The impact of CAFTA on employment, production and poverty in Honduras

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I. Introduction

The Central American Free Trade Agreement (CAFTA-DR) is one of the key components of the trade reform agenda in Central America. Producers in the region gain preferred access to the U.S. market for a wide range of products but at the same time those tariff and non-tariff barriers protecting them from lower cost U.S. products are reduced. Supporters of CAFTA hope that the reduction of most remaining barriers to trade between the Central American countries and the United States will lead to increased efficiency, greater exports and higher growth rates for the region. Yet many observers remain skeptical about the supposed benefits of CAFTA. They point out that for agricultural commodities Central America already has been granted preferred access to the U.S. market under the Caribbean Basin Initiative signed in 1983, and broadened under several later agreements. And yet under the agreement the countries were thought to have permitted significant reductions in the protection afforded to their own producers, particularly smallholders and producers of basic commodities such as beans, corn, pork, chicken and rice. These could have an important negative effect on incomes of the poor, offsetting all or part of the gains elsewhere in the economy.

The purpose of this paper is to shed some light on this debate first by looking closely at the agreement to see what the changes in protection and increased market access to the US market are for Honduras. Second, we use a CGE and a microsimulation model to simulate the impact that the CAFTA changes in tariffs and quotas both in Honduras and for Honduran products in the U.S. are likely to have on producers, wages, national income and poverty in Honduras.

II. Patterns of Protection and Trade Prior to CAFTA

In order to appreciate the likely impact of CAFTA on the economy of Honduras it is useful to look at the level of protection prior to CAFTA and also production trends in key sectors of the economy. Table one displays statistics on trends in production and tariffs since 1990. As the reader can see from the right hand columns in the table, Honduras underwent a fairly dramatic period of trade liberalization in the early 1990s well before the CAFTA agreement. In 1990 Honduras had the highest tariffs in Central America. Five years later its tariffs were the lowest in the region. This tariff history should be kept in mind when we consider the impact of CAFTA. On average, given the relatively low level of tariffs in 1999, that impact cannot be too great. There could, however, be a large CAFTA impact in particular sectors and commodities where relatively high levels of protection still remained in place in 2005 when the CAFTA agreement was signed. To get a sense of how important that could be one has to look at the disaggregated tariff data in detail which we shall do in a moment. But first, consider the sectoral production and trade data displayed in the table.

Table II.1: Honduras National Account Data

Honduras National Accounts Data											Tariff Data	
				shares (current prices)							average	dispersion
	GDP/capita	I/Y	X/Y	M/Y	ag	mfg	constr	utilities	mining	svc		
1990	685.7	0.202	0.372	0.399	0.200	0.145	0.046	0.028	0.015	0.566	0.419	0.218
1995	700.4	0.240	0.437	0.481	0.187	0.155	0.048	0.047	0.017	0.546	0.097	0.075
1997											0.097	0.054
1999											0.081	0.078
2000	713.6	0.261	0.413	0.552	0.140	0.170	0.046	0.041	0.017	0.585		
2001	714.2	0.238	0.378	0.542	0.122	0.177	0.043	0.038	0.016	0.604		
2002	714.2	0.222	0.380	0.531	0.119	0.182	0.037	0.039	0.017	0.606		
2003	720.7	0.234	0.383	0.549	0.113	0.183	0.041	0.042	0.017	0.605		
2004	738.7	0.248	0.397	0.588	0.115	0.181	0.037	0.042	0.016	0.609		

Source: CEPAL, *Anuario Estadistico*. Shares for 2004 are estimates based on a chain index from 2003 using country data from CEPAL. *Estudio Economico.* Tariff data are from Lederman et al.. (2002).

Trade liberalization does not appear to have been much of a boon to the Honduran economy. Between 1990 and 2004 per capita income rose by just 0.5% per year, one of the slowest growth rates in all Latin America. This performance did not reflect low investment. Indeed, according to the table trade liberalization was accompanied by a significant increase in the share of capital formation in GDP. Nor was it due to a failure to increase exports. The export share increased slightly over the decade when measured in current prices and much more when measured in constant prices. Rather the opening of the economy led to a massive increase in the import share not balanced by an equivalent increase in exports, but rather by an increase in the trade deficit.

If one looks at trends in the sectoral composition of output, one finds a sharp contraction in the share of agriculture and an increase in manufacturing. Both reflect the rise of the maquila sector. Honduras has the fastest growing and the largest maquila sector in Central America. By 2005 maquila comprised 27% of total exports and its value added contributed 36% of industrial production.[1] Meanwhile agriculture managed to grow at only 1.3% per year after 1995, reflecting low prices for its main export crops, natural disasters and an exchange rate increasingly affected by maquila.

Honduras does not have high tariffs on industrial commodities. Thus the CAFTA tariff reductions were going to primarily affect agriculture. Yet as the table indicates, this was a sector that had already suffered a quite severe decline in the years before CAFTA. Whether the positive effect of opening the United States to Honduran exports would offset the effect of further tariff reductions of agricultural commodities in Honduras is one of the key questions that we will seek to answer in simulation exercises reported later in this paper.

[1] / Banco Central de Honduras (2006).

II.2 Trade Liberalization under CAFTA

The CAFTA treaty specifies precisely how tariffs on all commodities traded between the signatories are going to be eliminated or reduced over time. For each country the agreement contains a long and very detailed list of commodities with both the current most favored nation (MFN) tariff and a tariff category to which the commodity has been assigned.[2] These categories determine how fast tariffs will be reduced over time. Table II.2 shows the categories which are relevant to Honduras.

Table II.2: Tariff Categories under CAFTA

Category	
A	Immediate tariff reduction to zero
B	Linear reduction of tariffs to zero over five years
C	Linear reduction of tariffs over ten years.
D	Linear reduction of tariffs over fifteen years
E	Six Year grace period, then reduction of 33% over next four years, then full liberalization from 12th to 15th year.
F	Ten year grace period, then linear reduction to zero over the next ten years.
G	Goods in this category already have zero tariff rate
H	Goods in this category are excluded from tariff reductions under CAFTA, with tariffs remaining at the rates agreed to in WTO.
M	Non-linear reduction in tariffs to zero. 2% in 1st year, 8% per year from 3rd to 6th year and 16% per year from 7th to 10th year.
N	Elimination of tariffs in 12 equal annual steps.
O	Six year grace period and then elimination in nine non-linear steps, 40% from 7th to 11th year and 60% from 12th to 15th year.
P	Ten year grace period, then elimination over 7 years. 33% from 11th to the 14th year and 67% from the 15th to the 18th year.

Source: CAFTA-DR Treaty

For a subset of sensitive agricultural products CAFTA also expands a system of tariff rate quotas (TRQ's) originally set up under the WTO which define amounts of certain commodities that can be imported free of tariffs.[3] In addition for many products safeguard provisions permit a country to apply the MFN tariff level if imports from the US or in the case of the US, imports from Central America exceed the safeguard level. Safeguards are provisions permitted under WTO (and GATT) regulations by which imports beyond the safeguard level can be temporarily restricted if the affected industry can show that it will suffer serious injury from the level of imports beyond the safeguard level. In most cases the safeguard level tariffs fall over time.

[2] The reader should note that formally CAFTA only reduces Honduran tariffs on goods imported from the US. In this paper for simplicity we will treat the CAFTA tariff reductions as if they applied to all imported commodities. This implies that our estimates of impact of tariff reduction will overstate the impact. The reason for this simplifying assumption is that the tariff rates are so low that the differences between the true effect and our estimates are necessarily small.

[3]/ These are products that are politically sensitive and or produced or consumed by the poor.

II.3 Changes in the protection of agriculture based products under CAFTA

We now turn our attention to changes in the level of protection of agricultural commodities under CAFTA (See table II.3). As we pointed out above, under CAFTA commodities are divided into various categories according to the time profile of programmed tariff reductions under the agreement. Table II.3 shows the amount of trade in each of the tariff categories for all agricultural and processed agricultural products and the level and changes in the average tariff in each of the categories. For example in category A, tariffs are eliminated immediately while in B they are reduced to zero in five equal installments over the first five years and in C over the first ten years. Note that these averages are all weighted averages of individual tariff rates, where the weights are determined by the share of the commodity in total imports. As is well known this method of averaging can seriously under estimate the average level of protection when there are tariffs so high that they choke off imports. The last category in each table is comprised of all the commodities which have quotas which in Honduras is mainly yellow corn, chicken and dairy products.

Certain commodities like beans, corn and rice are of particular importance to either the income or the consumption of the poor. We have used the information on tariff categories and initial tariffs in table two to calculate the time path of tariff reductions for a number of these "sensitive" commodities and show the results in the second half of table II.3. Note that the table shows only the tariff level, not the impact of quotas which we will discuss in a moment.

Other than white corn in several countries, tariff protection for all of these sensitive products will disappear over twenty years. But for most products, the liberalization will be very gradual, much of it occurring at least ten years after the treaty goes into effect. This is important. In Central America many have protested that CAFTA will hurt small farmers by reducing protection of commodities of particular importance to smallholders and the poor. The evidence in the table makes it quite clear that this will not the case, at least for the first five to ten years. It seems that the Honduran negotiators of CAFTA were not willing to impose shock treatment on their producers of these sensitive commodities. But it is also clear that over the long run, the reductions in tariffs for these commodities are considerable. Domestic producers are given a fairly long time to adopt new crops or new and more efficient production techniques. But in the long run, they will have to adjust to a far lower level of protection, particularly in rice, beans, poultry and dairy.

