# CAFTA and Migration: Lessons from Micro Economy-wide Models and the New Economics of Labor Migration

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# CAFTA and Migration: Lessons from Micro Economy-wide Models and the New Economics of Labor Migration

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This article uses economy-wide modeling techniques to offer an intra-regional perspective on the impacts of trade reforms on rural economies and migration for five Central American countries (Costa Rica, El Salvador, Honduras, Guatemala, and Nicaragua) that are negotiating the Central American Free Trade Agreement (CAFTA) with the United States. Potential migration and welfare impacts of agricultural provisions in CAFTA depend on market integration, diversification of economic strategies, and government policies. Conclusions highlight the importance of product mixes, technologies, and labor markets in shaping outcomes of trade policy reforms.

*Key words:* CAFTA, Central America, Economy-wide Modeling, Liberalization, Migration.

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Since January 2003, five Central American countries (Costa Rica, El Salvador, Honduras, Guatemala, and Nicaragua) and the United States have met monthly in order to draft the Central American Free Trade Agreement (CAFTA) before the prescribed deadline of December 2003. Skeptics of trade agreements among countries at vastly different levels of development argue that poor member countries will be targets of "big business" and suffer environmental damage and a decrease in agricultural output, especially of traditional crops such as maize. The overall impact could be a greater propensity to migrate internally or internationally, especially to the United States. . Given less developed countries' reliance on primary exports, the high concentration of poverty in rural areas, and controversy over impacts of immigration in host countries, concern over impacts of trade reforms is understandable. There is a critical need for economic analysis to uncover the multi-faceted interactions among trade reforms, rural economic development, and migration as a basis for designing trade and adjustment policies.

This article offers an intra-regional perspective on the impacts of trade reforms on rural economies and migration upon the five Central American countries included in CAFTA. Potential migration and welfare impacts of agricultural provisions in CAFTA for the regions and individual countries depend on international market integration, diversification of economic strategies, and government policies. We employ regional economy-wide modeling techniques, building upon Taylor, et al. (1999) and Taylor and Adelman (1996). The consequences for rural production, incomes and migration will depend upon the extent to which influences of trade integration are transmitted to

different rural household populations, as well as the ability of households to adjust to changing market conditions, both positive and negative, by altering their income activities at home or through migration. Product mixes, technologies, and labor markets are critical in shaping outcomes of trade policy reforms.

**Trade Integration and Migration: An Overview**

In 1986, the United States Immigration Reform and Control Act (IRCA) established a commission to search for mutually beneficial policies that could accelerate economic growth and eventually reduce unwanted immigration. The final report concluded that "expanded trade between the sending countries and the United States is the single most important remedy" for unwanted migration (CSIMCED, 1990). However, the Commission also concluded that the same policies that accelerate economic growth, including privatization, land reform, and freer trade also may temporarily increase migration pressures, because of the displacements and disruptions that accompany development. The fact that trade and migration may be complements in the short run may create a short-run versus long-run dilemma for countries concerned about migration (Martin, 1993).

Studies using macro-level or aggregate computable general equilibrium (CGE) models highlighted potential negative impacts of the North American Free Trade Agreement (NAFTA) on the rural Mexican economy. They predicted that a reduction in the government support price of corn mandated by NAFTA would decrease rural employment and wages and also stimulate a sharp increase in rural out-migration. Predicted increases in migration ranged as high as 700,000 to 800,000 people, with the majority bound for the United States (Levy and van Wijnbergen; Cornelius and Martin).

The Binational Study concluded that economic integration would lead to an increase in Mexico-to-U.S. migration, at least in the short run (U.S. Commission on Immigration Reform).

However, to date it appears that the predicted surge in migration above the historical trend has not materialized. Mexico-to-U.S. migration has continued its upward trend, but it does not appear to have increased to the extent predicted by most models. Most paradoxically, perhaps, in 2001 maize output in Mexico reached a new record high (INEGI, 2001). Two factors explain the divergence between the predictions of CGE models and recent migration and rural employment trends: the high degree of diversification in Mexico's small-farm economy and endogenous local input and output prices, which tend to buffer rural micro-economies from agricultural policy shocks (Taylor, Yúnez-Naude and Dyer, 1999). Our model to explore impacts of CAFTA on agricultural production, employment and migration in Central America was designed to take into account these factors.

