from 771,600 to 1,342,000. The rural migration response potentially has an important influence on how agricultural trade policy reforms affect rural poverty.

Two other considerations are critical when modeling rural welfare effects of trade-policy shocks: the heterogeneity of rural households and the diversification of these households' activities and income sources.

Rural Heterogeneity

Tables 3a-3d present the classification of rural household groups that we use to capture the heterogeneity of the rural population in each Central American country, the criteria used to create the household categories, and the number of households (i) in each country and (ii) in the data bases used to estimate the models. Landless households represent the largest number of rural households in all but Guatemala, where more than half of all rural households are subsistence producers. In all four countries, rural households without land depend primarily on salaries, both agricultural and nonagricultural, and remittances from internal and international migrants. Subsistence households produce basic grains on small holdings, principally for home consumption. Because they do not participate in markets, the implicit value of their grain output is given by shadow prices that are endogenously determined for each subsistence household group. In our DREMs as in the micro agricultural household models of Strauss (1986) and De Janvry, Fafchamps, and Sadoulet (1991), these households are modeled as autarkic; basic grain production is equal to demand. A novelty of the DREM is its ability to represent differences in market articulation as well as in demands, production technologies, and activity mixes among different rural household groups.

Production decisions in commercial households, which produce primarily for markets, are guided by market rather than shadow prices. Marketed surplus from these households is simply the difference between output and demand, as in the staple agricultural household model described by Singh, Squire, and Strauss (1986).

All household groups participate in markets for other agricultural and nonagricultural commodities and for factors, either as buyers (e.g., commercial households demanding labor for crop activities) or sellers (landless households supplying labor to farm and nonfarm activities). They differ with respect to incomes, activity mixes, demand patterns, and technologies.

Average per-capita incomes, human capital and landholdings vary widely across countries as well as rural household groups. Landless households have an average annual income of US$347 per capita in Honduras and $877 in El Salvador, where we were unable to disaggregate landless households by schooling. Landless low-education households had an average per-capita income of $502 in Nicaragua and $576 in Guatemala. Average incomes of subsistence producer households range from $359 (Honduras) to $510 (Nicaragua), and those of small commercial producers, from $409 (Honduras) to $479 (Nicaragua). The highest incomes are found in large commercial households in El Salvador $1,909 and Nicaragua ($1,955).

With the exception of high-skilled landless households, rural household heads in all four countries have low levels of completed schooling, ranging from 1.3 years (low education landless households in Nicaragua) to 3.5 years (large commercial households in El Salvador).

The range of average landholdings across household groups is larger in Nicaragua (3.9 to 88.2 manzanas) and El Salvador (0.9 to 64.7 manzanas) than in Honduras (1.3 to 38.4 manzanas) and Guatemala (1.3 to 8.7 manzanas). [5] In part, these differences reflect the criteria that were used to classify rural households; however, both the average landholdings and the criteria used to construct our household groups also reflect differences in access to land in the four countries. What constitutes a large holder household in Nicaragua is not the same as in Guatemala, for example.

Rural Income Diversification

In addition to being heterogeneous, rural households exhibit diversified income sources, technologies, and demands. The same rural household commonly participates in multiple activities and receives income from various sources. Policy shocks that directly affect one activity are transmitted to others within the household as well as to other households in the rural economy. In most household groups, the share of household income from agricultural and livestock production is less than 50% and for some groups it does not reach 25%. Nearly all groups obtain around 50% of their income from wages, the majority of which are nonagricultural. Even commercial households depend heavily on wage labor for their income.

Agricultural and livestock production in each household group is also diverse. For example, in Nicaragua, medium commercial households acquire a little less than one third of their total value-added from the production of basic grains, and the other four producing groups obtain between 16% and 24% from this activity. Livestock accounts for between 27% and 52%, depending on the household group. The shares of traditional export crops are less than 10% of total value added in all groups except large commercial households. Production of non-traditional crops represents more than 10% of total value added in all household groups, and non-agricultural production accounts for more than 10% in all but low-education landless households (8%) and large commercial producers (5.5%). Similar levels of diversification are found in the other three countries. In all groups, the average household participates in multiple income activities, including production, wage labor, and migration.

There is evidence of technological diversification, reflected in differences in factor value-added shares in the same activity but across households. In general, family value-added shares are smaller in the same activities for large commercial households than for subsistence producers, while market-input shares (including hired labor) are larger for commercial producers. Technological heterogeneity across households, like differences in market access, is generally absent from aggregate economy-wide models.

The Disaggregated Rural Economy-Wide Model

DREMs embed agricultural household models within general-equilibrium models of the rural economy. Similar to Dyer, Boucher, and Taylor (2006), each agricultural household in the model is assumed to maximize utility $U(G, X, \underline{c}; \underline{\beta}^h)$, defined on the consumption of home-produced grain (G), leisure (X), and a vector of other consumption goods that may be purchased or home produced ($\underline{c} = (c_1, c_2, ..., c_I)$), subject to a budget constraint (1), production technology (2), a time constraint (3), migrant remittances (4), and in the case of subsistence households, a subsistence constraint (5):

(1) $\sum_{i=1}^{I} p_i c_i = p_M (Q_M - G) - wL_M + \sum_{i=1}^{v} p_i Q_i - w\left[\sum_{i=1}^{v} L_i - F^h\right] + I$

(2) $Q_G = Q_G(L_G, \overline{T}_G; \overline{k}^h_G, \gamma^h_G); \quad Q_i = Q_i(L_i, \overline{T}_i; \overline{k}^h_i, \gamma^h_i) \quad i = 1, ..., v$

