Economic Effects of a Free Trade Agreement like CAFTA on Agricultural Trade Between Southern U.S. and Latin American Regions, and the Potential Implications for Rural Development.

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ABSTRACT

A SEM model is presented to simulate the effects of a Free Trade agreement. As expected results show an increase in social welfare in trading regions involved resulting from the FTA implementation. An analysis of the potential effects on rural poor and policy implications for rural development are also presented.

Price differential between spatially separated trading regions are substantial due to natural trade barriers like transportation cost, and artificial trade barriers like import and export tariffs. This artificial trade restriction greatly affect trade of agricultural products, since they increase consumer prices in the importing regions, reducing the number and quantity of commodities available to consumers, and consequently reducing society welfare.

Given the importance of tariffs and taxes as artificial trade barrier, there is a large body of literature on applied research that has studied the effect of tariffs rates structure changes in inter- and intra-regional trade. The commonly used method in this type of research is Spatial Equilibrium Models (SEM), which are useful to analyze price relationships and the resulting trading patterns between two or more regions due to changes in artificial trade barrier structure or any other natural trade barrier like transportation cost.

This paper implements a SEM to simulate the effect of reductions or elimination of tariffs resulting from a free trade agreement (FTA) like the Central America Free Trade Agreement (CAFTA) and analyze the policies and potential implications for rural development en C.A.. To this end, the simulation makes use of perishable and time sensitive commodities (beef and poultry) traded via airfreight between Southern U.S. Latin America and the Caribbean.

CENTRAL AMERICA FREE TRADE AGREEMENT

Most Central America Countries can be characterized as open economies. They have been net exporters of fresh and processed agricultural products to the World. The opening of the Central America (C.A.) countries economies has had a positive tendency since the 60's decade, and it was accentuated during the 80's and 90's decades as result of economics structural reforms, experienced by most countries of the region. Exports from C.A. countries are diversified in terms of products and markets, being products of agricultural origin (fresh or processed) the main export products, after maquilas. The U.S. is the main trading partner with the C.A. countries, especially for agricultural products, given the proximity of both markets.

The North America Free Trade Agreement (NAFTA) established the basis for a free trade agreement with C.A. With the purpose to reduce the negative effect on C.A. economies as result of implementing NAFTA, U.S. unilaterally expanded the already existing agreements under the Caribbean Basin Initiative (CBI), extending the preferential treatments to the Central America exports to the U.S. and expanding the number of goods and commodities that would have reduced or zero import tariffs into the U.S. market.

As result of the opening of the economies, economic structural reforms, and the CBI, during the 90's decade there was a notorious increment in exports from the C.A. to the U.S. and the World. Most of this increment can be attributed to the expansion of the CBI after the implementation of NAFTA, which gave more market access for the C.A. products to the U.S. and increments in foreign investment into the region. Consequently, based on the previous experience of the 80's and 90s, it is expected that a FTA that further increases trade between the regions, will contribute even more to the economic development of the C.A. region through the creation and opening of new markets, and new flow of foreign investments.

A FTA has as main objective to reduce or eliminate all type of tariff and non-tariff barriers that restrict or limit the trade of products, services, and investments between the regions or countries involved in the agreement. Through this process, it is expected to allow a greater market access and consequently foster economic development and social welfare through increase in income, and the consequent increase in consumption of goods and services neither available nor affordable before the FTA. Welfare gain is the result of the reduction on import prices to the benefit of consumers in importing regions, and increase in export prices to the benefit of exporters and producers in exporting regions.

The U.S.-Central America Free Trade Agreement (CAFTA), has as objectives: 1.- To expand markets for U.S. and C.A. products; 2.- Foster Economic Development of the C.A. region through economic reforms that will rise income and help reduce poverty, promote prosperity and in the process strengthen democracy; 3.- Maintain democracy and the fundamental values of the region like:

a. Respect for the international Laws

b. Respect labor laws and eliminate exploitation of minors as the main source of labor.

In the process, it is expected to strengthen the economies of the C.A. countries, foster a sustainable development and increase the responsibility of the government toward society. CAFTA involved negotiations in different economic and social dimensions. a. - The main dimension is to gradually reduce and eventually eliminate tariffs and non-tariffs barriers to facilitate the trade and exchange of goods, services, and investments; b. - reinforce cooperation and transparency in customs laws and regulations; c. - eliminate non justifiable technical trade barriers; d. - reinforce policing and respect for intellectual properties rights, like copyrights, patents; e. - the elimination of discriminatory barriers that reduce the trade of services and

investments; and f.- elimination illegal reproduction of software, music, and other electronic materials (pirating). Other dimensions of the negotiations involve regulations in electronic commerce, transparency and anti-corruption government reforms, and environmental protection.