**Migration and the Transformation of Migrant-Source Economies**

Until the 1980s, models of migration behavior by individuals shaped economic understanding of migration, its determinants and impacts. Modern economic research on migration often is traced to Lewis' (1954) seminal work on economic development with unlimited supplies of labor, in which labor demand in the modern (urban) sector drives migration out of rural areas. Neoclassical economic models posit that migration is driven by wage differences created by the interaction between labor demand and supply in sending and receiving areas (Ranis and Fei, 1992). This assumption is used to model international migration in virtually all CGE models of trade integration (e.g., Levy and Wijnberger, 1992;

Robinson et al., 1991). In contrast, most microeconomic models of rural out-migration are grounded on Todaro's (1969) hypothesis that each potential migrant decides whether or not to move based on expected income, not wages. Despite what has proven to be a seminal contribution to understanding determinants and impacts of rural out-migration, the Todaro model has been criticized on a number of grounds, especially that urban unemployment does not appear to reconcile the urban-rural wage differential and migration does not appear to equilibrate expected incomes across sectors (Rosenzweig, 1988). The new economics of labor migration (NELM; see Stark, 1991 and Stark and Bloom, 1985) shifts the analytical focus from individuals to households and larger social groups.

Migrant households are part of larger economies, such as communities, regions, and nations. Economic interactions within these economies project migration's impacts beyond the households that send migrants and receive remittances. For example, if a household with migrants uses remittances to finance a new project in the village, it may demand labor from another (non-migrant) village household. Without migration, the investment project might not have taken place, and the linkage with the non-migrant household might not have materialized. Investing may not be limited to the migrant household. If some kind of local credit market (formal or informal) exists, savings may be channeled from the migrant to non-migrant households.

The existence of local markets creates the possibility for linkages to transmit impacts of foreign-market integration to local actors. However, high transaction costs in rural markets do the opposite. For example, high costs of migrating—due to lack of information, etc.—inhibit some households from sending migrants abroad or to domestic

urban centers. Missing or incomplete credit markets prevent capital from being channeled to its most efficient uses in rural areas and constrain rural households to self-finance investments; e.g., in the NELM, the same household that does the migrating must also do the investing.

Imperfections in rural commodity and factor markets may affect migration impacts, negatively in some cases and positively in others. Regional or national markets for goods or labor may have high transactions costs, which limit the possibilities for rural areas to benefit from regional trade integration, possibly intensifying migration pressures. However, they also create local market linkages that transmit migration's impacts—both positive and negative—to others in sending areas. Understanding direct and indirect interactions between migration and development in migrant-source economies requires an approach that goes beyond the traditional household focus, to connect economic actors in the regional economies of which they are part.

**Migration, Agricultural Production, and Trade Policies Trends in Central America**

Central American countries have a relatively long history of sending migrants abroad. The United States is far and away the most important destination for international migrants from Central America. Only Nicaragua sends more migrants to a Central American country (Costa Rica, where an estimated 400,000 to 500,000 Nicaraguans reside; see Migration News, October 2000). Mexico is also an important destination for Central American migrants; however, in the majority of cases, it is an intermediate destination for those bound for the United States. Although political factors played a critical role in instigating international migration from Central America during the 1980s, economic factors appear to be instrumental in perpetuating these migration flows. Over

the past three decades the total number of Central America-born persons in the United States increased 17-fold, from 624,851 to 10,578,786. The sharpest increase was in migration from El Salvador (from 6,310 to 817,336, a 128-fold increase), followed by Guatemala and Honduras.

Gross migration probabilities are ratios of total number of migrants to the total number of people born in each sending country. A ratio of 0.13 for El Salvador in 2000 indicates that 13 out of every 100 Salvadorans alive were in the United States at the time of the 2000 population census. The smallest emigrant ratio was in Costa Rica (2 percent). Nicaragua, Honduras and Guatemala each had about 4 percent of their populations residing in the United States in 2000. Unfortunately, data on international migration to countries other than the United States are not available for this period. This impacts Nicaragua migration the most, given the high emigration rate to Costa Rica. If we add these individuals to the number of Nicaraguans in the United States, the share of Nicaraguans living abroad rises from 4 percent to 10 percent.

*Agricultural Production*

Differences in the structure of agricultural production among Central American countries will determine the success of trade liberalization and its differential impacts within the region. Traditional export crops, including coffee, bananas and sugar cane, are an essential source of revenue for all the five CAFTA countries. . However, new crops are emerging. Tables 1-2 summarize major agricultural exports and trading partners for CAFTA countries.

Costa Rica and Guatemala have been models of agricultural export diversification. Guatemala's agricultural sector is largely comprised of traditional export crops (coffee, sugar and bananas), but recent exports include Cardamom and other non-

traditional crops. Costa Rica's principal exports continue to be bananas, coffee, sugar and beef, but in 2001 the share of non-traditional exports reached 85 percent of export earnings (up from 75 percent in 1997). Furthermore, the share of acreage in traditional crops (beans, rice, corn and sorghum) has decreased from .36 in 1990 to .19 in 2001. Honduras has been somewhat successful at diversifying its agricultural production, expanding into in melons, pineapples, mangos and other tropical fruits.