(3) $X + F + M = \overline{L}$

(4) $R = R(M)$

(5) $G \leq Q_M$

U is a standard, quasi-concave utility function, $\underline{\beta}^h$ is a vector of household specific preference parameters, $\underline{L}_i$ is the amount of labor used in the production of good *i*, and *I* is other (exogenous) transfer income. In the cash income constraint, goods are ordered such that the first v goods are produced by the household, Q_i is the output of the i^{th} good produced by the household, w is the local wage rate, and F is the household's total local labor supply (to both own farm and off-farm work). Production of each good is assumed to exhibit constant returns in labor, land, $\overline{T}_i$, and capital, $\overline{k}_i$ (land and capital are assumed fixed). The household's total time endowment, $\overline{L}^h$, is allocated among leisure, migration, and other work. R is migrant remittances, which are a quasi-concave function of household labor allocated to migration, M. The subsistence constraint, C5, which is not binding for commercial households, restricts consumption of home produced grain to equal production in subsistence households.

The solution to this constrained optimization problem yields a set of input and consumption demands for each household. Rural general-equilibrium constraints in the model require that the sum of labor demands across all activities and households equal the sum of local labor supply. This constraint determines the rural wage, which is endogenous in each of the four country models. Thus, each rural model contains three types of prices: (1) exogenous prices for tradables (non-farm wages and the prices of most goods, which are determined outside the rural economy but may be influenced by government policies (e.g., import tariffs); (2) prices exogenous to households but determined within the rural economy (in the present models, these are limited to rural wages); and (3) household-specific shadow prices for grain (in subsistence households). The subsistence household's endogenous shadow price of grain $\rho^h = \mu / \lambda$, where μ is the shadow value of the subsistence constraint (5) and λ is the marginal utility of income (De Janvry, Fafchamps, and Sadoulet 1991; Strauss 1986).

Data and Model Calibration

To construct the rural economy-wide models, we first used data from the surveys to construct a Social Accounting Matrix (SAM) for each rural household group. Each of these SAMs could be viewed as generated by a single agricultural household model. The SAMs were then joined together into a rural sector-wide SAM for each country. Nearly all of the information needed to calibrate the corresponding household models and the rural economy-wide models are contained within these SAMs, as explained below. The four rural SAMs are interesting in and of themselves, because they offer a snapshot of individual groups of rural households as well as the linkages that transmit influences of policy shocks among households. The framework of the SAMs is described in appendix B. Each household SAM consists of a set of 44 production activities, 5 factors, government, 9 investment accounts, and three "rest-of-world" accounts, including the rest of the rural sector of which the household is part, the rest of the country, and the rest of the world outside the country.

Unfortunately, no single data source provides all of the information necessary to estimate the SAMs. Because of this, data from diverse sources were used to construct a SAM for each rural household group in each of the four countries. The SAMs, together with econometric estimates of remittance elasticities and family value-added shares, were used to calibrate the household models that constitute each DREM.

The key data sources for each country include the rural components of the El Salvador Multi-purpose Household Survey (*Encuesta de Hogares de Propósitos Múltiples*, or EHPM) of 2003, the Guatemala National Living Standards Survey (*Encuesta Nacional de Condiciones de Vida*, or ENCOVI) of 2000, and the Nicaragua Living Standards Survey (*Encuesta del Nivel de Vida*, or MECOVI) of 2000. All three of these are nationally representative and provide information on socio-demographic variables, production and inputs, wages, migrant remittances and income from other sources, and expenditures. A nationally representative survey was not available to construct the Honduras DREM; thus, the six rural household SAMs were constructed from two data sources: a survey of rural households conducted by IFPRI-WUR-PRONADERS in 2001-2002 (see Jansen, Siegel, and Pichón 2005), and a rural household survey conducted by the University of Wisconsin and The World Bank in 2000-2001 (see Boucher, Barham, and Carter 2005). The IFPRI survey covered 376 households and 1066 parcels in 19 cantons, and the University of Wisconsin survey covered 850 households in 26 cantons, mostly in the northern part of the country. We primarily used the IFPRI survey to construct the Honduras household SAMs, because of its greater detail on production costs and consumption expenditures and because it is more nationally representative, as hillside zones constitute 80% of the nation's land area. The Wisconsin data were used primarily to disaggregate family value added.

The form of each household-specific factor and consumption demand depends on technology and preferences. On the technology side, we assume Cobb-Douglas production functions for each household group and good, in which the exponents are set equal to factor shares in value added, as implied by profit maximization and available from the household SAMs.[6] Consumption demands were modeled using a linear expenditure system (LES) with no minimum required quantities (Deaton and Muellbauer 1980), implying that preferences of individual groups are described by a Cobb-Douglas utility function. Budget shares, like factor value-added shares, were calculated from the household expenditure columns in the SAMs.[7] The elasticities of remittance income with respect to migration were estimated by regressing household remittances on the number of family migrants in each household.

The solution to the base model for each country determines labor demands in each activity, production, full income and consumption demands for each rural household group, the agricultural wage, migration, and shadow prices of grain in subsistence household groups.

This base model is the starting point for carrying out simulations to explore the impacts of CAFTA's agricultural provisions on rural welfare.

Simulation and Welfare Analysis Results

Simulations were conducted under three different scenarios designed to explore the impacts of trade policy adjustments, which are depicted in appendix A, on the rural economy of each of the four countries in the short, medium, and long run. The simulation experiments are summarized in table 4. Our simulations are founded on two propositions. The first is that domestic prices of agricultural commodities would decrease by percentage amounts equivalent to the changes in tariffs prevailing prior to CAFTA. The second is that the changes in agricultural prices would directly affect only the producers that market the good in question. That is, subsistence households would not be affected directly by trade reforms, although they may be affected indirectly, via other rural markets.