The table also makes clear the high level of protection afforded to domestic producers of sensitive products, particularly dairy, poultry and rice.[4] This pattern may, at least to some extent reflect the desire by the Central American governments to protect their producers from subsidized exports from the United States. A recent study estimated that

[4]/ This pattern is observed both in Honduras and in the other Central American countries. See Morley (2006).

subsidies in the US amounted to 41% of the value of production of rice, 50% for milk and 32% for corn.[5]

Table II.3: Tariff Levels over time in CAFTA

		Trade		Average Tariff Rates				
Tariff Category	Imports	Exports	No. prod	Pre CAFTA	First year	5th year	10th year	15th year
A	26000	192298	365	0.127	0.000	0.000	0.000	0.000
B	5908	30360	124	0.140	0.112	0.000	0.000	0.000
C	15670	9227	175	0.166	0.149	0.083	0.000	0.000
D	16685	50656	137	0.147	0.137	0.098	0.049	0.000
F	78	10	7	0.150	0.150	0.150	0.150	0.075
G	107545	830	235	0.000	0.000	0.000	0.000	0.000
N	4510	0	10	0.139	0.127	0.081	0.023	0.000
O	869	379	4	0.150	0.150	0.150	0.090	0.000
Quota	50482	1514	33	0.416	0.416	0.416	0.416	0.277
total	227747			0.136	0.119	0.107	0.097	0.061
total without rice and yellow corn				0.072				

	tariffs on sensitive commodities					
	Pre CAFTA	first year	5th year	10th year	15th year	20th year
yellow corn	0.450	0.450	0.450	0.302	0.000	0.000
white corn	0.450	0.450	0.450	0.450	0.450	0.450
rice	0.450	0.450	0.450	0.450	0.252	0.000
beans	0.150	0.140	0.103	0.050	0.000	0.000
beef	0.150	0.120	0.000	0.000	0.000	0.000
pork	0.150	0.150	0.150	0.090	0.000	0.000
poultry	0.549	0.520	0.455	0.411	0.230	0.000
dairy	0.121	0.118	0.116	0.113	0.055	0.000

Source: Morley (2006).

Tariffs in Categories A and B are either eliminated immediately or over the first five years of the agreement. Products in these categories are broadly comprised of prime cuts of beef, fish, flowers, various fresh fruits and vegetables, potatoes, and inputs to processed food such as soups and dog food. For the most part, these are not products in which US imports compete with local producers. For fish, fruits and vegetables it is unlikely that US prices would be competitive with local product even at a zero tariff. The picture in beef is more complicated. Central American cattle growers do not now produce prime cuts of beef, so the increase in tariff-free imports should have little effect on local producers. In fact, because CAFTA grants beef import quotas in the U.S., the treaty is on balance likely to be favorable to them.

Category C commodities are those with a ten-year linear tariff reduction schedule. This group is comprised primarily of processed foods. D and F category commodities have a very gradual reduction of tariff protection over either 15 or 20 years. Thus whatever impact CAFTA will have on producers in these two categories will necessarily be quite drawn out. The bulk of D category products are what could be called processed agricultural commodities such as animal or vegetable fats, candies and products made

[5]/ Monge et al (2004).

from sugar, products made from chocolate, leather, flour, beverages and products made from vegetables or fruits. In Honduras the category also includes potatoes and some beans. The F category where there is a ten-year grace period followed by ten-year tariff elimination is comprised completely of dairy products.

The table tells us that the treatment of different agricultural commodities under CAFTA was anything but uniform. Over half of imports either had no protection prior to CAFTA (category G) or had tariff rates set to zero upon ratification of the agreement. A second group of commodities will have their tariffs lowered, but the process will be quite gradual. Finally for several sensitive commodities such as white corn, rice, poultry and dairy, tariffs are either not lowered at all, or not lowered significantly until at least ten years after ratification.

We now allocate these tariff reductions across the sectors which we are going to use in the CGE based simulations presented later in the paper (See table II.4). As in the previous tables, the average tariffs shown are the weighted averages of individual commodity tariffs where the weights are the import shares of the commodities in question. The table gives a good idea of which sectors still had high levels of protection prior to CAFTA, and how that protection is slated to change over the next twenty years. As the reader can see, trade liberalization in the 1990s reduced protection in all manufacturing sectors other than textiles and processed food to a low level. Other than textiles, all the sectors which had significant tariffs were agricultural which means that for the most part, further trade liberalization under CAFTA will primarily affect agriculture. Tariffs go to zero in all sectors by year twenty, but the process is not uniform. As we already saw in table II.3, liberalization for subsistence commodities does not begin until almost ten years after ratification. Protection does drop very rapidly for textiles and bananas, but since these are both export sectors it is not clear how important this change in protection really is.

Table II.4: Changing tariff rates over time by sector

	Year					
	Base Year tariff	1	5	10	15	20
Bananas	15.00	0.00	0.00	0.00	0.00	0.00
Coffee	12.22	8.83	5.67	1.70	0.00	0.00
Sugar	14.16	13.19	9.33	4.51	0.00	0.00
Mining	4.07	0.00	0.00	0.00	0.00	0.00
Livestock	4.30	2.18	1.37	0.35	0.00	0.00
Lumber	0.52	0.02	0.01	0.00	0.00	0.00
Non-traditional exports,veg fruit	12.40	7.58	3.84	0.28	0.00	0.00
Animal and veg oil	5.31	4.66	3.30	1.61	0.00	0.00
Subsistence ag-includes grain and beans	15.91	14.97	12.90	10.90	5.46	1.87
Processed food,incl fish,beverage and tobacco,dairy	9.27	5.18	3.84	2.57	0.87	0.00
Textiles	13.44	0.71	0.40	0.00	0.00	0.00
Paper	5.38	2.80	1.18	0.00	0.00	0.00
Chemicals	4.16	1.17	0.63	0.00	0.00	0.00
Metal, machinery and minerals	4.64	2.48	1.30	0.00	0.00	0.00
Other manufactures	7.83	5.05	1.99	0.00	0.00	0.00
Elect. Water and gas	6.87	0.00	0.00	0.00	0.00	0.00
Construction	8.26	2.93	1.63	0.00	0.00	0.00

Source: authors estimates

III: Modeling the Impact of CAFTA on employment and production

We are going to use a recursive dynamic general equilibrium model to predict the impact of CAFTA on the Honduran economy. The main reason for doing this is to incorporate the general equilibrium effects of the changes introduced by CAFTA on the prices, output and employment across different sectors of the economy. As we have already seen trade liberalization under CAFTA is mainly limited to tariff reductions in various agricultural commodities. Those changes will obviously affect prices, output and employment in agriculture. But those changes will also have indirect effects on urban consumers, government revenue, prices, the balance of payments and the exchange rate which may well be larger than the direct effect of the tariff reductions in agriculture, as well as second round effects. In this section we will give a short overview of the model, with a complete mathematical and technical discussion relegated to annex one.

III.1 The recursive dynamic CGE model[6]

Recursive dynamic CGE models have been used in Chenery et al.(1999) and El-Said et al. (2001) to analyze different development strategies in Korea and Egypt, respectively, in Lofgren (2001) as a tool to model changes in poverty resulting from various policy alternatives, and finally in Thurlow (2003), who developed a recursive dynamic model for South Africa.

These models are solved in two stages. The first is to find a solution for a one-year equilibrium using a static CGE model (see Lofgren et al, 2002). In the second stage, a model between periods is used to handle the dynamic linkages that update the variables that drive growth. The intertemporal equations provide all exogenous variables needed for the next period by the CGE model, which is then solved for a new equilibrium. The model is solved forward in a dynamically recursive fashion, with each static solution depending only on current and past variables. The model does not incorporate future expectations; instead the behavior of its agents is based on adaptive expectations, as the model is solved one period at a time. The variables and parameters used as linkages between periods are the aggregate capital stock (which is updated endogenously, given previous investment and depreciation), the population, the domestic labor force, factor productivity, export and import prices, export demand, tariff rates and transfers to and from the rest of the world (all of which are modified exogenously). The dynamic model used in this research follows the models developed by the International Food Policy Research Institute (IFPRI).[7]

This model for Honduras is solved for 1997 (the base year for the data) and then solved recursively year by year until the year 2020. This allows us to compare growth trajectories under different policy scenarios as well as track changes in policies such as tariff levels which change slowly over time. Most CGE trade models are solved for just the final comparative static equilibrium changes resulting from a change in tariffs. However under CAFTA the tariff changes are gradual to give affected sectors the time to

[6] / This section of the paper is taken from Piñeiro (2006).
[7] / Lofgren et al (2001) and Thurlow (2003).

make adjustments, so tracking the timing of impacts of the changes is an important part of the analysis.

First step: the single period solution

Basic data for CGE models are obtained from a Social Accounting Matrix (SAM). A SAM is a comprehensive, economy-wide data framework, typically representing the economy of a country. The SAM used in this paper is for 1997 and is based on the SAM developed by Jose Cuesta and reported in Cuesta (2005).