El Salvador and Nicaragua have the smallest percentage of acreage in non-traditional crops and have been less successful in terms of overall agricultural performance. This is mirrored in the percentage of the workforce that is in agriculture in these two countries (25% in El Salvador and 40% in Nicaragua). In Nicaragua, productivity in basic food grains has not risen since the late 1970s, and domestic food production per capita is lower now than it was 25 years ago. In Honduras, agriculture employs 60% of the workforce and accounts for over half of total export earnings, which come mostly from bananas and coffee.

*Trade Partners and Policies*

The United States is the dominant trading partner for Central American countries in terms of both exports and imports. Nicaragua has the lowest percentage share of trade with the United States, approximately 28 percent for both imports and exports. For the remaining Central American countries, the average share of trade (imports and exports) with the United States is around 50 percent. More than 65 percent of El Salvador's exports go to the United States. The next four largest markets for Salvadoran exports are Guatemala, Honduras, Nicaragua and Costa Rica, which together account for 34.6 percent of the total. The United States also dominates on the import side (49 percent of all Salvadoran

imports are from the United States), followed distantly by Guatemala (8.6 percent) and Mexico (7.2 percent) (See Table 2).

Nicaragua has been committed to liberalizing trade with its Central American neighbors. In May 2000, it agreed to form a Central American customs union with El Salvador and Guatemala. However, a few months before signing, in December 1999, Nicaragua imposed a 35 percent tariff on all imports from Honduras. Costa Rica has also been committed to trade liberalization, but agricultural products such as milk, poultry, rice and sugar enjoy a high rate of protection. Table 3 summarizes tariff rates for selected agricultural products. (These tariff rates are from the WTO tariff schedule posted on the website and may or may not be the "true" rates imposed on imports from particular countries.)

**A Micro Economy-wide Modeling Approach**

Micro economy-wide models occupy a middle ground between household-farm models and aggregate (national) CGE models for policy analysis. Like household-farm models, they are rooted in the micro economy and constructed "from the bottom up," using household-farm survey data. However, they integrate models of household-farm activity into a local (e.g., village or regional) general-equilibrium framework. This makes it possible to capture complex linkages and general-equilibrium feedbacks among household-farms that shape the effects of exogenous shocks on local economies.

Microeconomic models focusing on households, firms, or household-firms (Singh, Squire and Strauss, 1986), including those in imperfect market environments (de Janvry, et al., 1991), overlook local general-equilibrium effects. Our small or "micro" economy-wide modeling uses an adaptation of village-wide modeling techniques presented in Taylor et al. (1999) and Taylor and Adelman (1996). It blends microeconomic analysis

with economy-wide modeling, offering an alternative to both micro (household, firm, and household-farm) and aggregate CGE models.

Consider the effect of a change in an exogenous variable Z (e.g., a trade policy reform) on an endogenous variable (or vector) Y (e.g., production, rural income in a particular region, or migration). Let P denote a vector of local input and output prices. The full impact of the change in Z on Y is given by:

$$dY/dZ = \partial Y/\partial Z + \partial Y/\partial P \; dP/dZ \tag{1}$$

The first term represents direct income effects, an economy-wide analogue to the partial effects in a microeconomic model in which all prices are held constant. The second term represents the indirect, general-equilibrium effects of the exogenous shock through endogenous local prices. If all goods and factors are tradable (that is, all prices are given to the local economy by outside markets), or if supplies of all goods and services are perfectly elastic (as in a Social Accounting Matrix (SAM) multiplier model), the second term vanishes. In this case, a series of microeconomic models of households and firms (or, in the case of perfectly elastic supplies, a SAM multiplier model) may be sufficient to estimate local production, marketed-surplus, and income effects of the policy change. However, if some goods (e.g., labor, output) are non-tradable and supplies are not perfectly elastic, the second term in Equation (1) may be nonzero. Market linkages resulting from endogenous prices then alter the effects of policy reforms in small economies.

Micro economy-wide models are flexible and may include a large variety of economic variables. Production activity mixes, factors, and household groups reflect both the structure of the local economy and the researcher's interest. Production activities purchase factor inputs explicitly or, in the case of family inputs, implicitly, from inside or outside the local economy and generate value-added. The technological relationship between

factor inputs and outputs in each sector is nonlinear, increasing with quantity of factor inputs but at a decreasing rate, as described by sector-specific production functions. Prices of factors, for which there are markets, can also be observed. Endogenous family-factor prices and value-added are estimated econometrically from time use information and the difference between gross value of production and the cost of all purchased inputs.