The implementation of a free trade agreement like CAFTA is expected to increase quantity traded of high value and time sensitive/perishable commodities, among others, by substantially reducing import prices, and increasing quantity demand in importing region; and increasing export prices and it associated quantity supplied in exporting region, relative to the previous tariff structure. As result, there is an expected welfare gain to society, measured by an increase in consumer and producers surplus in the regions involved in trade.

The benefit derived from implementing a FTA, can be divided in four basic categories: (1) Reduction in cost of production benefits, measured by the reduction in cost of resources necessary to produce commodities with the new tariff structure. (2) Shift in commodities production benefits, measures the benefits resulted from the production of new commodities and increase of existing commodities with the new tariff structure, relative to the benefit from the production of commodities before the new tariff structure was implemented. (3) Shift of origin to destination benefits, measures the increase in commodity movements originating or terminating at a different regions due to the new tariff structure. (4) New movement benefits, which measures the increase in the amount of current and new commodities flow that occurs only with the implementation of the new tariff structure under the free trade agreement.

THE MODEL

The spatial equilibrium model implemented in this study is static not dynamic, involve partial equilibrium, and makes use of quadratic programming technique. In conformity with most SEM empirical applications, this model assumes homogeneous products, perfect competition in

supply and demand of commodities, and in transportation services. It also assumes that prices and quantities are determined along the demand and supply functions, which remain unchanged in the basic model. The model was developed according to Takayama, T. and Judge, G. (1971) and drawing from the experience of other studies. This model uses price formulation, in which the decision variables are prices and interregional quantity flows, incorporates export supply equations at U.S. southeast export districts, and import demand equations in Latin America importing regions. Trading regions are linked trough transportation activities.

Let $I = 8$ be the number of trading regions, $i = 4$ the number of exporting regions, $j = 4$ is the number of importing regions, and $n = 2$ the number of commodities traded between the regions. The specific notation for the conceptual model is as follows: $W(n_{ij}) = NSP$ = Net Social Payoff, or Social Welfare Function to be maximized; ES_{ni} = Excess supply function for commodity n exported from region i; ED_{nj} = Excess demand function for commodity n imported in region j; $P^s_{ni} = P_x$ = Export price of commodity n in export region i; $P^d_{nj} = P_m$ = Import price of commodity n in region j; T_{ij} = Transportation cost between regions i j; It_j = Add-valorem import tariffs in importing region j; and $X_{nij} = X_{nji}$ = Quantity of commodity n exported from region i to j and vice versa. The following is the general notation of the implemented model:

$$\boldsymbol{W = \sum_{i=1}^{4} \int_{0}^{p_{ni}} ES_{ni} \times \partial P^{s}_{ni} + \sum_{j=1}^{4} \int_{p_{nj}}^{P^{*}} ED_{nj} \times \partial P^{d}_{nj} - \sum_{i=1}^{4} \sum_{j=1}^{4} (T_{ij} + It_{j}) \times X_{ij}} \qquad (1)$$

Subject to

$$\boldsymbol{ES_{ni} \geq \sum_{j=1}^{4} X_{nji};} \qquad (2)$$

$$\boldsymbol{ED_{nj} \leq \sum_{i=1}^{4} X_{nij};} \qquad (3)$$

$$\boldsymbol{\sum_{i=1}^{4} ES_{ni} = \sum_{j=1}^{4} ED_{nj};} \qquad (4)$$

$$\boldsymbol{P^{d}_{nj} - P^{s}_{ni} \leq T_{ij} + It_{j}} \qquad (5)$$

$$\boldsymbol{ES_{ni} \geq 0, P^{s}_{ni} \geq 0, ED_{nj} \geq 0, P^{d}_{nj} \geq 0, X_{nij} \geq 0} \qquad (6)$$

Equation (1) represents the Net Social Payoff function net of transportation cost plus Ad-valorem import tariffs; (2) and (3) represents the trade flow constraints; (4), non-negativity constraints; (5) is a constraint which indicates that price differential between two regions, cannot exceed transfer cost. In this case transfer cost equals transportation cost plus import tariffs; and (6) indicate that all the decision variables must be positive. Demand and supply equations are linear functions of own prices. That is:

$$\boldsymbol{ES}_{ni} = \alpha_{0_i} + \alpha_{1_i} \boldsymbol{P}_{ni}^{s} \quad \text{and} \quad \boldsymbol{ED}_{nj} = \beta_{0_j} + \beta_{1_j} \boldsymbol{P}_{nj}^{d} \tag{7}$$

Where: α_0 and β_0 = Intercepts of the export supply and import demand equations, respectively.