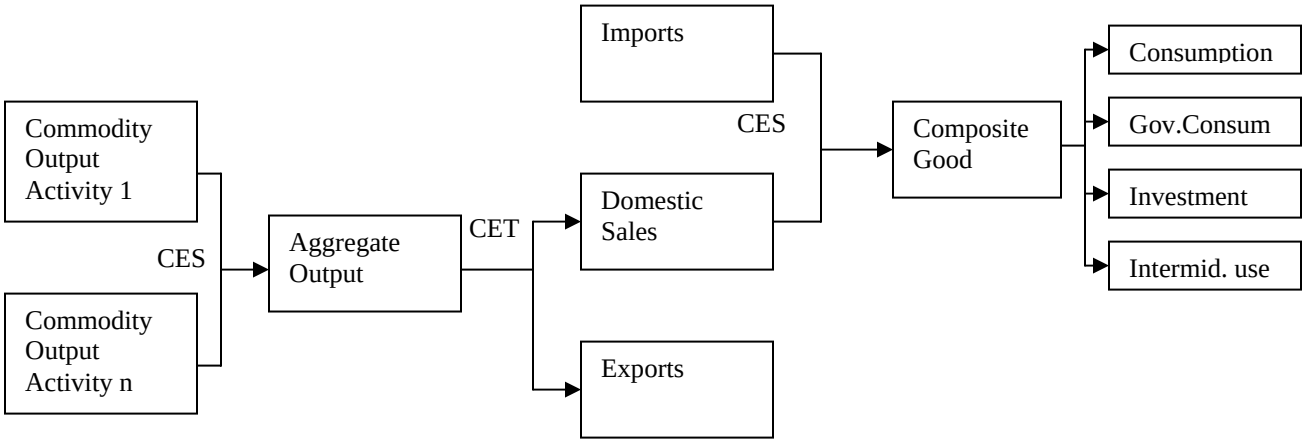
The CGE model has three components. The first shows the payments that are registered in the SAM, following the same disaggregation of factors, activities, commodities and institutions shown in the matrix. The second has the equations that represent the behavior of the different institutions present. The third has the system of constraints that have to be satisfied by the whole system covering the factor and goods markets, the balances for savings-investment, the government and the current account of the rest of the world.

Each producer maximizes profits under constant returns to scale and perfect competition. There are two factors of production, labor (differentiated by skill) and capital. Production is related to factor inputs in a constant elasticity of substitution function (CES) production function, which allows the producers to substitute these two inputs until they reach the point where the marginal revenue of each factor equals the factor price (wage or rent). The second choice the producers make is the amount of intermediate inputs they will use. This specification is made assuming fixed shares that specify the appropriate amount of intermediate inputs per unit of output and labor/capital (value added. Finally, output prices depend on the value added (cost of L and K), intermediate inputs and any relevant taxes and subsidies.

Figure III.1 shows the flow of a single commodity from producers to final demand. First, goods from all producers are aggregated into commodity outputs using a CES product demand system. The aggregate output is sold domestically or internationally. The producers' allocation between domestic sales and exports is specified via a constant elasticity of transformation (CET) function, assuming imperfect transformability between exports and domestic sales. The producers will sell their products to the market with the highest profitability. The domestic price is the international price times the exchange rate plus any possible export taxes or export subsidies. The domestic good is combined with imports to produce the composite commodity. For this the Armington[8] specification is used, which means that the domestically produced and imported goods are imperfect substitutes.

[8]/ Armington (1969).

Figure III.1: Flow of goods from producers to the national composite commodity



In this model there are four institutions, households, enterprises, government and the rest of the world, which do three things: (i) produce, (ii) consume, and (iii) accumulate capital. Households save a constant coefficient of their disposable income and buy consumption goods. They have ownership of the enterprises and they work in those enterprises. As a result, household income is the sum of salaries, profits and government and rest of the world transfers. Household consumption of goods and services is determined by a linear expenditure system (LES). Firms buy intermediate goods, hire factors of production, produce commodities and services, and sell them in the market. Government receives taxes, consumes goods and services and makes transfers to households. The capital account collects the savings from the households, firms, government, and rest of the world and buys capital goods (investment).

Closures and Assumptions on factor supplies:

The closures are the mechanisms which determine how various macro constraints are satisfied. (i) Honduras has a flexible exchange rate, which means that foreign savings is fixed. (ii) For the government, the level of consumption and income taxes are fixed across simulations. (iii) In equilibrium total saving must equal total investment. There are various ways to guarantee this. In all but one of our simulations we fixed the saving rates of households and government which makes total saving and investment positively related to the level of income. (iv) In the labor markets, we have assumed that there is an excess supply of unskilled and semi skilled labor and a fixed real wage rate. We also

assume that within each period labor is mobile across sectors, which means that real wages are equal across sectors for these two types of labor. For skilled labor a supply curve was added making wages as well as quantities endogenous to the model (iv) Capital, is fully employed and sector specific, which means that profit rates are free to vary across sectors.

Second step: between periods

In the second step of the recursive model the linkages between periods are introduced. This is done by solving the static model for one specific year and then updating the capital stock, population, domestic labor force, factor productivity, export and import prices, and export demand parameters. The updated model is then solved again for the following year and so on.
Total capital accumulation is endogenous (in all but the FDI scenario) since it is equal to total saving which is endogenous. By definition it is equal to the last period's capital stock plus total investment minus depreciation.[9] The allocation of new capital across sectors is done by adjusting the proportion of each sector's share in aggregate investment as a function of the relative profit rate of each sector compared to the average profit rate of the economy as a whole. Sectors with higher (lower) average profit rates will get higher (lower) shares of the available investment. Over time sector profit rates should converge.

The reader should note that our version of dynamic behavior may well understate or overstate the full reason of an economy to changes in policies or conditions. In our model total investment is determined by total saving and is therefore endogenous. But neither the saving nor the investment decision is modeled directly. Thus we do not incorporate the possible effect on total capital formation of a rise in the overall profit rate in response to CAFTA for example, or a rise in total saving in response to a rise in the interest rate. This limited characteristic of our version of the dynamic reaction to changes in CAFTA should be kept in mind in interpreting the results we will be presenting.

Turning to the supply of labor by skill, the model determines only the amount of employment. It does not distinguish between those who are unemployed and those of working age who are not in the labor force. This is an important distinction for skilled labor. For unskilled labor we assume that up to 2020 there is an excess supply of labor which is equivalent to assuming that the rate of growth of employment does not exhaust the available stock of either unemployed or inactive unskilled labor.

For skilled labor we assumed an upward sloping supply curve with an elasticity of +5 with respect to the real wage, and shifting rightward by 2% per year. In Honduras in

[9] / To get an estimate of the base period capital stock in 1997, we assumed a lifetime of 12 years for capital where all the depreciation occurs in the final year. With this assumption the estimate of the capital stock in 1997 is completely independent of the assumed initial capital output ratio and depends only on the level of investment observed between 1984 and 1996. With that assumption the initial level of capital turned out to be 2.26 times the level of GDP at market prices. In the dynamic simulations we set depreciation in year t at 8% of the capital stock so that the transition equations at time would depend only the solution at time t-1.

addition to unemployment there is a large pool of well-educated but inactive labor, especially among women. We assume that the growth in this group will be high enough up to 2020 to supply the amount of skilled labor called for in our sequence of short run solutions. This assumption may be unrealistic in the FDI scenario because of the rapid growth rate of employment it requires.

Finally, productivity growth, real government consumption and transfers, world price of exports and current account balances are set exogenously based on observed trends.

For investment we have two different treatments depending on the simulation. In the CAFTA simulations related with reduction in tariffs, changes in the maquila scheme and import quotas we used a saving-driven closure in the single period solution. In the FDI simulation we imposed as a constraint that the addition to FDI all be devoted to fixed investment. Therefore in this simulation total saving is investment driven.

To summarize, the dynamic accumulation process is:

1. Updated by exogenous trends (labor force growth, productivity changes, capital stock growth and population growth).
2. Updated by economic behavior (distribution of investment by sector, distribution of labor force by sector and category).
3. Updated by implemented policies (changes in tariffs, import quotas, and FDI as result of implementation of CAFTA.

With the resulting dynamic model, we first do a forward simulation to 2020 to create what we call a base run in which there are no CAFTA-related changes in exogenous variables.[10] We then run the model with various different CAFTA policy alternatives and compare those results with the base run. Because we may not have completely captured important aspects of dynamic behavior or because of misspecifications in the model itself, we put less weight on the absolute values of our projects than we do in the comparison of our base run with the various CAFTA alternatives. In other words we are less confident in the growth or employment forecasts of our base run or CAFTA alternatives than we are in the difference between that base run and the CAFTA alternatives.

IV. The CAFTA simulations

The dynamic model we have described in the previous section is recursive. It solves the system of equations for all the endogenous variables for each period, and then updates those variables such as the capital stock, labor force, tariff rates which change over time, either because they are endogenous in the model, or because they are policy variables such as tariffs which change over time. In each of our simulations we run the model from its 1997 base, using the observed values for all exogenous variables up to 2005, and then

[10] / For this exercise we modified the transfers from the enterprises to the rest of the world in such way that they were eliminated by the year 2005 in all the scenarios including the "base".

inserting the changes introduced by CAFTA in 2005 and beyond. We ran each simulation out to 2020 and present the results in the form of growth rates of all the endogenous variables of interest from the 1997 initial values. In each of our tables we display the initial values for each variable and the annual average growth rate from 1997 to 2020. There are five simulations.