Simulation and Scenario Designs

The three simulations include:

The *extreme* or *long-run scenario,* in which an immediate elimination of tariffs for all agricultural goods is simulated (table 4). This scenario illustrates what might occur without transition policies, including gradual removal of tariffs, and with no change in Central American countries' agricultural exports to the United States. Unlike NAFTA, CAFTA does not call for a reduction in tariffs for white maize. Nevertheless, we include the removal of tariffs on white maize imports in this simulation because it is intended to represent the extreme case and also because there may be some substitutability between white and yellow maize in production and consumption.

The *intermediate* or *medium run scenario* simulates a case in which there is immediate elimination of tariffs for sensitive agricultural goods whose tariff-free quotas exceeded imports from the United States in recent years, and/or for which the tariff phase-out period initiates during CAFTA's first year.

How to treat maize in this scenario is complicated for various reasons. Although CAFTA differentiates between white and yellow maize, there is some degree of substitutability between the two. However, in our simulations it is not possible to differentiate between yellow and white maize. Most household production in Central America is of the white varieties, but the available data do not distinguish maize by color. Additionally, the decision of whether to include or exclude maize (like other sensitive agricultural products) based on the difference between CAFTA quotas and imports depend on the period during which one measures maize imports.

This intermediate scenario includes maize liberalization in El Salvador, Guatemala, and Nicaragua. In these three countries, tariff-free quotas established for the first year of CAFTA significantly exceed maize imports from the Untied States; thus, one would expect a decrease in domestic prices in the medium but not the short run. Maize liberalization is excluded from the intermediate scenario for Honduras, where tariff-free quotas are equal or inferior to pre-CAFTA imports and are small compared with total supply (Morley 2005). This scenario also includes the elimination of tariffs for beans and meats in each of the four countries, because a grace period was not negotiated for these products. Finally, rice was included for Honduras, where the negotiated quota exceeds current imports.

Finally, the *low* or *short-run scenario* simulates a situation in which sensitive products with special safeguards and/or grace periods of 10 years or more are excluded. This scenario excludes liberalization of rice, maize, small livestock, and milk products in each of the four countries. It eliminates tariffs on large livestock and beans in Guatemala, Nicaragua, and Honduras. There are special safeguards and a 15-year phase-out of tariffs on these products in El Salvador. The phase-out period of included products initiates in year 1 and that of excluded products begins after year 5 of CAFTA's implementation. The exception is low-quality meats in El Salvador, for which the grace period is only three years.

The results of these scenarios depend on (i) the design of the scenarios, which reflect pre-reform protection levels and the details of the agreement's implementation in each country, (ii) the linkages among rural households and markets, which transmit the effects of the reforms through the rural economy, (iii) the mix of pre-reform production and income activities in each household group and country (for example, the concentration of production in sensitive activities ranges from 17.3% in large commercial households of Honduras to 70% in medium commercial households in Guatemala), and (iv), the model parameters, which shape the responses of rural household production, consumption and migration.

Simulation Results

Tables 5 and 6 report the results of the CAFTA simulations. Table 5 presents simulated impacts on production, while table 6 reports income and welfare effects.

Production Effects

The extreme scenario represents a significant shock for the rural economies of all four countries. Its immediate effect is felt in the producer households that sell the affected goods prior to CAFTA. Market linkages transmit the effect from these to the other rural household groups, including landless and subsistence households.

Basic grain production falls sharply in almost all cases; however, there are striking differences between countries as well as among household groups within countries (table 5). Grain production decreases by 26-30% in Guatemala, 14% in Honduras, and 8-50% in Nicaragua. Supply elasticities for each household group, which can be calculated from the simulations, reflect general-equilibrium adjustments in each country's rural sector. For maize, these range from 0.26 to 1.15 in Nicaragua, 0.70 to 0.90 in Honduras, and 1.65 to 1.69 in Guatemala. In most cases, the largest decreases in supply are for the grains that were most heavily protected prior to the CAFTA reform: rice in Nicaragua, El Salvador and Honduras and maize in Honduras. Nevertheless, in some cases general-equilibrium effects mitigate the effects of prices changes implied by the elimination of tariffs. This is the case in El Salvador, where the price of maize decreases by 20% under the extreme scenario but maize production falls by 1.4 and 12.2 percent in small and medium commercial households, respectively. Large commercial households in El Salvador increase their production of maize. This seemingly paradoxical result is explained by the importance of livestock products in this group's production mix and an even steeper decline in livestock products under this scenario.

The changes in basic grain prices do not have a direct effect on subsistence households. However, its impact is transmitted to these households via rural markets, particularly for labor. Implicit or shadow prices of specific basic grains are almost unchanged in El Salvador, but they decrease 0.9-2.8% in Guatemala, 0.5-1.3% in Honduras and 2.1-6.7% in Nicaragua, compared to decreases in commercial prices that range from 15% to 62%. Lower shadow prices of grains accompany decreases in subsistence household incomes.

Labor demands on large farms contract, causing a reduction in rural wages in all scenarios. Wages fall by only 0.5% in El Salvador but nearly 3% in Guatemala, 8.5% in Nicaragua and 26% in Honduras. Because of these wage decreases and an imperfect transmission of output price changes across households, subsistence grain production increases by 1.8% and 2.1% in Guatemala and Nicaragua, respectively, while remaining almost unchanged in El Salvador and Honduras. This finding is reminiscent of what occurred in Mexico after NAFTA: a decrease in the market price of maize was associated with an increase in maize production on rainfed farms (Yúnez-Naude 2002). Dyer, Boucher, and Taylor (2006) refer to this as a "retreat into subsistence."