In addition to the endogenous accounts summarized above, economy-wide models may contain a diversity of exogenous accounts, including the rest of the world. The rest of the world typically includes the rest of the country and the world abroad. With few exceptions, the relevant rest of the world abroad for rural residents of Mexico and Central America is the United States, with which migration connections typically are strong.

For either a household or an entire local economy, when the supply of a particular factor exceeds demand, summed across all production activities, one of two things can happen, depending upon access to markets for the factor. The first possibility is that excess supply of the factor is marketed outside the household or local economy, at existing factor prices (e.g., fixed wages). This includes internal and international labor migration. The second possibility is that the market for the factor is imperfect, for which two scenarios are possible. The first is that individual households do not have access to factor markets and thus are constrained to be self-sufficient in the factor. This case corresponds to missing markets at the household level elucidated by Strauss (1986) and de Janvry, et al. (1991). The second scenario is that households have access to local factor markets that are isolated from regional or national markets by high transaction costs. In addition to markets for factors, markets for goods must also clear, either through interactions of supply and demand at the household or local level, or else by using outside markets to sell excess supply or satisfy

excess demand for goods. The market-clearing conditions determine equilibrium quantities and prices (for each nontradable) or marketed surplus (for each tradable). A trade equation constrains the value of local "imports" or purchases of goods and services from the outside world to equal total "exports" or sales to outside markets minus net borrowing. The trade equation represents the redundant equation in these models.

**A Stylized CAFTA Model**

The economy-wide model used in the CAFTA trade policy experiments below is a conglomerate of separate economy-wide models for Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua. The building blocks of our economy-wide model are micro models of firms and households engaged in a variety of economic activities that are of intrinsic policy interest and that may be influenced directly or indirectly by policy changes (Detailed model information, code and results are available from authors upon request).

The CAFTA model was designed to explore micro economy-wide impacts of specific market and policy changes in a diversity of rural economic contexts characteristic of Central America. It is essentially a hybrid, stylized model, selectively drawing elements from several small-economy (village, village-town) and country models that have been estimated for rural Mexico and Central America over the past decade (These include Taylor, Yúnez-Naude and Dyer 1999; Taylor, Zabin and Eckhoff, 1999; Taylor, Yúnez-Naude and Hampton, 1999; and Becerril, et al., 1996 and 1997). Although this is a stylized model, all parameters were derived from past models; most were estimated using original survey data and current information on local agricultural production.

The elements of the model include differing mixes of production sectors for each of the five countries (Table 4). Each country model highlights the major export crops as well as the major import and staple crops. It also includes livestock, other agricultural production,

and nonfarm production. In light of our focus on rural economies and migration, urban economies are represented in a highly aggregated form (industry and services). Each activity produces output with inputs of labor and capital, assuming a Cobb-Douglas production technology. Consumption demands are modeled using a linear expenditure system (LES) approach. Although more complicated functional forms are possible we have found that the results of our policy experiments using similar models are robust to the specification of functional forms (Taylor, Yunez and Hampton, 1999). This is not surprising, inasmuch as the model is always calibrated at the same point given by the survey data, and most policy experiments involve marginal changes in exogenous variables. The base models solve for local equilibrium prices and quantities of all goods and factors. The trade policy experiments are then run on this base.

The model also includes separate rural and urban labor markets and country-specific wages and capital rental rates. They also include rural and urban household groups, which obtain income from production activities in the sector to which they supply factors and spend this income on locally produced goods and imports. Households also obtain income from international migrant remittances. A remittance function relates numbers of international migrants to remittance income from abroad.

Rural households in each country allocate labor to different crop and noncrop production activities and to migration so as to maximize total income. This implies an optimum at which marginal value products are equal across production and migration activities—for migration, the marginal effect of migration on remittances. In this prototype model, internal migration is estimated directly, by changes in rural and urban labor demands,

and internal migrant remittances are ignored. In real life, changes in urban incomes are shared with rural households through remittances.

Many different market-closure scenarios are possible. For labor markets, we can assume either a fixed country wage (perfectly elastic labor supply) or an endogenous wage (fixed labor supply). The second scenario is the one chosen for the experiment. This wage corresponds to country labor markets in which the total supply of labor available for production or migration is fixed. Labor-market clearing conditions determine country-specific equilibrium wages, which also affect international migration.