α_1 and β_1 = slopes of the export supply and import demand equations, respectively.

Excess Supply and Demand Equations

To define the Export supply and import demand equations, is necessary to estimate the respective elasticity. Export and import elasticity, were derived using domestic price elasticity of supply and demand for the respective regions involved in the analysis, following the procedure according to Houck, J. (1986) and Koo, W.W. (1985), as shown in equations (8).

$$\varepsilon_{xs} = \boldsymbol{e}_{si} \frac{\boldsymbol{Q}_{si}}{\boldsymbol{Q}_{xi}} + \left|\boldsymbol{e}_{di}\right| \frac{\boldsymbol{Q}_{di}}{\boldsymbol{Q}_{xi}} \quad \text{and} \quad \varepsilon_{md} = \boldsymbol{e}_{dj} \frac{\boldsymbol{Q}_{dj}}{\boldsymbol{Q}_{mj}} + \boldsymbol{e}_{sj} \frac{\boldsymbol{Q}_{sj}}{\boldsymbol{Q}_{mj}} \tag{8}$$

Where: ε_{xs} = excess or export supply elasticity and ε_{md} = excess or import demand elasticity. e_s = domestic supply elasticity, e_d = domestic demand elasticity, Q_s = domestic quantity supplied, and Q_d = domestic quantity demanded, in exporting *i* and importing *j* regions. Q_{xi} = quantity exported from exporting region and Q_{mj} = quantity imported in importing region. Domestic elasticity for exporting and importing regions were obtained from the USDA-ERS publication "*A Database for Trade Liberalization Studies"*, by Sullivan, J. et al. (1991). The estimated export supply elasticity is assumed to be the same for the 4 export districts in the U.S. southeast region.

Domestic quantities supplied, demanded, and consumed in the exporting and importing regions are three-year average (1997-2000) of production, stock changes, and consumption obtained from the "*Food Balance Sheets of Food and Agriculture Organization (FAO) Statistical and Economic database"*. Quantities supplied for each of the 4 U.S. southeast districts and imported into the Latin America and Caribbean regions, are three-year averages (1997-2000) of the data obtained from the "*US Imports and Exports of Merchandise"* database, from the Bureau of Census of the U.S. Department of Commerce. The data was extracted by 2 digits commodity codes for beef and poultry. The extracted data were air exports from the following U.S. custom district: Miami FL, New Orleans LA, Charleston NC/Savannah GA, and Houston/Galveston TX.

Data for each district was separated further into exports from each of these districts to Latin America considered regions. Latin America region was divided in 4 import ports: Puerto Veracruz, (Mexico), Puerto Cortes (Honduras C.A), Caracas, (Venezuela S.A), and Port au Prince (Haiti Caribbean). Based on the elasticity of excess demand and supply, the linear export supply and import demand functions, as specified in equations (7), were estimated using the approach demonstrated by Koo, W. (1985). The intercepts and slopes can be derived as follow:

$$\alpha_1 = \varepsilon_{xs} \frac{\boldsymbol{Q_x}}{\boldsymbol{P_x}} \qquad \textbf{\textit{and}} \qquad \alpha_0 = \boldsymbol{Q_x} - \alpha_1 \boldsymbol{P_x} \tag{9}$$

$$\beta_1 = \varepsilon_{md} \frac{\boldsymbol{Q_m}}{\boldsymbol{P_m}} \qquad \textbf{and} \qquad \beta_0 = \boldsymbol{Q_m} - \beta_1 \boldsymbol{P_m} \tag{10}$$

Where, ε_{xs}, ε_{md}, Q_m and Q_x are defined as before, while P_x and P_m are exports and imports price at exporting and importing regions respectively. Exports prices are estimated as a ratio of air export values and export quantity for each of the U.S. districts. Import prices were estimated by adding transportation cost (T_{ij}) to export prices and import tariffs (It_j) at each of the importing

regions. Import tariffs are calculated as a product of export price times average ad-valorem regional import tariff rates ($\bar{t}_j$), as illustrated in the following formulas:

$$P_x = Exp\ Value \div Exp\ Quantity \quad (11)$$

$$P_m = P_x + T_{ij} + It_j \quad (12)$$

$$It_j = P_x \times \bar{t}_j \quad (13)$$

The import tariff rates used are the median of the regional tariffs for poultry and beef, obtained from the ERS/USDA publication "*Profiles of Tariffs in Global Agricultural Markets-AER-796"* (2001). The reason for choosing the median import tariff rates is because is considered to be a more representative measure for comparing the overall tariff schedule of each region, since is less sensitive to a few extremely high and low rates.