In response to decreased profitability in the previously protected importables sectors, rural producers channel their resources into other crop and non-crop activities and migration. The cross-effect of tariff elimination on other activities varies across households and countries. All groups with a significant participation in traditional-crop production (plantains, bananas, coffee) prior to reforms increase their production of these goods. In El Salvador, small and medium commercial households increase their production of traditional crops by 3.3% and 0.9%, respectively. In Guatemala, production of traditional crops increases between 7% (small commercial households) and 45% (large commercial); in Honduras, between 0.6% (subsistence) and 17% (medium commercial), and in Nicaragua between 31% (medium commercial) and 51% (subsistence). Output of non-traditional crops increases more, although from a smaller base. Total rural out-migration increases by 7.6% in El Salvador, 1.1% in Guatemala, 0.3% in Honduras and 0.6% in Nicaragua.

The major difference between the extreme and intermediate scenarios is that the latter maintains tariffs for maize in Honduras, for rice in Guatemala and Nicaragua, and for milk products in all four countries. As a result, commercial production of grains in Honduras falls less under the intermediate (2.3-5.0%) than the extreme (13.7%-14.4%) scenario. In Nicaragua, grain production now falls by 4.7% in small commercial households (compared with 7.6%) and by 9.7% and 3.3%, respectively, in medium and large commercial households (compared with 16.7% and 50.2%). In Guatemala, where maize trade is liberalized under both scenarios, there is little difference between the two. However, there are substantial differences between scenarios in El Salvador, where livestock production is relatively important. Grain output now falls in large commercial households, and it decreases more than under the extreme scenario in medium households. This result illustrates the way in which non-uniform implementation of trade reforms can create new distortions on the production side, as the newly liberalized activity (in the Salvadoran case, livestock) becomes less profitable relative to the protected activity (grains). A similar result is evident in Honduras, where under the intermediate scenario the tariff on maize imports persists while that on beans is eliminated; maize production increases, while bean production by all commercial households contracts sharply. Rice production by all commercial households in Honduras also decreases more sharply here than under the extreme scenario.

Under the low scenario, tariffs are maintained for maize, rice and small livestock but eliminated for beans and large livestock. This mutes the negative production effects in all four countries. Basic grain production is almost unchanged in El Salvador. There is little difference in production effects between the intermediate and low scenarios in Honduras, where maize tariffs are maintained under both. Negative grain production effects become positive for medium commercial households in Guatemala and for subsistence and large commercial households in Nicaragua, once again highlighting the complexity of effects when trade reforms are not uniform.

Income Effects

Income effects are summarized in the left-hand panel of table 6. Under the extreme scenario, nominal income falls for all household groups in all four countries. In three of the countries (El Salvador, Guatemala and Nicaragua), large commercial producers are hardest hit by agricultural trade reforms. This group's income falls by 4.9% in Nicaragua, 8% in Guatemala, 8.7% in Honduras and 24.1% in El Salvador. The sharp drop in nominal income for large commercial households in El Salvador reflects these households' production concentration in livestock and livestock products (e.g., milk) prior to reforms. (Price decreases for these products range from 15% to 61%; see table 4.) Medium commercial producers also suffer relatively large nominal income losses in El Salvador, Guatemala y Nicaragua (-6.3%, -4.1% and -2.6%, respectively). In Honduras, the biggest losers are landless households, which rely heavily on agricultural employment (-25.1%), followed by medium (-12.2%), small (-10.1%) and large (-8.7%) commercial farms.

Nominal incomes of subsistence households do not change in El Salvador and decrease by only 0.5% in Honduras and 1.0% in Guatemala and Nicaragua. These households lose primarily because of the decrease in rural wages. Lower wages, however, partially counteract a negative income effect on subsistence production. As a result, the supply of basic grains either does not change (El Salvador, Honduras) or else increases slightly (Guatemala, Nicaragua).

In Honduras, under the intermediate scenario the income of subsistence households changes little and that of commercial households decreases far less than under the extreme scenario. Small commercial households lose 4.6%, compared with 10.1% under the extreme scenario. Medium commercial households lose 2.7% (compared with 10.1%), and large commercial households lose only 1% (compared with 8.7%). Clearly, the maintenance of tariffs on maize imports protects Honduran commercial household incomes but has little effect on subsistence households. In the other countries, where the intermediate scenario includes liberalization of maize trade, the income effects are similar to those under the extreme scenario. The chief exceptions are medium and large commercial households in El Salvador.

Minimal impacts of trade reforms on production are mirrored in the household income results under the low scenario. Decreases in nominal incomes do not exceed 1% for any rural Salvadoran household group or any subsistence household group in the four countries. Among commercial producers, decreases in nominal income under the low scenario range from 0.5% to 2.5% in Guatemala, from 0.9% to 4.4% in Honduras, and from 1.1% to 3.6% in Nicaragua.

Welfare Effects

A decrease in food prices has an ambiguous effect on welfare in an agricultural household model, as positive effects of decreases in consumption prices may counteract the negative income effects described above. Which effect dominates is an empirical question. Assessing rural welfare effects of agricultural trade reforms is particularly complex in a general-equilibrium setting, because both quantities and prices are changing.

We employ a general-equilibrium version of the compensating variation (GECV) to estimate the rural welfare effects of CAFTA's agricultural provisions. By introducing a GEVC slack variable into each household's budget constraint and holding utility constant before and after the simulated reforms, one obtains the transfer required to compensate households *taking into account all quantity and price adjustments* captured by the DREM. A positive value of the GECV implies that welfare decreases as a result of the reforms—that is, the negative income effect dominates the positive consumption-price effect. A negative GECV implies the opposite.