Product markets, like labor markets, can be characterized either by endogenous or exogenous prices. Exogenous prices assume that countries are price-takers in international markets. The farmgate price is the international price minus the export or import tariff. Prices for goods are endogenous if policies or transaction costs isolate producers and consumers from outside markets. An import quota, if binding, results in a country-specific equilibrium price for the protected good. If trade liberalization results in disbanding import quotas, the country price becomes endogenous. However, high transaction costs within countries, which may be endemic to rural markets, may isolate groups of producers and households from this world price (de Janvry, Fafchamps and Sadoulet, 1991; Taylor, Yúnez-Naude and Dyer, 2000). However, lack of access to regional and national staple markets imposes a self-sufficiency constraint on farmers, which can adversely affect supply response in other crop and noncrop activities. Our experiments, below, illustrate the effect of such a constraint.

**Parameterizing the CAFTA Model**

The most critical parameters needed for the household component of our model are value-added shares, which link household incomes to production; expenditure shares, which shape

household demand linkages inside and outside the rural economy; and migrant remittance function parameters, which relate migration to remittance receipts. Factor value-added shares and household budget shares by commodity were obtained from a variety of sources, including village surveys in El Salvador and Mexico and SAMs for Central American countries and Mexico. Production values and wages were obtained from the Central American agricultural report by CEPAL (2002, 2003). Imports and exports for agricultural commodities were obtained from the Food and Agriculture Organization FAOSTAT agricultural database (http://apps.fao.org/page/collections?subset=agriculture). Nonagricultural totals are from the World Bank 2001 World Development Report. Labor force and employment information is from the International Labor Office and other sources (Table 5). International migrant remittances are from the International Monetary Fund, and numbers of Central Americans in the United States were obtained from the US Decennial Population Census (Table 6).

The CAFTA model was programmed using the General Algebraic Modeling System (GAMS). Changes in activity, factor and household incomes reverberate through economies like ripples in a pond. Production technologies, expenditure patterns and the distribution of value added across households determine the size and direction of these ripples. Large budget shares for locally produced goods create a potential for income changes to stimulate local production activities. For nontradables, local prices transmit changes in demand to production activities. For tradables, prices are determined in markets outside the local economy. Thus, local demand does not affect production, but it does determine the size of the net surplus available to outside markets. The structure of our model permits us to explore

the impacts of a variety of trade and market shocks on production, incomes, migration and trade in alternative market contexts.

**Trade Integration Experiments**

Without attempting to predict specific the outcomes of CAFTA negotiations or exchange-rate influences of market integration, we used the CAFTA model to explore likely impacts of selected CAFTA-related price changes on employment, wages and migration. The potential number of policy experiments that can be carried out with this model is large. In this paper, we simulate three price shocks: a 10 percent increase in coffee export prices, a 10 percent decrease in maize prices, and a 10 percent increase in livestock prices. The impact of trade reforms on commodity prices, of course, may be either positive or negative, depending upon the degree of protection enjoyed by the commodity prior to reforms. The signs of these price changes are arbitrary, but they reflect our a-priori expectations of price effects of regional integration. In general, the impacts of price changes in this model are more or less symmetric. These particular experiments were chosen to illustrate how sensitive labor-market outcomes are to the specific commodity prices affected by policy reforms as well as to differences in production structures and expenditure patterns across Central American countries. Coffee and Maize are relatively labor-intensive activities, in contrast to livestock production. Coffee and livestock are export activities, while maize is a major import in the region. The model makes it possible to explore the likely directions of impacts of policy or market shocks once the impact of trade reforms on import or export prices is known.

In each of our experiments, we assume that country wages are endogenous, determined by the interplay of labor supply and demand and migration. Country labor supplies are assumed to be equal to total labor forces, but mobile across sectors. Labor demand includes demand by country production activities (determined by conditions for

profit maximization). Migration is determined by equating marginal remittances to the marginal product of labor in country production activities (or country wages). In this way, the model does not assume wage convergence across countries, which we believe would be an unrealistic assumption in light of the striking wage between the countries. The sensitivity of any or all of these assumptions can be explored by changing closure conditions in the model.

*Results of Increase in Coffee Prices*

The immediate impact of higher export prices is on producers of the affected export crops. In this experiment, the higher coffee price stimulates coffee production and labor demand, but the magnitudes of these impacts vary across countries. Because the production technology for coffee is similar across countries in the model, the supply response does not vary much: it has an elasticity of 0.59 to 0.77 (Table 7). Increased demand for labor in coffee production puts some upward pressure on country wages. Resulting wage increases reflect the structure of country labor markets and production, especially the relative importance of the coffee sector. They range from only .001 in Guatemala to 0.39 percent in Nicaragua. Higher wages, in turn, transmit the policy impact from coffee to other production sectors as well as migration. By the time the impacts of the coffee price change are fully transmitted through country economies, rural labor demand increases (by 0.02 to 3.74 percent), and urban labor demand falls (by 0.004 to 1.13 percent). The increased coffee price dampens international migration pressures to a varying extent across countries, notably in Nicaragua and El Salvador. There is little impact in Costa Rica and Guatemala, possibly because this country already is already heavily invested in coffee. Despite the importance of coffee exports in some Central American countries, the total income effects of the 10 percent increase in coffee price are

not large in most cases. They range from almost no impact in Guatemala to around 0.82 percent in Nicaragua. This reflects production and labor market adjustments to the price change within countries (which dampen production in competing sectors), but more importantly, the high degree of diversification in even the largest coffee-exporting countries.