Since the trading regions in the model are linked through transportation activities, and the model includes commodities moved via airfreight, the transport cost considered was airfreight transportation cost. Transportation cost was calculated as an average of the charges per kilogram between the trading regions in the study, published by 3 airlines and a cargo forwarder (Northwest Airlines Cargo, United Cargo, Delta Air Lines Cargo and APX Cargo) that provide transportation service between the considered trading regions.

EMPIRICAL RESULTS

This study includes one base model and four alternative simulations for tariffs rates reductions. The base model is implemented using three-year average airfreight imports and exports of beef and poultry, and the estimated transportation rates. The base model was then use as a benchmark against which the results from the other alternatives simulations were compared to. The alternative simulations were implemented by reducing import tariffs rates in the Latin America regions, for four different scenarios, 25%, 50%, 75% and 100% reduction.

Model Validation

The validation of the model was done according to McCarl and Spreen (1997). Results from the original simulation, shows that the base model replicates closely the original data for quantities and prices as presented in Tables 1 through 3. The model seem to predict better for beef than for poultry, reflected in the percentage of prediction of export and import quantities and prices. Most beef exports and imports specific regional quantities were slightly overestimated (Table 1). For poultry, most quantities are overestimated in a larger proportion than for beef (Table 2). In general, the base model results are congruent with actual data.

Specific beef quantity flows between different U.S. southeast districts, L.A., and Caribbean ports are mostly underestimated. The model is not able to simulate effectively low current flows, since they are associated with extremely low and high estimation values. In terms of prices, the base model closely replicate most import and export prices for beef, being New Orleans export price the highest with an overestimation of 1.2% (Table 3). Poultry prices (Table 3) are not replicated as well as for beef, and they are underestimated by –13.2% for Miami export price, and -11.1% for Central America import price.

Predictive performance was tested using the Theil "U" inequality coefficient, which is a non-parametric goodness of fit test, commonly use in mathematical programming (Leuthold, 1975). This test measures the prediction or forecasting accuracy of a model. A coefficient close to zero indicates an almost perfect prediction, while a value near 1 corresponds to near perfect inequality or negative proportionality between the actual and predictive values. In this study, this coefficient comes to corroborate the findings according to the model predictions for quantities, prices and flows.

Alternative Model Simulations

Alternative model simulations involved changes in import tariff rates at the importing regions. These tariff rates vary among the Latin American regions, with the lowest tariff in Mexico, and the highest in the Caribbean and Central America regions. Four scenarios were simulated, which includes a reduction in the tariffs rates by 25%, 50%, 75%, and 100% of the average regional tariff rates for beef and poultry..

For beef, results in Table 4 shows that, as expected, tariff rate reductions increases the flow of the commodity to a maximum of 18.5% when tariffs are reduced by 100% of the original average rates to zero tariff for all Latin American and Caribbean regions. For Central America alone, the increase in flow is as much as 65.2% when tariffs are reduced to zero. With a more conservative scenario of 50% reduction in the average regional tariffs, the overall flow increase is more modest with an 8.2% increase for all regions, and about 38.5% for Central America region alone. Most Latin America trade flow increase comes from increased demand in the Caribbean and Central America, and is matched by increasing supply in an almost equal proportion for all U.S. southeast exporting districts.

In terms of U.S. district and L.A. regions specific flows, results indicate that such flows are constantly increasing as the average tariff rates are reduced, except for Miami-Mexico flow, which is constantly reducing to a maximum of -1.9% when tariffs are reduced to zero. This flow reduction between Miami Mexico indicates that there is a diversion of exports from Miami to the other L.A. regions, especially to Central America and the Caribbean, at the expense of Mexico. This diversion is partially the result of large import price reduction in C.A. and Caribbean.

As expected, import prices are reduced across the board as import tariff rates decline, with reductions ranging from 0.4% for Mexico to 28.5% for the Caribbean, when tariffs rates are

reduced to 0%. For C.A., the reduction on beef imports price is almost 20% with zero tariffs. For Central America and Caribbean, the effect of tariff reductions on import prices is substantial, given the fact that import tariffs make up a higher percentage of import prices. Therefore, it is important to point out that the larger reduction in import prices are associated with high import tariffs regions, like Central America and the Caribbean, while low import price reduction is associated with low import tariffs. In the case of export prices, they increased as expected, at an almost constant rate up to 26.4% for all export districts, relative to the base model.