Estimated GECVs are reported in the right-hand panel of table 6. Despite a decrease in nominal income for all rural groups under the extreme scenario, in the majority of cases the GECV is negative, implying that rural household welfare increases. This reflects the fact that income decreases are much smaller in percentage terms than the decreases in prices that result from tariff removal. For example, in El Salvador small commercial households reap a benefit from agricultural trade reforms equivalent to 10.3% of their income prior to the reform. Effects on medium and large commercial households and on landless laborer households are smaller but nonetheless positive. In all countries except Honduras, the total GECV is negative under the extreme scenario, ranging from 1.5% to 5.7% of base income. In Honduras, lower consumption prices are not sufficient to compensate for a sharp decrease in wages for rural worker households, and the GECV is positive (14.7% of base income).

The compensating transfer is small and positive for large commercial producers in Guatemala, nil for subsistence households in El Salvador, but negative for all other rural household groups. Under the intermediate scenario, the GECV is negative for all groups except small and medium commercial households in Honduras and large commercial households in Guatemala. Under the low scenario, GECVs are zero or negative for all groups. In some cases the estimated transfer is negative and largest in absolute value under the extreme scenario, due to the decrease in consumption costs that result from immediate tariff removal.

These results might appear surprising in the light of the negative effects of agricultural trade liberalization on agricultural production. However, they are not surprising when viewed from the consumption side of the rural household, which typically spends a significant share of its budget on food items protected by pre-CAFTA tariffs ranging from 10-154%. The results of our welfare simulations suggest that the majority of rural households, in particular smaller producers, do not benefit from pre-CAFTA agricultural import tariffs.

Limitations and Caveats

As in any simulation model, modeling assumptions and data limitations influence the results of our simulations and welfare analysis. The model assumes that rural households can reallocate resources among activities in which they participate prior to the reform. Constraints on rural households' capacity to adjust, due for example to rural credit market imperfections, would tend to magnify the negative effects of trade reforms. Indeed, in the majority of cases, positive cross-sector effects presented in table 5 are smaller in subsistence and small-commercial households than in larger commercial households, even though liquidity constraints are not explicitly incorporated into the model. For example,in Honduras, small commercial households change their production of traditional and nontraditional agricultural goods only slightly in response to the removal of import tariffs on grains and other sensitive items, and the nontraditional agricultural supply response is more than six times greater for large than small commercial households. These considerations highlight the need for transition policies to facilitate rural adjustments to trade reforms, particularly for small-producer households in which adjustment constraints are likely to be most severe.

Conclusions

The findings presented in the paper highlight the importance of using a disaggregated modeling approach with a focus on rural households to explore the impacts of agricultural trade reforms on rural welfare. Aggregate CGE models capture important economy-wide effects of policy shocks; however, they miss the diversity of activities, technologies, and degrees of articulation with markets that characterize LDC rural economies. Consistent with aggregate CGE models, DREM simulations indicate that removal of import tariffs on agricultural goods, ceteris paribus, would negatively affect the production of these goods while stimulating other crop and noncrop activities, including migration. However, the production effects of agricultural trade reforms would vary widely across both countries and rural household groups and depend critically on the structure of rural economies, including market linkages that transmit influences from one household group to another. Phased-in trade liberalization, as called for in CAFTA, would eliminate most negative production and income effects on agriculture in the short run. Nevertheless, gradual reform tends to increase the negative effects on the agricultural sectors for which tariffs are eliminated. In the longer run, when tariffs on all agricultural imports are eliminated, income effects, while negative, would be small relative to the magnitude of price changes.

By design, the present research focuses on negative aspects of agricultural trade reforms, that is, the perception that removing agricultural tariffs would adversely affect own production, incomes, and rural welfare. If trade reforms opened up new markets for agricultural exports, they would also create positive rural economic linkages that could be studied with the models used here. Even when one ignores this possible upside of regional trade integration, negative income effects of own-tariff removal are mitigated to the extent that households are able to channel resources into other crop and non-crop activities in response to price shocks. Impediments to households' capacity to adjust would tend to amplify negative welfare effects of trade reforms, and partly because of this, incomes would be negatively affected more for some rural household groups than for others. However, consistent with agricultural household theory, we find that a positive consumption effect of lower food prices would mitigate and, in most cases, reverse the negative effect that lower incomes would have on rural welfare.

Footnotes

[1] Prevailing tariffs and proposed tariff adjustments under CAFTA are summarized in Appendix A.

[2] The principal traditional exports include sugar, bananas and coffee.

[3] The anomaly of Nicaragua's recent agricultural production and land use trends likely reflects, in part, a catching up process following social upheavals in the 1980s and early 1990s.

[4] The chief exception is migration by Nicaraguans to Costa Rica.

[5] One manzana is equal in area to 0.7 hectares.

[6] For subsistence households, the exponent was obtained by valuing output at the household's shadow value of grain.

[7] Budget shares for the subsistence good were obtained by valuing this good at a shadow price equal to its observed per-unit cost of production.

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Table 1. Agricultural Trade Balance and Production and Trade Volumes for Key Products, 1990-2003