BASE: This is the projection of the economy without CAFTA. It is our best estimate of how the economy would grow in the absence of CAFTA, and therefore it is the counterfactual with which each of our CAFTA simulations should be compared.

CAFTA-tariffs: In this simulation we change all the sectoral tariffs according to the time patterns shown in table 4. Since these tariff changes vary across both time and sector, in this case it is useful to show explicitly the time path of the response to the changes, rather than just the twenty-three year average rate of growth.

MAQUILA- Textiles are an area of potentially large benefits but equally large and uncertain risks because of the expiration of the Multifiber Agreement in January 2005. In the past, (before 2000) in Central America maquila was almost entirely limited to the assembly of clothing from imported inputs. From 1984, with the passage of the Caribbean Basin Economic Recovery Act, the maquila industry was exempted from the world-wide quota system then in force. But its products were not exempt from U.S. tariffs until the Caribbean Basin Economic Recovery Expansion Act was passed by the US Congress in 1990. With the passage of NAFTA in 1994, this advantage was partially offset by the more generous treatment of Mexican producers with regards to rules of origin. The Caribbean Trade Promotion Act (CBTPA) passed in 2000 extended to the Central American countries the market access conditions for maquila granted to Mexico under NAFTA with similar liberalized restrictions on rules of origin. Imports of knitted or shaped apparel were permitted free of tariffs provided that the intermediate inputs from the yarn forward were produced in a CAFTA country.[11] This has had a major impact on production in Central America. But the CBTPA has a sunset provision. It will expire in 2008 unless CAFTA is implemented. What CAFTA does for textiles is to make permanent the liberalized rules of origin for inputs to the maquila industry granted temporarily under the CBTPA. To model the impact of these provisions of the CAFTA agreement, we keep the level of intermediate imports to the textile industry at the observed level of 1997 prior to the passage of the CBTPA. Then starting in 2005 we reduce these intermediate imports to the very low levels observed after 2000. This simulation then shows the positive effect of domestically producing a greater share of the intermediate inputs to the booming maquila industry.

QUOTAS- For imports into Honduras certain commodities of particular importance to the poor, either as consumers or producers, were given special treatment under CAFTA. Tariffs for these commodities were typically quite high prior to CAFTA, and the rate of tariff reduction under CAFTA in most cases will be slow as shown in table II.3. But CAFTA also established tariff-rate quotas (TRQs) in many of these commodities making possible faster liberalization that is apparent from the tariff category in which these

[11]/ Tee shirts and socks were subject to a maximum tariff-free import ceiling.

commodities were placed. These are the commodities in which CAFTA could have a significant effect in the short run since it permits tariff-free imports up to certain quantitative limit as soon as the treaty is implemented (or in the case of chicken legs, in year three). In addition the United States granted tariff free importation for quantities of certain commodities from Honduras. We now look at the most important of these commodities and then ask what the impact of the TRQs is likely to be in practice.

For Honduran quotas we are interested in the effect of the quota on domestic prices and producers. It is easy to show that quotas only have an effect on domestic prices and output levels if they are larger than the amount previously imported. (See Morley, 2006) If they are smaller, they are effectively a transfer of tariff revenue to the importer. In the Honduras case yellow corn is the only product where the initial quota is bigger than the level of imports. But there is no yellow corn production in Honduras. For pork and chicken legs the quota is approximately equal to the level of imports, but both are quite small relative to the level of production which means that if there is a price effect it must be small. Therefore in the quota simulation we will assume that these quotas have no effect on the domestic price of imports.

The other possible impact of the quota component of CAFTA is the favorable effect of liberalized quotas in the United States for certain Honduran exports. As in the import case, expanded quotas in the U.S. only affect the domestic price and production in Honduras for products for which the CAFTA quotas are larger than the current level of exports. That is the case for sugar, beef and some dairy products. The value of the additional quota is equal to the US tariff times the international price times the quantity of imports permitted into the US market tariff-free. In addition there is a change in the market clearing domestic price of these commodities where the size of the change depends on the size of the liberalized quota compared to the initial level of production. In fact, when one makes this comparison one finds that the change in the domestic price of these commodities is virtually zero[12]. We have therefore not reported simulations for the quota changes in the sections that follow.

FDI- It is relatively straightforward to model the impact of trade liberalization under CAFTA. But there are many additional items and agreements under CAFTA that have to do with the treatment of foreign direct investment. All are aimed at defining and protecting the rights of foreign investors with respect to the protection of intellectual property, and expropriation. For many observers these conditions are seen as excessively generous to foreign investors. It is beyond the scope of this paper to make a complete analysis of the net benefits or costs of these FDI provisions on the Honduran economy. Since no one has a very clear idea of just how much additional foreign direct investment Honduras can expect to receive under the new CAFTA legal conditions, as a first approximation we simply increased by 25% the observed level of FDI that came into Honduras between 2000 and 2004 and kept that same increase all the way to 2020. This gives rise to two effects. The first, and less important one is the simple balance of payments effect of an increased inflow of foreign resources. The second, and more important effect is on total capital formation. These inflows go to capital formation.

[12]/ See Morley (2006) for details.

Therefore in this simulation we change our saving-investment closure to insure that these inflows directly increase investment.

V. Results

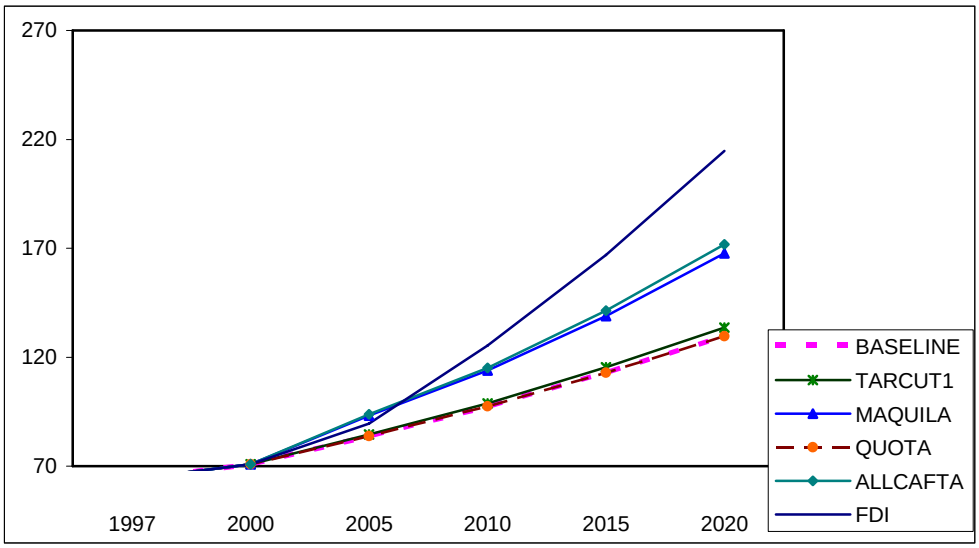
Our model projects that without CAFTA the Honduran economy would grow at a relatively slow rate of 3.06% per year from its 1997 base up to 2020, or at slightly lower rate between 2005 and 2020 because of big increases in the level of transfers between 1997 and 2005. The model reproduces quite well both the observed growth rate and fluctuations in the growth rate between 1997 and 2005 which gives us some confidence in the simulations of the effect of CAFTA. This low rate reflects three things; first the relative low rate of investment in the base year, second the low rate of growth of observed productivity in the recent past and third the treatment of maquila. We assumed no growth in productivity in any of the runs to be reported here. Lifting that assumption would have little effect on the comparisons between the base run and the CAFTA alternatives.

Maquila requires a further comment. In the usual case, one simulates the effect of a change from current conditions. The maquila case is different because the favorable treatment for inputs to maquila started in 2000, but would have expired in 2008 in the absence of CAFTA. Our baseline simulation is our best forecast of what the growth rate would be without maquila, while our maquila simulation is the forecast of growth where those temporary benefits to maquila are made permanent. Our forecast is that without maquila, growth in Honduras will fall to 3.06% per year whereas with the conversion of the temporary to permanent benefits for maquila the growth rate jumps to 4.5%. (See Table V.1)

In Figure V.1 we show various projections of real GDP at market prices starting in year 2000. The dashed line is the baseline showing our estimate of how Honduras will grow in the absence of CAFTA. The remaining lines show the effect of the CAFTA tariff cuts, the liberalization of rules of imports for maquila, and an increase in FDI.[13] As the reader can see other than FDI and maquila each of these effects is positive, but none of them is large, particularly tariff cuts and quotas. The tariff cuts for example while positive add less than 0.02% to the overall growth rate. Higher tariff free quotas for sugar, beef and dairy in the United States are like a small foreign exchange windfall to the economy. While that windfall is positive it does also tend to appreciate the exchange rate, discourage exports and encourage imports, both of which reduce the net positive impact of the quotas themselves.

[13]/ We do not show the quota line on the graph because the effect is so small that the line is indistinguishable from the baseline projection.