For poultry, results in Table 5 show that as tariff rates are reduced, the poultry flows increase to a maximum of 78.2% when tariffs are reduced by 100% from the original average tariffs for all Latin America and Caribbean regions. For Central America alone, the increase in poultry is of almost 80%. This increase in the commodity flows to all regions comes from an increased demand in South America, followed by Central America and the Caribbean. This increased in demand is supplied by increasing exports from Savannah/Charleston, followed by Houston/Galveston and Miami, all of them increasing in almost the same proportion.

In the case of flows specific, again there is a diversion of exports from Miami and Savannah/Charleston to other regions. This diversion is at the expense of reducing exports to Mexico and the Caribbean by as much as 100% in the case of Miami-Mexico and Miami-Caribbean in favor of the other regions. All other flows are increased, with the highest flow increase of 266% for Miami-South America. Import price reduction ranges from 30.6% for Caribbean to 8.1% for Mexico, being the larger reductions associated with the regions that have high import tariffs rates like Central America and the Caribbean. Export prices are increased at a constant rate of about 12% for all exporting districts in the U.S. southern region.

DISCUSSION OF POTENTIAL IMPLICATIONS FOR RURAL DEVELOPMENT IN CENTRAL AMERICA

The implementation of the SEM has showed as expected that the elimination of import tariffs due to the implementation of a FTA, would increase social welfare by opening markets and increasing trade flows due to reduction of import prices in importing regions and export prices in exporting regions. However, the opening of new markets as result of a free trade agreement can stimulate transformation and structural changes especially in developing countries economies. It is known that a free trade agreement will bring positive (benefits) and negative (costs) economic changes, with the expectation that benefits will exceed costs.

The main benefit will be the expansion of markets for the already existing products, and for the factors of production offered by the rural economic agents, other than the opening of markets for non-existing products previous to the FTA. The main cost will be the increment in market competition for the products offered by rural economic agents, especially agricultural products that were protected against competition, before the implementation of the FTA. This negative effect to the rural economic agents will be exacerbated if other than reducing the producer's price, as result of the free trade, these agents are excluded from participating in the export market due to high transaction cost, which is characteristic of rural producers in developing countries like C.A.

The opening of agricultural markets can be a sensible decision, especially for those goods whose production are on the hands of small farmers in the rural areas of C.A., and consequently may have negative consequences for rural development. These sensible agricultural products normally include staple foods for rural and urban population (in the case of C.A. they include rice, corn, and beans), which bring costs and benefits for the poor. The urban poor will benefit given that will pay lower consumer prices relative the ones prevailing before the FTA.

The rural poor whose income typically depends from production of staple foods, will be affected negatively given that will be receive lower prices than before the implementation of the FTA.

Given this potential negative impact especially to the rural poor, it may be necessary to implement economic policies that will reduce this negative effect, at least during the transition period. These measures or policies could include domestic price support or subsidies consistent with the guidelines and regulations of the FTA and the World Trade Organization.

The effect to rural economic agents from implementing a FTA with respect to production, income, and poverty, will depend on three factors: 1. - The extent at which market signals are transmitted to rural economic agents, and consequently allow them to participate in the benefits derived from the implementation of the FTA. 2. - The ability of the small rural producer to diversify and respond to the markets signals and reforms induced by the FTA, to allow them to reduce the negative effect and respond to the market expansion and opening of new markets. 3. - Whether the rural economic agent is involved in the production of exportable or non-exportable products. Exportable products are goods that have access to the export markets; and non-exportable are goods for which export markets could exist, however they are excluded from exports due to the high transaction cost involved in their production and marketing.

To analyze the effect of these factors is necessary to know the rural market structure, and the way that these structure influence production in rural areas. In general, the Central America rural poor is characterized as being limited resource farmers, which typically face high transaction costs in the production and marketing of their products, given that they have low or no access to capital, formal credit, and products market, which contribute to their exclusion in participating in the benefits resulting from FTA. Due to these limitations and constraints face by the rural poor, one alternative they may have is to transfer their resources (land and labor) to

economic sectors with better access to capital and markets once the FTA has been implemented. These resource transfers among economic sectors, will put pressure in the cost of factors of production in the rural areas, reducing further agricultural production and rural income derived from agricultural production.

However the severity of the effect on the rural economic agents will depend on whether they participate directly in the international market as producers, buyers or sellers of goods or factors of production. If they participate in the international market by producing exportable products previous to the implementation of the trade agreement, the negative effect of higher cost of some domestic production factors like labor, may be more than compensated by the positive effect of lower imported input prices and higher export prices resulting from the FTA. If the rural economic factor do not participate in the international market, by producing non-tradable goods, they may be affected more severely since they would face higher cost for domestic factors of production, and will not benefit from higher prices for their goods, instead they receive lower prices relative to before the implementation of the FTA. However they will still benefit from lower prices for imported production factors. Furthermore, they could also benefit indirectly through market expansion, and the consequently increase in exports. If market expansion is primarily induced by foreign investment, it will stimulate and increase income and urbanization due to migration from rural to urban areas, creating new demand for goods produced in rural areas whether tradable or not, and consequently increasing domestic prices for non-tradable goods.