	El Salvador		Guatemala		Honduras		Nicaragua	
	1990	2003	1990	2003	1990	2003	1990	2003
Agricultural Trade Balance (millions of US$)								
Exports (E)	349	438	829	1358	895	665	255	479
Imports (M)	220	817	262	885	137	567	107	285
(E)-(M)	129	-379	567	473	758	98	148	194
Production and Trade Volumes (thousands of metric tons) for Selected Products								
Maize								
Production	482	508	1,034	861	446	414	177	412
Exports	0	0	0	3	0	4	0	2
Imports	31	400	119	539	24	225	57	80
Beans								
Production	47.4	76	107.6	87.8	66.3	77.4	53.5	185.2
Exports	0.9	2.9	0	0	0	3.5	1.8	43.7
Imports	3.9	21.9	2.1	0	0	0	8.4	1.9
Rice								
Production	38.1	13	28.4	22.4	36.7	9.4	66.7	181.2
Exports	0.6	1.3	0	1	0	1.5	0	1.4
Imports	4.5	93.5	14.1	58.7	4.9	130.9	38.7	84.3
Beef								
Production	27	29	64	63	96	57	51	66
Exports	0.8	0.3	29	0.7	11.4	1	25.3	34.9
Imports	0	15	0	5	0.03	0.3	0	0.4
Poultry								
Production	33	85	66	155	30	99	7	62
Exports	0	0	0	0.4	0	0.3	0	0.2
Imports	0	1.2	0.2	26	0	4.8	0	0.7
Milk								
Production	272	393	251	270	350	597	158	641
Exports	0.3	4	0.7	9	0.3	22.8	0	61.8
Imports	61	195	71	226	26	52	24	19
Sugar								
Production	273	529	975	1,912	193	300	208	346
Exports	44.8	266.3	568.8	1,264.1	27.1	53.6	116.4	133.1
Imports	0.07	0.07	0.01	1.5	0	0.02	15.5	0.027

Source: FAOSTAT

Table 2. Changes in Land Use and Cattle Herds, 1978 to 2001 (Thousands of hectares and head of cattle)

Product	El Salvador		Guatemala		Honduras		Nicaragua	
	1978	2001	1978	2001	1978	2001	1978	2001
Basic Grains	467	484	793	795	571	494	374	623
Traditional Agro-Exports	303	244	482	593	259	338	363	188
Other Crops	42	57	129	221	48	73	43	53
Head of Cattle	1,211	1,050	1,929	1,100	2,247	1,860	2,270	2,657

Notes: Basic grains include maize, beans, rice, and sorghum; traditional agro-exports include cotton, coffee, sugar cane, sesame, bananas, and cacao; other crops include mostly vegetables, citrus and other fruits.
Source: FAOSTAT

Table 3. Typologies of Rural Households

a. El Salvador

Code	Definition	Selection criteria	Number of this type of households in…	
			the country	**survey sample**
H1	Landless households, low skill	Don’t own land, but may rent for agricultural production; household head has fewer than 6 years of education	261,252	13,948
H2	Landless househlds, high skill	Don’t own land, but may rent for agricultural production; household head has more than 6 years of education	71,764	4,156
H3	Subsistence agricultural households	Own up to 10 manzanas; produce only basic grains	107,246	6,860
H4	Small commercial producers	Own up to 10 manzanas; diversified production	126,681	8,957
H5	Medium-sized commercial producers	Own between 10 and 50 manzanas; diversified production	6,234	349
H6	Large commercial producers	Own more than 50 manzanas; diversified production	401	14
H7	Households with land, but without agricultural production	Own land, but do not produce agricultural products	2,622	155
	Total		**576,200**	**34,439**

Source: Gathered from the El Salvador Multi-purpose Household Survey (Encuesta de Hogares de Propósitos Múltiples) of 2003 published by DIGESTYC (Dirección General de Estadística y Censos) *b. Guatemala*

Code	Definition	Selection criteria	Number of this type of households in…	
			the country	**survey sample**
H1	Landless households, low skill	Without agricultural land; household head has fewer than 6 years of education.	160,357	503
H2	Landless househlds, high skill	Without agricultural land; household head has more than 6 years of education.	30,031	107
H3	Subsistence agricultural households	Comply with at least two of the three following criteria: produce basic grains on less than one manzana; consume more than 95% of their own production; do not hire non-family labor for cultuvation.	659,922	1,931
H4	Small commercial producers	Own less than 5 manzanas; sell more than 5% of production; hire non-family labor.	295,854	994
H5	Medium-sized commercial producers	Own between 2 and 30 manzanas; sell more than 5% of production; hire non-family labor.	66,752	204
H6	Large commercial producers	Own over 30 manzanas; sell more than 5% of production; hire non-family labor.	26,129	113
	Total		**1,239,045**	**3,852**

Source: Guatemala Living Standards Survey (2000) *c. Honduras*

Code	Definition	Selection criteria	Number of this type of household in…		
			the country	survey sample IFPRI	survey sample Wisconsin
H1	Landless households, low skill	Don't own land, but may rent for agricultural production; household head has fewer than 6 years of education.	180,000	9	39
H2	Subsistence agricultural households	Own less than one manzana; only produce basic grains.	65,000	24	42
H3	Small commercial producers	Own between 2 and 5 manzanas; diversified production.	140,000	113	223
H4	Medium-sized commercial producers	Own between 5 and 10 manzanas; diversified production.	90,000	112	299
H5	Large commercial producers	Own more than 10 manzanas; diversified production.	17,000	112	184
H6	Households with land but without agricultural production	Own land but do not produce agricultural products.	sd	6	26
	Total		**492,000**	**376**	**813**

Sources: Total number of rural households in the country: PNUD, Human development survey, Honduras 1998. Rural population: World Bank 2005.

d. Nicaragua

Code	Definition	Selection criteria	Number of this type of household in…	
			the country	**survey sample**
H1	Landless households, low skill	Don't own land, but may rent for agricultural production; household head has fewer than 6 years of education.	86,541	425
H2	Landless households, high skill	Don't own land, but may rent for agricultural production; household head has more than 6 years of education.	11,455	57
H3	Subsistence agricultural households	Own less than 10 manzanas; consume more than 50% of their own production.	72,124	361
H4	Small commercial producers	Own less than 10 manzanas; sell more than 50% of basic grains harvested.	60,972	327
H5	Medium-sized commercial producers	Own between 10 and 50 manzanas; sell more than 50% of basic grains harvested.	38,553	226
H6	Large commercial producers	Own more than 50 manzanas; sell more than 50% of basic grains harvested.	23,451	130
	Total		**293,097**	**1526**