Figure V.1: Projections of real GDP



Source: author worksheets

These results confirm what we already should have expected. Past trade liberalization in Honduras reduced average tariffs to a level where the further reductions resulting from the CAFTA agreement simply are not large enough on average to have much of an impact. On sensitive products such as corn, beans and rice, either the tariff reductions permitted by CAFTA are not large, or they are spread out over a long period. In either case the net effect on the overall growth rate is small. This does not mean necessarily that the effect on particular sectors is not large, or at least larger as we shall see in a moment.

Table V.1 shows the rates of growth of the main macroeconomic aggregates in the different simulations assuming that government saving is fixed and that productivity growth continues to be zero[14]. The last column on the right shows the combined effect of all of the changes other than FDI while each of the other columns shows the separate effect of each of the changes. The table confirms what was already implied in figure V.1. Tariff reductions and liberalization of quotas both have positive effects on growth but the effects are very small. Trade liberalization does make the Honduran economy more open, increasing the rates of growth of both exports and imports, but the positive effect on the growth rate of GDP is small.

In contrast, the liberalized rules of origin for maquila do have a significant impact on the growth rate of the economy. CAFTA makes permanent the CBTPA rules of origin for the intermediate inputs for many lines of textile exports to the United States. In our

[14]/ We also ran a set of simulations where we dropped the assumption of fixed government saving. This change had very little impact on the results which means that even though the loss of government revenue from tariffs is significant in an accounting sense, whether or not that loss is offset by an increase in other taxes or a higher government deficit makes little difference in the overall growth rate or the sectoral composition of output.

simulation we made permanent the sharp reductions in imported inputs to the maquila sector that were observed in Honduras after 2000 when the CBTPA went into effect. This alone raises the level of output in 2020 by about 38% relative to what it would have been in the baseline simulation. Maquila alone brings the growth rate up from 3.06% to 4.5% per year. If one compares the All CAFTA column in the table with the maquila column, one sees that virtually the entire positive impact of CAFTA on the growth rate is due to maquila.

Table V.1: Rates of growth of macroeconomic aggregates is CAFTA simulations

	INITIAL VALUE 1997*	BASE	CAFTA	MAQUILA QUOTAS	ALL CAFTA	FDI	
		Annual Percentage growth rate (1997-2020)					
Absorption	74.10	3.35	3.47	4.62	3.35	4.72	5.35
Private Consumption	50.80	3.33	3.44	4.73	3.34	4.82	5.24
Fixed Investment	15.87	3.67	3.81	4.69	3.67	4.81	6.84
Government Consumption	5.42	3.42	3.58	4.39	3.43	4.54	
Exports	28.06	2.40	2.64	3.40	2.40	3.60	5.04
Imports	32.00	3.22	3.40	3.98	3.23	4.13	5.29
GDP (market price)	70.17	3.06	3.19	4.46	3.06	4.57	5.26

* in 1997 billion of lempiras.

Source: authors worksheets.

There are several further growth patterns that should be noted. First the rate of growth of domestic spending or absorption exceeds the growth rate of production in all the simulations which implies that an increasing share of domestic spending is supplied by imports in both the base line and all the CAFTA simulations Since the rate of growth of exports is less than the growth rate of the economy, this implies an increase in the trade deficit. This pattern is misleading. In the base year 1997 there was a very large negative transfer from Honduras enterprise to the rest of the world. This transfer was eliminated by 2005. In our simulation we adjusted the transfer account so that it followed the observed balance of payments data. That means that there is a very large positive change in the transfer account permitting a rapid increase in imports and a decline in exports up to 2005. After 2005, the trade deficit is assumed to be fixed in real terms. Since real income is rising, the trade deficit as a fraction of total income is falling. Using a 2005 base, exports grow at 4% and imports grow at only 2.6% in the base simulation. In fact, the rate of growth of exports exceeds that of both the economy and the rate of growth of imports after 2005 in all the simulations.

The impact of CAFTA on sectoral growth rates

The sectoral growth rates of trade and domestic production are displayed in table V.2. As the reader can see, trade liberalization under CAFTA increases exports, imports and production in both the primary and secondary sectors. The impacts are all small, but they are all positive. Thus, despite the fears of some that the rise in imports due to falling trade barriers would more than offset whatever expansion there was in exports, our results suggest that this will not happen.

The sectoral effects of maquila are more complex. Liberalized rules of origin on intermediate inputs in maquila cause a big reduction in imports to the textile industry. On balance one might have expected this to appreciate the exchange rate causing exports to

fall and imports to rise by enough to offset the reduction in textile imports. But that is not what happens. Instead there is a significant increase in national production, employment and demand which is large enough to require a depreciation of the exchange rate to induce more exports and choke off some of the demand for imports.[15] Effectively the economy becomes slightly more closed by import substitution in the textile industry and the increase in employment that this makes possible increases demand and output in all other sectors.

Table V.2: National Production and Trade

	INITIAL SHARE 1997*	BASE	CAFTA	MAQUILA	QUOTAS	ALL CAFTA	FDI
		Annual Percentage growth rate (1997-2020)					
Exports	100.00						
Agricultural sector	26.53	1.96	2.23	2.64	1.96	2.86	5.01
Primary sector	29.18	1.97	2.26	2.63	1.97	2.86	5.01
Minery	2.65	2.08	2.54	2.55	2.08	2.91	5.09
Secondary sector	47.91	2.60	2.86	3.76	2.60	3.98	5.24
Manufacturing sector	47.85	2.60	2.86	3.76	2.60	3.98	5.24
Food Industry	25.74	2.88	3.09	4.27	2.88	4.45	5.47
Imports	100.00						
Agricultural sector	9.59	3.39	3.65	4.66	3.39	4.91	5.45
Primary sector	20.22	3.16	3.40	4.28	3.16	4.50	5.43
Minery	10.62	2.94	3.16	3.91	2.94	4.11	5.42
Secondary sector	39.68	3.23	3.45	3.44	3.24	3.62	5.35
Manufacturing sector	39.44	3.23	3.44	3.43	3.24	3.61	5.35
Food Industry	0.00	3.57	3.64	4.64	3.58	4.71	5.61
Production	100.00						
Agricultural sector	43.18	3.26	3.37	4.57	3.26	4.66	5.39
Primary sector	43.21	3.26	3.37	4.57	3.26	4.66	5.39
Minery	0.03	2.29	2.59	2.90	2.29	3.10	5.17
Secondary sector	19.72	3.08	3.24	4.21	3.08	4.35	5.39
Manufacturing sector	13.19	2.88	3.05	4.04	2.88	4.18	5.23
Food Industry	4.88	3.14	3.30	4.43	3.14	4.57	5.51

* initial share of total exports, imports and production respectively.

Source: author worksheets.

In table V.3 we show the effect of the different CAFTA simulations on production by the disaggregated sector included in the CGE model. The full detail of exports, imports by sector in the different experiments is relegated to annex 1. This table helps to understand why the Honduran economy is relatively insensitive to CAFTA. Consider agriculture. CAFTA has a positive impact on exports and production of coffee, bananas and lumber but it has virtually no effect on the subsistence part of agriculture (that is the production of corn, beans, rice and other commodities produced by the poor). Since this subsistence sector comprises over 80% of total agricultural production in Honduras, the production of agriculture as a whole is insensitive to CAFTA. Similarly, maquila has a big positive effect on textiles, but the base period level of production in textiles is not big enough to give the entire manufacturing sector a big push forward.

The fact that the tariff reductions and TRQs granted by Honduras under CAFTA do not cause significant price reductions in the short run does not mean that domestic producers

[15]/ The import share rises from 40.7% in 2005 and 47.4% in 2020, and exports grow at 5.3% per year after 2005.

will be unaffected by the agreement in the long run. In the long run the level of protection for many important commodities will be eliminated. But the tariff reductions are gradual which will give farmers time to adjust and to become more competitive. What will be critical from a policy perspective is that this time is used wisely to increase productivity, switch to more profitable crops and take advantage of the new export opportunities opened up by CAFTA.

Table V.3: Production and annual percentage growth rates

	1997 shr	baseline	CAFTA	Maquila	Quotas	All Cafta	FDI
Sector		Annual Percentage growth rate					
Banana	0.71	1.30	1.72	1.77	1.30	2.13	4.14
Coffee	1.20	2.23	2.51	2.97	2.23	3.21	5.80
Mining	0.03	2.29	2.59	2.90	2.29	3.10	5.17
Livestock	0.91	3.21	3.35	4.74	3.22	4.84	5.40
non-trad. Ag	6.94	2.81	2.93	3.86	2.81	3.95	5.26
Subsist. Ag.	33.44	3.41	3.52	4.79	3.41	4.88	5.43
Food	4.88	3.14	3.30	4.43	3.14	4.57	5.51
Textiles	2.13	2.96	3.08	4.51	2.97	4.61	5.30
Paper	1.33	2.51	2.65	3.31	2.52	3.42	5.18
Cemicals	1.83	2.63	2.78	3.58	2.63	3.69	4.58
Metals	1.14	2.99	3.12	3.95	2.99	4.05	5.22
other mfg	1.88	2.50	2.85	3.33	2.50	3.63	5.04
elec,water,	1.72	2.93	3.10	4.09	2.93	4.23	5.16
Construction	4.81	3.63	3.78	4.68	3.63	4.81	5.87
Commerce	14.10	3.00	3.15	4.01	3.00	4.14	5.55
Hotels	2.94	2.76	2.92	4.57	2.77	4.67	5.08
Transport	4.53	2.94	3.15	3.76	2.94	3.93	5.62
Finance	3.08	2.87	3.00	3.76	2.87	3.87	5.11
Personal svc	1.19	3.01	3.14	3.97	3.01	4.09	5.20
government	4.77	2.97	3.07	3.71	2.97	3.79	5.34
other svc	6.46	3.02	3.13	3.91	3.02	4.01	5.37
TOTAL	100.00						

Source: authors worksheets.