As mentioned before, non-exportable are goods with high transaction costs. One of the main reasons for high transaction costs is the non-existence or poor infrastructure that do not allow rural producers to access external markets. Another reason for the rural economic agents

not being able to participate in the export market is the level of production efficiency, which may not allow them to be competitive in the export markets even when the product is exportable (i.e. corn). Therefore in order for the rural producer, either of exportable or non-exportable, to be able to participate and benefit from opening of the export market, will need to have the capacity to increase production, which implies increase efficiency. Even more important is the access to formal credit and information about the specific requirements for the goods demand by the market. In the case of producers of non-exportable, they must have the capacity to diversify production to exportable products, and to develop the necessary efficiency to become competitive in export markets.

Consequently, it will be important for the Central America Governments to implement economic policies that will facilitate the creation of new infrastructure and the improvement of the existing ones, to allow the rural economic agents, especially agricultural producers, to fully participate in the export markets resulting from the FTA. The most important infrastructure investment would be roads and the development of communication media (spoken and written like radio and bulletins), which will allow producers in rural areas to reduce the cost of moving their products to the market, and stay informed about prices, quantities, and product requirements as demanded by the market, at the time of decision making of what and how much to produce. In addition it will also be necessary to implement credit policies that will give rural producers access to formal credit to implement the productive activities according to markets demand.

If these type of policies are not implemented and the conditions to take advantage of the FTA benefits are not in place, there is a possibility to create a new social stratum perhaps non existent before the implementation of the FTA. That is a landless peasant, due to the economics pressure by the commercial producers who want to have access to land for the production of

exportable, which the small producer would not be capable to produce because of the lack or no access to resources, and know how. That is financial resources, information and efficient productions techniques. As result of the creation of landless peasant, there will be a potential exodus or migration from rural to urban areas, or even internationally, in search for new and better income opportunities. The problem with the exodus or migration is that if the landless rural agricultural producer is not prepare to face the challenges presented in urban areas in terms of skills and education, will create new social problems in urban areas (homeless, increase in crime, diseases and epidemics, etc). Consequently, it will be also necessary to implement policies and programs aimed at capacity building for the rural poor who decides to migrate to urban areas, and for the rural poor who stays behind in the rural areas, to increase their know how and consequently their efficiency for the production of either tradable or non-tradable goods.

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APPENDIX TABLES

Table 1 - Validation Results: Base Model Estimates and Actual Beef Quantities and Prices.

	QUANTITIES			PRICES		
Export Ports	**Actual**	**Estimated**	**"U" Statistics**	**Actual**	**Estimated**	**"U" Statistics**
Savannah/Charleston	4.28	4.28	0.0005	3080.1	3082.41	0.0004
Miami	349.63	349.30	0.0005	3098.4	3094.39	0.0007
New Orleans	2.31	2.33	0.0034	3043.0	3080.59	0.0061
Houston/Galveston	59.50	59.66	0.0013	2961.3	2973.00	0.0020
Import Ports						
Mexico	310.03	310.51	0.0008	5129.1	5127.66	0.0001
Central America	**32.97**	**32.19**	**0.0119**	**6082.4**	**6128.53**	**0.0038**
South America	27.95	27.96	0.0001	5490.8	5490.21	0.0001
Caribbean	44.77	44.90	0.0015	6908.7	6902.13	0.0005
Total Exports	**415.72**	**415.56**	**0.0002**			
Total Imports	**415.72**	**415.56**	**0.0002**			

Table 2 - Validation Results: Base Model Estimates and Actual Poultry Quantities and Prices.

	QUANTITIES			PRICES		
Export Ports	**Actual**	**Estimated**	**"U" Statistics**	**Actual**	**Estimated**	**"U" Statistics**
Savannah/Charleston	129.64	129.82	0.0007	1601.3	1601.56	0.0001
Miami	130.78	150.06	0.0687	1857.9	1613.55	0.0704
Houston/Galveston	141.94	146.55	0.0160	1579.2	1597.76	0.0058
Import Ports						
Mexico	108.69	131.45	0.0948	3402.0	3024.86	0.0587
Central America	**69.06**	**68.01**	**0.0076**	**4047.9**	**3636.80**	**0.0535**
South America	95.91	99.36	0.0177	3778.0	3491.07	0.0395
Caribbean	128.70	127.60	0.0043	4093.0	4088.52	0.0005
Total Exports	**402.36**	**426.43**	**0.0290**			
Total Imports	**402.36**	**426.43**	**0.0290**			

Table 3 - Validation Results: Specific Districts-Regions Estimates and Actual Beef & Poultry Flows.