Source: Living Standards Survey, 2000

Table 4. Comparison of Simulation Designs in the Four Countries

Country and simulation of trade policy adjustments	Simulated percentage reduction of the price of …					
	Corn	Beans	Rice	Large Livestock	Small Livestock	Milk products
El Salvador						
Extreme	20%	15%	40%	15%	61%	15%
Intermediate	20%	15%	40%	15%	61%	
Low		15%		15%		
Guatemala						
Extreme	20%	20%	29%	15%	54%	15%
Intermediate	20%	20%		15%	54%	
Low		20%		15%		
Honduras						
Extreme	45%	15%	45%	15%	43%	15%
Intermediate		15%	45%	15%	43%	
Low		15%		15%		
Nicaragua						
Extreme	10%	30%	62%	30%	31%	15%
Intermediate	10%	30%		30%	31%	
Low		30%		30%		

Table 5. Simulated Production Effects of CAFTA Agricultural Reforms (Percentage Changes)

Country and simulation	Basic Grains				Livestock				Traditional crops				Non-traditional crops				Non-agricultural production			
	BG	SC	MC	LC	BG	SC	MC	LC	BG	SC	MC	LC	BG	SC	MC	LC	BG	SC	MC	LC
El Salvador																				
Extreme	0.0	-12.3	-1.4	33.3	NA	-11.4	-15.7	-15.8	NA	8.2	20.5	NA	NA	10.0	21.0	NA	0.1	-30.9	-23.8	-6.5
Intermediate	0.0	-14.5	-12.0	-6.0	NA	-13.4	-22.4	-28.9	NA	4.1	4.0	NA	NA	5.0	4.1	NA	0.0	4.8	4.4	2.5
Low	0.0	0.4	0.6	0.0	NA	-12.2	-9.5	-1.1	NA	0.4	0.7	NA	NA	0.5	0.7	NA	0.0	0.5	0.8	0.0
Guatemala																				
Extreme	1.8	-27.8	-24.7	-27.7	-30.0	-25.1	-16.6	-29.9	12.0	4.6	24.8	45.3	7.3	9.3	13.0	16.0	4.6	2.4	NA	NA
Intermediate	0.5	-27.6	-25.6	-30.0	-19.1	-12.7	-10.3	-12.6	7.0	4.8	20.5	27.9	4.3	9.1	10.8	9.5	2.7	2.4	NA	NA
Low	-0.4	-1.3	2.7	-0.1	-13.3	-7.1	-8.5	-3.9	3.5	0.9	8.7	6.6	2.1	-0.2	4.7	1.5	1.3	-0.1	NA	NA
Honduras																				
Extreme	0.0	-14.4	-13.7	-13.9	-3.9	-2.6	-2.6	-4.1	0.6	8.5	17.9	3.3	0.3	11.0	20.6	71.0	1.4	17.5	6.2	-3.2
Intermediate	0.0	-5.0	-2.3	-2.9	--3.8	-3.1	-3.3	-3.8	0.2	3.4	2.6	0.5	0.1	3.8	1.9	1.7	0.4	8.1	2.3	0.7
Low	0.0	-4.3	-2.1	-2.3	-3.7	-3.0	-3.3	-3.8	0.1	3.2	2.6	0.4	0.1	3.6	1.9	1.6	0.4	7.6	2.3	0.7
Nicaragua																				
Extreme	2.1	-7.6	-16.7	-50.2	-41.4	-34.3	-37.8	-47.2	51.0	37.4	31.1	43.8	NA	88.6	71.7	107	7.7	5.8	2.8	0.5
Intermediate	1.8	-4.7	-9.7	-3.3	-40.3	-30.8	-36.5	-49.9	44.0	31.1	23.3	24.6	NA	71.7	52.1	55.6	11.7	8.8	6.1	2.6
Low	1.8	1.5	-4.0	3.2	-36.7	-26.3	-33.6	-48.8	40.0	22.9	17.2	20.9	NA	51.0	37.4	46.3	10.9	6.6	4.5	2.5

Notes: BG: Producer of basic grains; **SC**: Small comercial producer; **MC**: Medium-sized comercial producer; **LC**: Large commercial producer.
Source: Simulations using the DREM for each country.

Table 6. Income and Welfare Effects of CAFTA Agricultural Reforms in Central America (Percentage Changes)

Country and simulation	Household net income						Compensating variation					
	BG	SC	MC	LC	WL	All	BG	SC	MC	LC	WL	All
El Salvador												
Extreme	0.0	-0.6	-6.3	-24.1	-0.3	-0.4	0.0	-10.3	-5.8	-2.9	-5.0	-5.7
Intermediate	0.0	-0.7	-2.4	-2.2	-0.3	-0.3	0.0	-4.5	-3.9	-8.4	-2.4	-2.7
Low	0.0	-0.1	-0.4	0.0	0.0	0.0	0.0	-0.2	-0.3	0.0	-0.3	-0.3
Guatemala												
Extreme	-0.9	-0.5	-4.1	-8.0	-0.4	-1.0	-4.8	-6.7	-5.7	0.3	-6.2	-5.2
Intermediate	-0.8	-0.7	-3.7	-5.0	-0.6	-0.9	-2.1	-3.5	-2.8	0.4	-2.9	-2.4
Low	-0.7	-0.5	-2.5	-1.7	-0.6	-0.7	-1.2	-0.8	-1.0	-0.6	-0.8	-1.0
Honduras												
Extreme	-0.5	-10.1	-12.2	-8.7	-25.1	-12.0	-0.4	-1.9	-4.4	-1.1	14.7	1.1
Intermediate	-0.1	-4.6	-2.7	-1.0	-0.9	-1.7	-0.2	2.5	0.4	-3.5	-7.6	-2.6
Low	-0.1	-4.4	-2.7	-0.9	-0.9	-1.6	-0.2	2.4	0.4	-3.4	-7.6	-2.6
Nicaragua												
Extreme	-1.2	-1.8	-2.6	-4.9	-1.5	-2.3	-1.6	-1.6	-2.1	-0.6	-2.1	-1.5
Intermediate	-0.9	-1.4	-2.1	-4.2	-1.2	-1.8	-0.9	-0.9	-1.0	-0.1	-1.4	-0.8
Low	-0.8	-1.1	-1.6	-3.6	-0.9	-1.5	0.0	0.2	-0.2	0.7	-0.5	0.1