Foreign Direct Investment

One of the main purposes of the CAFTA agreement was to attract more foreign direct investment to Central America by reducing or eliminating the risk of expropriation, or other unfavorable actions by national governments that specifically targeted foreign enterprises. These components of the agreement have elicited a good deal of unfavorable comment within Latin America because they appear to infringe on the sovereignty of host country governments. Our purpose here is not to enter into this dispute but rather to make a rough estimate of the effect on the economy of these components of the agreement, assuming that they in fact succeed in attracting more FDI. This exercise is somewhat different from what we have done so far, because we have no observable econometric basis on which to make an estimate of the response of foreign investors to the new CAFTA incentives for FDI. In our FDI simulation we assume an increase of

25% over the observed capital transfers to Honduras between 2000 and 2004. Furthermore, we made all this additional FDI a net addition to domestic capital formation. In other words here we have made the saving-investment closure investment driven.

Consider now what the FDI simulation tells us about the effect of additional inflows of foreign direct investment. Compare the FDI column in each of the tables with the base simulation. By assumption we are both increasing total saving and forcing more of it into investment. As a result the share of investment in GDP in 2020 rises to 31.9% compared to only 25.9% in the base run. That additional capital coupled with the additional employment it induces leads to dramatic increases in production in all sectors. Overall the growth rate of the economy jumps from 3% to 5.3% (See figure one). Instead of growing by 4% per year between 2005 and 2020, exports now grow at twice that rate (7.9%).

No one should take these results as a firm prediction of the likely effect of CAFTA on either FDI or growth. Rather it is a way of emphasizing the central importance of investment to future growth in Honduras under CAFTA. If the more favorable treatment of FDI really does bring in more foreign capital, and if that foreign capital is invested in new capital, this will have a dramatic positive effect on the development prospects of the Honduran economy.

CAFTA and domestic factor markets.

Consider next the impact of CAFTA on wages, employment and the rate of return to capital. The available data permit us to disaggregate labor by education, gender and type of employment (wage versus self employment). Unfortunately they do not permit a rural urban breakdown.[16] As noted above, we have assumed that there is an excess supply of labor, both male and female with less than ten years of education. That implies that we are assuming that the base period level of real wages for these types of labor is fixed. The simulations then determine the amount of employment of unskilled or semiskilled labor that is consistent with the supply of skilled labor and capital as well as the other macro constraints.

Table V.4 displays the changes in employment of unskilled and semi skilled labor by gender and labor type in our different simulations, while table V.5 shows what happens to relative wages. The numbers in the table are units of employment normalized by total payments to each category of labor in the base year.

[16]/ In a later paper we will combine information from a recent household survey with the results reported here to get an estimate of the impact of CAFTA on rural and urban incomes.

Table V.4: Employment by skill and gender

male unskilled and semiskilled wage labor						
	Baseline	TARCUT1	MAQUILA	QUOTA	ALLCAFTA	FDI
INITIAL	7.127	7.127	7.127	7.127	7.127	7.127
2000	7.711	7.711	7.711	7.711	7.711	7.852
2005	9.007	9.151	10.318	9.01	10.432	10.134
2010	10.423	10.682	12.592	10.427	12.831	13.707
2015	12.095	12.527	15.372	12.102	15.807	18.21
2020	13.925	14.551	18.612	13.935	19.293	23.399

self-employment of unskilled and semi-skilled male labor						
	Baseline	TARCUT1	MAQUILA	QUOTA	ALLCAFTA	FDI
INITIAL	25.624	25.624	25.624	25.624	25.624	25.624
2000	30.165	30.165	30.165	30.165	30.165	28.817
2005	36.87	37.218	43.09	36.889	43.354	37.357
2010	41.838	42.458	51.301	41.862	51.843	50.633
2015	47.771	48.849	61.601	47.807	62.663	67.237
2020	54.213	55.852	73.475	54.26	75.261	86.381

employment of female unskilled and semi-skilled wage labor						
	Baseline	TARCUT1	MAQUILA	QUOTA	ALLCAFTA	FDI
INITIAL	1.368	1.368	1.368	1.368	1.368	1.368
2000	1.458	1.458	1.458	1.458	1.458	1.461
2005	1.687	1.712	2.036	1.687	2.052	1.866
2010	1.966	2.012	2.535	1.966	2.576	2.585
2015	2.289	2.366	3.132	2.29	3.209	3.449
2020	2.642	2.754	3.834	2.644	3.957	4.453

self-employment of female unskilled and semi-skilled labor						
	Baseline	TARCUT1	MAQUILA	QUOTA	ALLCAFTA	FDI
INITIAL	3.856	3.856	3.856	3.856	3.856	3.856
2000	4.332	4.332	4.332	4.332	4.332	4.337
2005	5.154	5.232	6.146	5.156	6.204	5.726
2010	5.897	6.035	7.461	5.899	7.591	7.657
2015	6.762	6.989	9.017	6.766	9.252	10.052
2020	7.71	8.034	10.841	7.716	11.207	12.824

skilled labor-male						
	Baseline	TARCUT1	MAQUILA	QUOTA	ALLCAFTA	FDI
INITIAL	6.148	6.148	6.148	6.148	6.148	6.148
2000	6.482	6.482	6.482	6.482	6.482	6.553
2005	7.429	7.559	8.346	7.43	8.448	8.193
2010	8.629	8.852	10.156	8.632	10.351	11.112
2015	9.97	10.329	12.317	9.975	12.665	14.425
2020	11.399	11.911	14.747	11.406	15.28	18.126

skilled labor-female						
	Baseline	TARCUT1	MAQUILA	QUOTA	ALLCAFTA	FDI
INITIAL	1.812	1.812	1.812	1.812	1.812	1.812
2000	1.935	1.935	1.935	1.935	1.935	1.933
2005	2.229	2.255	2.502	2.23	2.521	2.436
2010	2.58	2.628	3.04	2.58	3.085	3.319
2015	2.971	3.054	3.664	2.973	3.747	4.322
2020	3.39	3.51	4.371	3.392	4.5	5.447

Note: These are normalized units of employment not numbers of jobs.
Source: authors worksheets.

Unskilled and semi-skilled labor in Honduras is concentrated in self-employment in small farms in the countryside and in the informal sector in the cities and towns. In the baseline simulation employment growth is slightly higher than the growth rate of the population (3% for male wage labor and 3.3% for the male self employed and slightly less than that for females in each category. By assumption there is an excess supply of unskilled labor willing to work at the constant real wage. Under those conditions the increase in the supply of capital permits a relatively rapid increase in the employment of the unskilled, particularly in the FDI simulation. In all the simulations the growth rate of employment is higher than the expected rate of growth in the supply of unskilled labor which implies that in the absence of CAFTA or some other policy change, the pool of unemployed unskilled labor should fall in Honduras.

As the reader can see, trade liberalization by itself (Tarcut1 column) has a positive effect but the total impact is small. That is consistent with the relatively small size of the production impacts under CAFTA. As before, what does make a difference is maquila. By 2020 maquila will create an additional 22 million units of employment for males and 4.3 million for woman raising the growth of employment for both sexes to around 4.5%. Increased FDI also has a very significant positive effect particularly for male wage labor. That is because of the strong link between investment and the construction sector which is a big employer of unskilled wage labor.

When one compares wage trajectories or wage differentials by skill category, our results suggest that there will be a slight rise in earnings inequality, with or without CAFTA. (See table V.5). The supply curve of skilled labor is projected to rise by 2% per year, somewhat less than the increase in the demand for skilled labor. As a result, real wages for the skilled rise in all of the simulations, including the baseline.[17] Since wages for the unskilled and semiskilled are fixed by the assumption of an excess supply of labor, there is a decline in the relative wage of the unskilled. In the baseline projection by 2020 the unskilled lose 12% relative to the skilled. Trade liberalization makes the wage pyramid for the employed slightly less equal. That is because it increases the growth rate of employment of the unskilled, and the wages of the skilled. CAFTA increases the earnings of both the skilled and the unskilled, but for the latter the improvements come in the form of more jobs at the same wage while for the former the improvement comes in the form of higher wages only.

The maquila and FDI simulations accentuate this picture. Both of them increase the growth rate of the economy by a significant amount, and as we can see, the faster the economy grows, the faster wages of the skilled grow relative to the unskilled. That increases earnings inequality. But at the same time there is a higher rate of growth of employment for the unskilled and semi-skilled of both sexes. The unskilled are better off

[17]/ For the maquila and FDI simulations we assumed that the rate of growth of working age skilled labor was 2.5% per year after 2010 to reflect increases in school attendance and higher levels of education in younger age cohorts. This makes the participation and unemployment rates consistent with the higher rates of growth of employment called for in these two simulations.

because more of them have jobs and the skilled are better off because all of them have higher real wages.