	BEEF QUANTITIES FLOWS			POULTRY QUANTITIES FLOWS		
Quantity Flows	**Actual**	**Estimated**	**"U" Statistics**	**Actual**	**Estimated**	**"U" Statistics**
Miami-Mexico	254.5	259.73	0.01	16.15	39.99	0.425
New Orleans-Mexico	0.91	0.00	1.0	-	-	-
Houston/Galv-Mexico	54.62	50.78	0.0364	92.54	91.46	0.0059
Savannah-C. America	**0.65**	**0.00**	**1.0**	**3.35**	**1.80**	**0.3016**
Miami-C. America	**30.92**	**29.87**	**0.0173**	**65.71**	**66.22**	**0.0038**
New Orleans-C. America	**1.4**	**2.33**	**0.2485**	**-**	**-**	**-**
Savannah-S. America	2.26	0.00	1.0	58.59	59.96	0.0116
Miami-S. America	20.81	19.08	0.0434	37.32	39.40	0.0271
Houston- S. America	4.88	8.88	0.2906	49.40	55.08	0.0544
Savannah-Caribbean	1.37	4.28	0.5147	67.7	68.05	0.0026
Miami-Caribbean	43.4	40.63	0.0330	11.6	4.46	0.4446

Table 4 – Beef Model Simulation Results with Import Tariffs Rates Reduction.

Quantity Flow from:	Base Model	75% tariff	% Change	50% tariff	% Change	25% tariff	% Change	0% tariff	% Change
Miami-Mexico	259.73	258.72	-0.4%	257.59	-0.8%	256.33	-1.3%	254.89	-1.9%
New Orleans-Mexico	0.00	0.00		0.00		0.00		0.00	
Houston-Mexico	50.78	53.09	4.5%	55.66	9.6%	58.56	15.3%	61.84	21.8%
Savannah-C. America	**0.00**	**0.00**		**0.00**		**0.00**		**0.00**	
Miami-C. America	**29.87**	**33.93**	**13.6%**	**38.46**	**28.8%**	**43.56**	**45.8%**	**49.33**	**65.2%**
New Orleans-C. America	**2.33**	**2.42**	**3.9%**	**2.52**	**8.2%**	**2.63**	**13.0%**	**2.76**	**18.5%**
Savannah-S. America	0.00	0.00		0.00		0.00		0.00	
Miami-S. America	19.08	20.83	9.2%	22.79	19.5%	25.00	31.0%	27.49	44.1%
Houston-S. America	8.88	8.88	0.0%	8.88	0.0%	8.88	0.0%	8.88	0.0%
Savannah-Caribbean.	4.28	4.44	3.8%	4.62	8.1%	4.83	12.9%	5.06	18.4%
Miami-Caribbean.	40.63	49.32	21.4%	59.02	45.3%	69.93	72.1%	82.28	102.5%
Import Price at									
Mexico	5127.66	5123.86	-0.1%	5119.62	-0.2%	5114.86	-0.2%	5109.47	-0.4%
Central America.	**6128.53**	**5879.37**	**-4.1%**	**5601.14**	**-8.6%**	**5288.45**	**-13.7%**	**4934.47**	**-19.5%**
South America	5490.21	5434.76	-1.0%	5372.84	-2.1%	5303.25	-3.4%	5224.47	-4.8%
Caribbean	6902.13	6491.55	-5.9%	6033.06	-12.6%	5517.79	-20.1%	4934.47	-28.5%
Export Price at									
Savannah/Charleston	3082.41	3251.34	5.5%	3439.66	11.6%	3650.80	18.4%	3888.91	26.2%
Miami	3094.39	3264.93	5.5%	3455.37	11.7%	3669.39	18.6%	3911.69	26.4%
New Orleans	3080.59	3249.62	5.5%	3438.18	11.6%	3649.80	18.5%	3888.91	26.2%
Houston/Galveston	2973.00	3136.73	5.5%	3319.54	11.7%	3524.97	18.6%	3757.52	26.4%
Quantity Exports									
Savannah/Charleston	4.28	4.44	3.8%	4.62	8.1%	4.83	12.9%	5.06	18.4%
Miami	349.30	362.80	3.9%	377.87	8.2%	394.81	13.0%	413.99	18.5%
New Orleans	2.33	2.42	3.9%	2.52	8.2%	2.63	13.0%	2.76	18.5%
Houston/Galveston	59.66	61.97	3.9%	64.54	8.2%	67.44	13.0%	70.72	18.5%
Quantity Imports									
Mexico	310.51	311.81	0.4%	313.26	0.9%	314.89	1.4%	316.73	2.0%
Central America	**32.19**	**36.34**	**12.9%**	**40.98**	**27.3%**	**46.19**	**43.5%**	**52.08**	**61.8%**
South America	27.96	29.71	6.3%	31.67	13.3%	33.88	21.2%	36.37	30.1%
Caribbean	44.90	53.76	19.7%	63.65	41.7%	74.76	66.5%	87.34	94.5%
Total Exports/Imports	**415.56**	**431.62**	**3.9%**	**449.55**	**8.2%**	**469.71**	**13.0%**	**492.53**	**18.5%**