*Results of Decrease in Maize Prices*

Our second experiment explores the economy-wide impacts of a 10 percent decrease in corn prices. The results mirror findings from Mexico that staple-price decreases have a minimal effect on migration. Lower staple prices adversely affect staple producers. They also benefit consumers. Our experiments only explore the first (adverse) affects, although we could easily extend the model to examine positive real income effects of staple price changes. In response to the staple price change, maize production falls significantly in all countries (the average estimated supply elasticity is on the order of 1.8). The change in production depresses wages but by a negligible amount in Costa Rica and Guatemala (see Table 8). Nicaragua has the largest impact, but this may reflect the higher percentage of crops that are traditional in that country. It is noteworthy that even in countries where many farmers grow maize, the labor market effects of the maize price decline are small. Labor is shifted among agricultural activities (output of other crops increases slightly) as well as between sectors, implying some rural-urban migration (see Table 8). The total impacts on migration range from almost no impact in Costa Rica to 745.6 in Nicaragua and 169.58 in El Salvador. Given the size of the El Salvador-born population in the United States (more than 817,000 according to the 2000 US population census), this represents a miniscule change in migration in response to maize prices.

*Results of Increase in Livestock Prices*

In contrast to coffee and maize, livestock is not a labor-intensive production activity. Not surprisingly, the labor market and migration impacts of changes in livestock prices are minimal, except for in Nicaragua (Table 9). Wages barely change in any of the five countries, there is little effect on the inter-sector distribution of labor, and international migration falls by a maximum of 272.39 migrants (Nicaragua). In Costa Rica, there is virtually no change in wages, labor demand, or international migration. Nicaragua appears to be the only country that is appreciably affected by the price change.

*Results of Impacts of Price Changes versus Currency Devaluations*

Our findings suggest that price changes associated with trade policy reforms are not likely to have a striking effect on international (or internal) migration. Nevertheless, if CAFTA promotes macroeconomic stability in member countries, it may discourage migration by stabilizing exchange rates. Currency devaluations stimulate international migration directly, by increasing the rate of returns to households from sending migrants to the U.S. They also may stimulate migration indirectly, by affecting expectations about future economic well being in complex ways.

Table 10 compares the international migration effects of the 10-percent commodity price changes of the previous experiments and a 10-percent currency devaluation. While the impacts of the price changes on migration are generally small, the currency devaluations have a marked impact on the number of extra-regional migrants. The change in international migration is more than 20,000 in most cases, reaching a high of more than 81,000 in El Salvador. The impact is small quantitatively in Costa Rica, which is not a major migrant-sender and is in fact a destination for many Nicaraguan migrants.

**Conclusions**

The goal of this paper has been to explore the likely ramifications of regional trade integration for labor markets and migration in Central America. Our analysis of the migration literature suggests that migration determinants as well as impacts are complex. Wage differences across regions, in general, tend to stimulate migration. However, there are other influences on migration, as well. The structure of local commodity and factor markets, the mixture of production activities, and access to migrant labor markets, including migration costs and risks, play critical roles in shaping migration. High transaction costs in rural commodity markets may limit the transmission of prices and dampen the responses of rural producers and households to new market opportunities created by trade reforms.

An underlying hypothesis of this study is that, in diversified rural economies, impacts of regional integration on migration are likely to be muted by local market adjustments. Simulations using our economy-wide CAFTA model suggest that there will be differences in impacts of regional integration on migration across countries; however, these impacts are likely to be small in most cases. We find small negative impacts of agro-export prices on internal and international migration. That is, higher prices for exports tend to reduce migration pressures, but only by a small amount in most cases. More strikingly, reductions in import prices for staples have a positive but almost miniscule effect on migration.

Competition from foreign corn and other staple producers negatively affects staple production. However, it also increases the economic returns of other activities relative to staples, thus encouraging a shift of resources (including labor) into production activities that effectively compete with migration. Total migration effects depend on the policy mix. CAFTA policy reforms will change many commodity prices simultaneously, possibly magnifying the impacts reported above. However, migration effects may offset one other;

for example, lower corn prices stimulate migration while higher agro-export prices tend to do the opposite. Moreover, rural market imperfections may dampen migration responses by inhibiting the transmission of world prices through rural markets.