Notes: Compensating Variation is defined as the transfer required to maintain households at the same level of welfare as before the reform. This transfer is expressed as a percentage of pre-reform income. A negative transfer means that the reform increases household welfare.
BG: Producer of basic grains; **SC**: Small comercial producer; **MC**: Medium-sized comercial producer; **LC**: Large commercial producer; WL: Without land, low skill
Source: Simulations using the DREM for each country.

Appendix A. Synthesis of Adjustment Process for Sensitive Agricultural and Livestock Products Under CAFTA

Product	Prevailing tariffs(%)				Category of tariff reduction			
	El Salvador	Guatemala	Honduras	Nicaragua	El Salvador	Guatemala	Honduras	Nicaragua
Rice	40	29.2	45	45-62	P	P	P	P
Yellow corn	15	35	45	15	O	C	O	E
White corn	20	20	45	10	H	H	H	H
Beans	15-20	20	15	30	D	SVE	C and D	D
Beef	15	15	15	30				
-High quality cuts								
-Low quality cuts					D and O	C	D and O[a]	Q (*)
Pork	40	15	15	15	O	D	O	D
Chicken (dark meat)	164.4	164.4	164.4	164.4	P	P	P	P
Milk	40	15	15	15	F	F	F	F
Powdered Milk	20	15	15	60	F	F	F	F
Cheese	40	15	15	15-40	F	F	F	F

Notes:

C Elimination of tariffs in 10 annual stages from the time the treaty takes effect. By the 1st of January of year 10, tariffs will be completely eliminated.
D Elimination of tariffs in 15 annual stages from the time the treaty takes effect. By the 1st of January of year 15, tariffs will be completely eliminated.
E Base level of tariff is maintained from years 1 to 6. On January 1st of year 7, tariffs will be reduced by 33% in 4 annual stages. In year 11, tariffs will be reduced by 67% in 5 annual stages. By January 1st of year 15, tariffs will by completely eliminated
F Base level of tariff is maintained from years 1 to 10. On January 1st of year 11, tariffs will be reduced by 33% in 4 annual stages. Starting from year 11, tariffs will be reduced in 10 equal yearly stages, with tariffs completely eliminated by January 1st of year 20.
H The country will continue receiving Most Favored Nation status. In the case of white corn, tariffs will not be reduced, but quotas will be increased.
O Reduction will be over 15 years in 9 stages: 40% from year 7 to 11; 60% from year 12 to 15.
P Reduction will be over 18 years in 7 stages: 33% from year 11 to 14; 67% from year 15 to 18.
Q Reduction will be over 15 years: 15% from year 1 to 3, 33% from year 4 to 8, and 67% from year 9 to 15
SVE Special Safeguards
a) No quota
Sources: CEPAL (2004), tables 2 to 14, and Morley (2005), table 3.

Appendix B. Accounts in Rural Household SAMs

Production activities					
Sector	**Definition**	**Sector**	**Definition**	**Sector**	**Definition**
MAIZ	Corn	OTRA	Other traditional crops	MANI	Peanut
FRIJ	Beans	PINA	Pineapple	AJON	Sesame
ARRO	Rice	PITA	Pitaya	SOYA	Soy
SORG	Sorghum	MALA	Malanga	FLOR	Flowers
GMAY	Large Livestock	CACO	Cacao	CITR	Citrus
GMEN	Small Livestock	TUBE	Tubers	PAPA	Papaya
PAST	Pasture	YUCA	Yuca	MANG	Mango
APIC	Beekeeping	CAMO	Sweet potato	AGUA	Avocado
BANA	Banana	CEBO	Onion	OPER	Other permanent crops
PLAT	Plantain	TOMA	Tomatoes	MELO	Melon and watermelon
CAFE	Coffee	PIMI	Peppers	CHAY	Chayote
AZUC	Sugar	LECH	Lettuce	AYOT	Ayote
CARD	Cardamom	ZANA	Carrot	PIPI	Pipían
TABA	Tobacco	OKRA	Okra	OFRU	Other fruits
SORI	Industrial Sorghum	REMO	Beet		

Factors	
Factor	**Definition**
FAMI	Family factors
LAHP	Agricultural workers
LNHP	Non-agricultural workers
KTIE	Land
KMAQ	Physical capital
KANI	Animal capital

Savings and Investment	
Savings	**Definition**
AHFI	Financial savings
AHAN	Livestock investment
AHTI	Land investment
AHPL	Plantation investment
AHIN	Infrastructure investment
AHVI	Housing investment
AHOT	Other investment
AHED	Human capital investment-education
AHSA	Human capital investment-health

Households	
Factor	**Definition**
H1	Households without land, low skill
H2	Subsistence agricultural households
H3	Small commercial households
H4	Medium-sized commercial households
H5	Large commercial households
H6	Households of agricultural laborers
H7	Households with land but without ag. production

Rest of World	
Place	**Definition**
RRUR	Rest of rural sector
RPAI	Rest of country
RMUN	Rest of world