*Tariffs rate reduction are assumed for 4 different scenarios to zero tariffs or free trade, in reduction by 25% of the original average tariffs for each importing region

Table 5 – Poultry Model Simulation Results with Import Tariffs Rates Reduction.

Quantity flow	Base Model	75% tariff	% Change	50% tariff	% Change	25% tariff	% Change	0% tariff	% Change
Miami-Mexico	39.99	0.00	-100.0%	0.00	-100.0%	0.00	-100.0%	0.00	-100.0%
Houston-Mexico	91.46	137.53	50.4%	143.91	57.3%	150.70	64.8%	158.29	73.1%
Savannah-C. America	**1.80**	**0.00**		**0.00**		**0.00**		**0.10**	
Miami-C. America	**66.22**	**80.35**	**21.3%**	**93.44**	**41.1%**	**107.32**	**62.1%**	**122.16**	**84.5%**
Savannah-S. America	59.96	48.68		77.62		107.86		130.69	
Miami-S. America	39.40	91.29	131.7%	105.57	168.0%	120.95	207.0%	144.30	266.3%
Houston-S. America	55.08	35.38	-35.8%	57.05	3.6%	79.71	44.7%	101.11	83.6%
Savannah-Caribbean.	68.05	105.33	54.8%	102.19	50.2%	99.16	45.7%	103.24	51.7%
Miami-Caribbean.	4.46	4.46	0.0%	4.46	0.0%	4.46	0.0%	0.00	-100.0%
Import Price at									
Mexico	3024.86	2969.39	-1.8%	2911.20	-3.8%	2849.22	-5.8%	2779.92	-8.1%
Central America.	**3636.80**	**3443.59**	**-5.3%**	**3238.45**	**-11.0%**	**3021.03**	**-16.9%**	**2787.15**	**-23.4%**
South America	3491.07	3408.44	-2.4%	3320.48	-4.9%	3227.65	-7.5%	3133.65	-10.2%
Caribbean	4088.52	3801.99	-7.0%	3499.88	-14.4%	3179.76	-22.2%	2836.99	-30.6%
Export Price at									
Savannah/Charleston	1601.56	1645.63	2.8%	1692.63	5.7%	1742.21	8.8%	1791.43	11.9%
Miami	1613.55	1659.92	2.9%	1708.68	5.9%	1760.80	9.1%	1820.86	12.8%
Houston/Galveston	1597.76	1641.32	2.7%	1687.65	5.6%	1736.31	8.7%	1784.21	11.7%
Quantity Exports									
Savannah/Charleston	129.82	154.01	18.6%	179.81	38.5%	207.02	59.5%	234.04	80.3%
Miami	150.06	176.10	17.3%	203.47	35.6%	232.73	55.1%	266.45	77.6%
Houston/G	146.55	172.91	18.0%	200.96	37.1%	230.41	57.2%	259.40	77.0%
Quantity Imports									
Mexico	131.45	137.53	4.6%	143.91	9.5%	150.70	14.6%	158.29	20.4%
Central America	**68.01**	**80.35**	**18.1%**	**93.44**	**37.4%**	**107.32**	**57.8%**	**122.26**	**79.7%**
South America	99.36	139.97	40.9%	183.19	84.4%	228.80	130.3%	274.99	176.8%
Caribbean	127.60	145.17	13.8%	163.70	28.3%	183.33	43.7%	204.35	60.2%
Total Exports/Imports	**426.43**	**503.02**	**18.0%**	**584.24**	**37.0%**	**670.16**	**57.2%**	**759.89**	**78.2%**

*Tariffs rate reduction are assumed for 4 different scenarios to zero tariffs or free trade, in reduction by 25% of the original average tariffs for each importing region