The most important effect of regional trade integration on migration may not directly involve changes in commodity prices, but rather, how trade reforms affect macroeconomic stability in the North American region. Our findings suggest that migration is more sensitive to changes in the exchange rate than to changes in commodity prices. If CAFTA helps promote stability in exchange rates in member countries, as arguably has been the case in NAFTA, it may reduce migration pressures over time.

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Table 1: Main Agricultural Exports of CAFTA Countries, 2001

| Main Agricultural Exports | Costa Rica | El Salvador | Guatemala | Honduras | Nicaragua |
|---|---|---|---|---|---|
| | %of Earnings | US $million | US $million | US $million | US $million |
| Total Ag Exports | 1303.7* | 268.05 | 959.8 | 915.4 | 415.7 |
| Bananas | 10.31 | N/A | 183 | 161 | 11.6 |
| Coffee | 3.23 | 119 | 306 | 31 | 104.9 |
| Sugar | 0.71 | 70 | 213 | 177 | 49.1 |
| Nontraditional | 85.24 | 119 | 138 | 10 | 252.2 |
| Fish & Seafood | 115.7* | 19 | 22 | 37 | 75.8 |

Ref: Economist Intelligence Unit. 2002 Country Profiles. Available at www.eiu.com/schedule.
*In US $millions

Table 2: Main Agricultural Imports of CAFTA Countries, 2001

| | Costa Rica | El Salvador | Honduras | Guatemala | Nicaragua |
|---|---|---|---|---|---|
| **Exports to:** | %of total | %of total | %of total | %of total | % of total |
| US | 51.8 | 65.4 | 45.7 | 55.3 | 28.0 |
| EU | 20 | | 9.0 | | 9.3 |
| Central America | 10.6 | 34.6 | 19.9 | 13.3 | 26 |
| Asia | 5.2 | | | | |
| South America | 1.7 | | | | |
| **Imports From** | %of total | %of total | %of total | %of total | % of total |
| US | 53.2 | 49 | 46.2 | 32.8 | 27 |
| South America | 10.8 | | | | 10 |
| EU | 10.3 | | | | |
| Asia | 9.4 | 2.4 | | 8.2 | 4.0 |
| Central America | 4.9 | 11.4 | 24.3 | 15.9 | 30 |

Ref: Economist Intelligence Unit. 2002 Country Profiles. Available at www.eiu.com/schedule.

Table 3: Summary of Tariff Levels for Key Central American Exports

| | Coffee | *Banana* | *Sugar Cane* | *Maize* | *Plantains* | *Citrus* | *Rice* |
|---|---|---|---|---|---|---|---|
| | Tariffs | Tariffs | Tariffs | Tariffs | Tariffs | Tariffs | Tariffs |
| Costa Rica | 55 | 55 | 55 | 55 | 55 | 55 | 55 |
| El Salvador | 50 | 50 | 92.08 | 50 | 50 | 50 | 50 |
| Honduras | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| Guatemala | | 45 | 45 | 84 | 45 | 45 | 100 |
| Nicaragua | | | 120 | 70 | | | 70 |

Available from WTO tariff schedule

Table 4: Accounts in CAFTA Model

| | | |
|---|---|---|
| *Products* | COF | Coffee |
| | BAN | Bananas |
| | CAR | Cardamon and other Spices |
| | SUG | Sugar Cane |
| | MAI | Maize |
| | PL | Plantains |
| | PF | Oil Palm Fruit |
| | PO | Potatoes |
| | NT | Non-Traditional Crops |
| | RI | Rice |
| | OAG | Other Agriculture |
| | IND | Industry |
| | SERV | Services |
| | MT | Meat |
| | MIL | Milk |
| *Factors* | LABOR | Labor |
| | CAPITAL | Capital |
| *Sectors* | RURAL | Rural |
| | URBAN | Urban |
| *Countries* | CR | Costa Rica |
| | GUA | Guatemala |
| | Hon | Honduras |
| | NIc | Nicaragua |
| | ES | El Salvador |
| | BL | Belize |

Table 5: Labor Forces, Employment and Wages, by Sector

| Country | Labor Force | Population | Agriculture | | Industry | | Services | |
|---|---|---|---|---|---|---|---|---|
| | | | Employment | Wage[a] | Employment | Wage[a] | Employment | Wage[a] |
| Costa Rica | 1,552,924 | 3,935,506 | 234,924 | 195 | 856,148 | 369 | 362,145 | 290 |
| El Salvador* | 2,370,000 | 6,400,000 | 503,100 | 92 | 435,100 | 200 | 1,336,600 | 229 |
| Honduras | 2,226,700 | 6,580,000 | 853,100 | 75 | 455,700 | 78 | 917,900 | 95 |
| Guatemala*** | 3,318,000 | 11,400,000 | 5,700,000 | 11 | 1,710,000 | 22 | 3,990,000 | 27 |
| Nicaragua** | 1,900,400 | 5,205,000 | 739,000 | 49 | 137,700 | 224 | 815,400 | 281 |