Table V.5: Relative Real Wages by skill for Honduras in the CGE scenarios

	initial	2000	2005	2010	2015	2020
Unskilled women						
baseline	1.000	1.000	1.000	1.000	1.000	1.000
tarcut1	1.000	1.000	1.000	1.000	1.000	1.000
maquila	1.000	1.000	1.000	1.000	1.000	1.000
all cafta	1.000	1.000	1.000	1.000	1.000	1.000
fdi	1.000	1.000	1.000	1.000	1.000	1.000
Skilled women						
baseline	1.000	1.009	1.037	1.070	1.102	1.132
tarcut1	1.000	1.009	1.040	1.074	1.109	1.141
maquila	1.000	1.009	1.061	1.104	1.149	1.192
all cafta	1.000	1.009	1.063	1.109	1.155	1.200
fdi	1.000	1.012	1.060	1.129	1.190	1.246
Unskilled men						
baseline	1.000	1.000	1.000	1.000	1.000	1.000
tarcut1	1.000	1.000	1.000	1.000	1.000	1.000
maquila	1.000	1.000	1.000	1.000	1.000	1.000
all cafta	1.000	1.000	1.000	1.000	1.000	1.000
fdi	1.000	1.000	1.000	1.000	1.000	1.000
Skilled men						
baseline	1.000	1.009	1.037	1.070	1.102	1.132
tarcut1	1.000	1.009	1.040	1.074	1.109	1.141
maquila	1.000	1.009	1.061	1.104	1.149	1.192
all cafta	1.000	1.009	1.063	1.109	1.155	1.200
fdi	1.000	1.009	1.053	1.123	1.183	1.239

Source: authors worksheets.

Capital

The growth of capital is central to understanding our projections of the likely effect of CAFTA on the economy. In table V.6 we show how the stock of capital is expected to grow over time and how the gross rate of return to capital changes in the different scenarios. In the baseline simulation investment starts at 22.6% of GDP and grows to 26% by 2020. As a result there is a slight capital deepening as well as a slight reduction in the rate of return. Trade liberalization (TARCUT1) slightly raises both the growth rate of capital and the rate of return. However, as the reader can see the time path of the rate of return is not linear. In all the simulations it peaks in 2005. After that the increased rate of capital formation drives the rate of return to capital back toward or below its initial level. Maquila has a big impact on the profitability of capital and its growth rate. Upon adoption of the liberalized rules of origin which we first incorporate in the model in 2005, the rate of return to capital jumps from 10% to 15%. From there to 2020 the rate of growth of capital increases to 4.5% per year. That is enough to bring the rate of teturn

back toward its initial level, but at much higher levels of employment for the unskilled and higher wages for the skilled.

The FDI simulation shows what happens when there is a really rapid rate of capital formation. Not only does the rate of growth of the economy increase, but there is an increase in the rate of capital deepening. Not surprisingly the rate of capital formation is so high that it drives down the rate of return to below its level in year 2000.

Table V.6: The Supply and Return to Capital

			supply of capital			
	initial	2000	2005	2010	2015	2020
baseline	158.88	165.951	190.374	229.282	272.740	319.541
tarcut1	158.88	165.951	190.374	230.238	275.570	325.316
maquila	158.88	165.951	190.374	240.576	301.310	370.903
all cafta	158.88	165.951	190.374	241.407	304.067	376.942
fdi	158.88	165.951	212.745	320.673	436.536	569.130
			rate of return to capital			
baseline	0.3	0.113	0.118	0.108	0.103	0.099
tarcut1	0.3	0.113	0.123	0.113	0.108	0.105
maquila	0.3	0.113	0.159	0.144	0.137	0.133
all cafta	0.3	0.113	0.163	0.149	0.143	0.138
fdi	0.3	0.122	0.126	0.097	0.092	0.088

Source: authors worksheets

Factor Shares

To better understand the distributional implications of CAFTA, it is useful to look at what happens to factor shares in our various experiments. We know that trade liberalization, maquila and FDI all increase the growth rate of the economy. We know also that the skilled get higher wages, capital a higher rate of return and the unskilled, more jobs. How does all this translate into shares of GDP. Table V.7 gives us the answers. In the baseline simulation, both skilled and unskilled labor gain relative to capital for which the fall in the rate of return exceeds the increase in capital intensity. In the short run, CAFTA benefits capital at the expense of both skilled and unskilled labor. In all the simulations in 2005 the capital share rises relative to the baseline, especially in maquila and FDI. But that is not the end of the story. We know that there is a big increase in capital formation too. That drives down the rate of return in all the simulations so that by 2020 the share of capital falls from its peak in 2005, and is in fact below its initial level in all of our experiments except maquila. [18] Thus while CAFTA favors capital in the short run, in the longer run (to 2020) trade liberalization favors skilled labor at the expense of capital, while maquila favors capital at the expense of unskilled labor which tells us that the rate of growth of employment of the unskilled, even though quite large, is not as rapid as the growth rate of the economy. In FDI the situation is reversed. Here the decline in the profit rate after 2005 and the increase in

[18]/ Note that the experiment called ALLCAFTA is dominated by maquila.

employment are so rapid that both skilled and unskilled labor gain at the expense of capital.

Table V.7: Factor Shares as percentage of GDP at factor cost

		initial	2000	2005	2010	2015	2020
unsk+semi-skilled labor	baseline	0.59	0.60	0.60	0.60	0.60	0.60
	TARCUT1	0.59	0.60	0.60	0.60	0.60	0.59
	MAQUILA	0.59	0.60	0.58	0.58	0.58	0.58
	QUOTA	0.59	0.60	0.60	0.60	0.60	0.60
	ALLCAFTA	0.59	0.60	0.57	0.58	0.57	0.57
	FDI	0.59	0.58	0.56	0.59	0.60	0.60
skilled labor	baseline	0.12	0.12	0.11	0.12	0.12	0.13
	TARCUT1	0.12	0.12	0.11	0.12	0.13	0.13
	MAQUILA	0.12	0.12	0.11	0.11	0.12	0.12
	QUOTA	0.12	0.12	0.11	0.12	0.12	0.13
	ALLCAFTA	0.12	0.12	0.11	0.12	0.12	0.12
	FDI	0.12	0.12	0.11	0.13	0.14	0.14
capital	baseline	0.28	0.29	0.28	0.28	0.27	0.27
	TARCUT1	0.28	0.29	0.29	0.28	0.28	0.28
	MAQUILA	0.28	0.29	0.31	0.30	0.30	0.30
	QUOTA	0.28	0.29	0.28	0.28	0.27	0.27
	ALLCAFTA	0.28	0.29	0.32	0.31	0.31	0.30
	FDI	0.28	0.31	0.32	0.28	0.27	0.26

Source: author worksheets

VI: CAFTA and growth dynamics in Honduras

Honduras has been stuck on a slow growth trajectory for many years. Our results suggest that CAFTA will not do much to change that unless it leads to a significant increase in capital accumulation. The trade liberalization measures contained in the agreement do have a positive effect on growth and employment, but the effect is small. Thanks to trade liberalization in the 1990s tariff barriers simply were not high enough prior to CAFTA to have a big growth impact when they are dismantled.

Consider now what these CGE results are telling us about growth dynamics and a growth strategy for Honduras. By construction we are treating Honduras as an economy constrained by the available supply of skilled labor and capital. The country can get higher levels of output and/or higher growth rates either by shifting factors of production to more productive uses, by employing more of the excess potential supply of unskilled labor or by raising the rate of capital accumulation or human capital formation. Except for the FDI scenario, we did not change the rate of capital accumulation. Our tariff cut scenario tells us that the impact of shifting scarce factors between sectors in response to changes in tariffs does not produce much additional growth That is either because the levels of protection prior to CAFTA were not large or because the allocation of capital and skilled labor was not too far from optimal to begin with. In a word, there is not too much to be gained by eliminating Harberger triangles.

Maquila is different. It shifts some of the total supply of human and physical capital to a sector with a relatively high demand for unskilled labor. That increases the growth rate even with a constant total supply of capital. That is because it puts more of the potential but unused supply of unskilled labor to work. Productivity-enhancing investments in agriculture might well do the same thing. Indeed any growth strategy which increased the demand for unskilled labor, holding constant the supply of complementary factors, would increase output and growth.

The FDI scenario reminds us how big an impact can be gotten by increasing the growth rate of capital in the economy. If foreign direct investment really does increase in response to CAFTA to the degree that we have assumed in our CAFTA experment, the impact on the Honduran economy will be dramatic. Economic growth and employment of the unskilled could both virtually double, and while this is undoubtedly an overly optimistic projection, it does point to the critical role of increasing the rate of capital formation and technical progress in the Honduran economy. From a growth perspective, the crucial problem for Honduras is to create condtions which will attract more capital, both domestic and foreign.