Data from Economist Intelligence Unit. 2002 Country Profiles. Available at www.eiu.com/schedule.

a All wages in US $ per month

*Data from www.ilo.org (Year 1999)

**Data from www.ilo.org (Year 2001)

***http://www.cia.gov/cia/publications/factbook/geos/gt.html#Econ (but only for the percentages the rest from eiu)

Table 6:Total Migrant Remittances and Migrants in the United States, 1990 and 2000

| | Remittances | | Migration | |
|---|---|---|---|---|
| | 1990 | 2000 | 1990 | 2000 |
| Costa Rica | 12,000,000 | 116,000,000 | 43,530 | 71,870 |
| El Salvador | 366,000,000 | 1,386,000,000 | 465,433 | 817,336 |
| Guatemala* | 119,000,000 | 466,000,000 | 225,739 | 480,665 |
| Honduras | 63,000,000 | 352,000,000 | 108,923 | 282,852 |
| Nicaragua | Not available- | 300,000,000 | 168,659 | 220,335 |

Sources: Remittances: International Monetary Fund
Migration: US Decennial Population Censuses

Table 7: Estimated Economy wide Impacts of a 10% Increase in Coffee Prices

| Percentage Change In... | Country: Costa Rica | Guatemala | Honduras | Nicaragua | El Salvador |
|---|---|---|---|---|---|
| Production | | | | | |
| Coffee | 6.19 | 7.74 | 6.18 | 5.99 | 6.28 |
| Other Ag | -0.03 | -0.001. | -.04 | -0.39 | -.04 |
| Wages | .02 | .001 | .03 | 0.32 | .03 |
| Labor Demand | | | | | |
| Rural | 0.51 | 0.02 | .63 | 3.74 | 1.31 |
| Urban | -.09 | -.004 | -.12 | -1.13 | -0.11 |
| International Migration | -17.54 | -5.41 | -98.25 | -709.16 | -265.71 |
| Income (nominal) | .08 | .003 | 0.10 | .82 | .10 |

Source: CAFTA Model Simulations

Table 8: Estimated Economy wide Impacts of a 10% Decrease in Maize Prices

| Percentage Change In... | Country: Costa Rica | Guatemala | Honduras | Nicaragua | El Salvador |
|---|---|---|---|---|---|
| Wages | 0 | 0 | -.01 | -0.34 | -0.02 |
| Labor Demand | | | | | |
| Rural | -.01 | -.0095 | -0.26 | -3.97 | -0.84 |
| Urban | .002 | .002 | .05 | 1.2 | .07 |
| International Migration | .48 | 3.10 | 40.46 | 745.6 | 169.58 |
| Income (nominal) | -.0007 | -.00068 | -.01 | -.28 | -.02 |

Source: CAFTA Model Simulations

Table 9: Estimated Economy wide Impacts of a 10% Increase in Meat Prices

| **Percentage Change In...** | **Country** | | | | |
|---|---|---|---|---|---|
| | **Costa Rica** | **Guatemala** | **Honduras** | **Nicaragua** | **El Salvador** |
| Wages | .0075 | .0005 | .004 | .12 | .01 |
| Labor Demand | | | | | |
| Rural | .16 | .007 | .09 | 1.44 | .46 |
| Urban | -.03 | -.001 | -.02 | -.44 | -.04 |
| International Migration | -5.44 | -2.44 | -13.33 | -272.39 | -92.72 |
| Income (nominal) | .06 | .0035 | .03 | .69 | .08 |

Source: CAFTA Model Simulations

Table 10: Comparison of Migration Impacts of Price Changes and Currency Devaluation

| Country | Estimated Change in Number of Migrants | | | |
|---|---|---|---|---|
| | 10% Increase in Coffee Prices | 10% Decrease in Maize Prices | 10% Increase in Meat Prices | 10% Currency Devaluation |
| Costa Rica | -17.54 | .48 | -5.44 | 7,191 |
| Guatemala | -5.41 | 3.10 | -2.44 | 48,117 |
| Honduras | -98.25 | 40.46 | -13.33 | 28,307 |
| Nicaragua | -709.16 | 745.6 | -272.39 | 22,048 |
| El Salvador | -265.71 | 169.58 | -92.72 | 81,799 |

Source: CAFTA Model Simulations