CAFTA improves the employment prospects for the unskilled. Our simulations assume an excess supply of unskilled labor. In all the CAFTA simulations job creation is positive, small in the case of trade liberalization but substantial for maquila and FDI. At the same time, since there is an increase in the demand for skilled labor, wage inequality increases. Thus CAFTA increases the earnings of both skilled and unskilled labor. The unskilled are better off because more of them have jobs, and the skilled are better off because all of them have higher real wages. We look more closely at the distributional implications of CAFTA in the next section.

In the short run, CAFTA benefits capital at the expense of both skilled and unskilled labor. In all the simulations in 2005 the capital share rises relative to the baseline, especially in maquila and FDI. But that is not the end of the story. It turns out that in the longer run, increases in capital formation drive down the rate of return, so that by 2020 the share of profits in GDP is below its initial level in all but the maquila experiments. In the long run trade liberalization favors skilled labor at the expense of capital, while maquila favors capital at the expense of unskilled labor. In FDI the decline in the profit rate after 2005 and the increase in employment of the unskilled is so rapid that both skilled and unskilled labor gain at the expense of capital

VII: The Impact of CAFTA on poverty and the distribution of income

Our dynamic CGE model gives an estimate of the effect that CAFTA will have on employment, production and income. The question is what implications those changes have for poverty and the distribution of income. To answer those questions we have to find a way to translate the labor market outcomes of the CGE into a distribution of income across households. The difficulty is that the CGE tells us about employment creation and wages for individuals, but for distributional and poverty purposes those

individuals must be treated as members of households. Thus if the CGE tells us that a certain number of additional jobs have been created, we need a way of deciding which formerly unemployed individuals will get those jobs, and which families they come from. Exactly the same sort of questions arises if we are interested in the effect of a change in the skill composition of the labor force. The CGE solution for example may tell us that there is an increase in the fraction of the labor force that is skilled. We then need some way of deciding which members of which families are upgraded.

We will follow here a microsimulation methodology developed by Vos and Paes de Barros[19]. In the procedure a household survey as close as possible to the base year of the CGE is used to get a base period distribution of the labor force across the households represented in the survey. Then in the first step the labor force is divided among the various skills represented in the CGE model, and rates of unemployment for each are calculated. Then random numbers are assigned to the group which will shrink in size and that group is ranked according to the random numbers. Thus for example if the model calls for an increase in employment, random numbers are assigned to the unemployed. Then the procedure moves down the ranked list of the unemployed until a sufficient number have been found to reach the amount of employment given by the CGE solution. Then, working with the new simulated labor force by type, one repeats the procedure to change the skill or sectoral composition of that labor force. At a final stage, the wage of the new labor force with the composition determined by the CGE solution is changed in accordance with the CGE solution. At this point the new labor force with the new wage structure is reassembled into the households from the base period survey and new levels of household income per capita as well as poverty and income distribution statistics are calculated.

Two things to note about this procedure. First the selection of individuals to move from one labor category to another is entirely random, not based on any behavioral model. This is not very satisfactory from a theoretical point of view. To remedy that defect the procedure is duplicated 50 or 100 times and the statistical results tabulated. That is intended to test the validity or sensitivity of the results to the particular choice of individuals who are moved from a contracting to an expanding group. We can then report not only the mean of the various trials, but also the standard errors and confidence intervals. In the Honduras case we repeated these simulations 100 times. The second thing to note is that the solution we are proposing is sequential. That is we start with unemployment and adjust it to get the new labor force determined by the CGE model, then change the sector and skill level of that new labor force and then finally the wage. That seems like the right order, but it is possible that the solution would be different if we had chosen a different sequence of changes.

Results

Table VII.1 gives an overview of the results of our microsimulations. We show various poverty and distribution statistics for the baseline and each of the four alternate scenarios reported in previous sections of this paper. We started from the 2004 base determined

[19]/ See their description of the method in Vos et al (2002).

by a household survey from that year, and then did the microsimulations for the years 2010, 2015 and 2020 of which only the first and last are reported in the table. The table reports average labor and per capita income, distribution statistics and the three FGT poverty measures for both extreme and moderate poverty where the two poverty lines are calculated by CEPAL on the basis of national household survey, adjusted by changes in the cost of living between 2002 and 2004.[20] Table VII.2 reports standard errors and confidence intervals for the key poverty and distribution statistics for each of the simulations for year 2020.

[20]/ For the urban sector the poverty and extreme poverty lines are equal to $88 and $42. For the rural sector the two lines are $55 and $28. All of these are relatively high lines by the standards of countries at Honduras level of development.

Table VII.1: Changes in poverty and distribution under CAFTA

	2004	2010					2020				
		baseline	tarcut1	maquila	allcafta	fdi	baseline	tarcut1	maquila	allcafta	fdi
National											
Labor income	3349.1	3402.9	3405.1	3406.4	3409.4	3431.6	3469.5	3477.4	3463.9	3470.4	3449.3
Theil - labor income	0.93	0.95	0.95	0.94	0.94	0.94	0.96	0.96	0.95	0.95	0.95
Gini - labor income	0.63	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
Per capita Hh income	1643.7	1715.1	1728.9	1811.8	1828.3	2065.2	1833.3	1880.9	2115.0	2165.0	2602.6
Poverty incidence	70.07%	68.79%	68.47%	66.16%	65.80%	59.76%	66.38%	65.33%	59.10%	57.99%	50.84%
Poverty gap	40.68%	39.35%	39.03%	36.83%	36.48%	30.99%	37.13%	36.08%	30.38%	29.48%	24.35%
Poverty severity	28.77%	27.60%	27.33%	25.40%	25.09%	20.47%	25.67%	24.76%	19.95%	19.25%	15.28%
Ext poverty incidence	45.27%	43.75%	43.37%	40.60%	40.20%	33.41%	40.90%	39.71%	32.62%	31.50%	25.46%
Ext poverty gap	23.81%	22.69%	22.42%	20.56%	20.26%	15.91%	20.83%	19.95%	15.41%	14.78%	11.29%
Ext poverty severity	16.08%	15.21%	15.00%	13.57%	13.35%	10.10%	13.79%	13.12%	9.75%	9.31%	6.85%
Theil - per capita HH income	1.03	1.03	1.02	0.99	0.99	0.93	1.02	1.01	0.94	0.93	1.02
Gini - per capita HH income	0.65	0.65	0.65	0.64	0.64	0.62	0.65	0.65	0.62	0.62	0.63
Rural											
Labor income	1879.3	1910.4	1915.3	1952.6	1959.9	2048.0	1957.3	1973.8	2061.5	2072.4	2129.4
Theil - labor income	1.01	1.00	1.00	0.98	0.98	0.94	0.99	0.99	0.94	0.94	0.91
Gini - labor income	0.64	0.64	0.64	0.64	0.64	0.63	0.64	0.64	0.63	0.63	0.63
Per capita Hh income	879.6	916.2	923.5	977.5	990.7	1142.0	980.5	1008.5	1170.1	1200.3	1467.8
Poverty incidence	79.54%	78.32%	78.03%	75.66%	75.15%	68.91%	75.88%	74.85%	68.06%	66.80%	59.20%
Poverty gap	50.20%	48.65%	48.34%	45.79%	45.21%	38.75%	46.01%	44.79%	37.85%	36.76%	30.65%
Poverty severity	37.02%	35.58%	35.29%	32.95%	32.44%	26.72%	33.15%	32.05%	25.93%	25.03%	20.03%
Ext poverty incidence	59.54%	57.76%	57.38%	54.16%	53.49%	45.26%	54.24%	52.87%	44.08%	42.70%	35.12%
Ext poverty gap	33.17%	31.69%	31.39%	28.99%	28.46%	22.74%	29.20%	28.06%	21.93%	21.07%	16.27%
Ext poverty severity	22.74%	21.56%	21.32%	19.44%	19.04%	14.67%	19.62%	18.73%	14.09%	13.46%	10.01%
Theil - per capita HH income	0.99	0.98	0.97	0.93	0.92	0.83	0.95	0.93	0.83	0.82	0.89
Gini - per capita HH income	0.63	0.63	0.63	0.62	0.62	0.59	0.62	0.62	0.59	0.59	0.59
Urban											
Labor income	4779.9	4847.5	4841.2	4793.3	4800.4	4732.0	4923.6	4915.6	4790.7	4791.5	4687.5
Theil - labor income	0.74	0.76	0.76	0.77	0.77	0.79	0.79	0.79	0.82	0.82	0.84
Gini - labor income	0.58	0.58	0.58	0.59	0.59	0.60	0.59	0.59	0.60	0.60	0.61
Per capita Hh income	2462.7	2571.4	2592.2	2706.1	2726.3	3054.8	2747.5	2816.2	3128.0	3199.1	3819.1
Poverty incidence	59.90%	58.55%	58.20%	55.96%	55.76%	49.93%	56.16%	55.10%	49.47%	48.53%	41.86%
Poverty gap	30.45%	29.36%	29.03%	27.20%	27.10%	22.66%	27.59%	26.72%	22.35%	21.66%	17.60%
Poverty severity	19.91%	19.03%	18.77%	17.29%	17.21%	13.76%	17.64%	16.93%	13.53%	13.03%	10.17%
Ext poverty incidence	29.94%	28.70%	28.31%	26.03%	25.93%	20.69%	26.57%	25.57%	20.30%	19.48%	15.08%
Ext poverty gap	13.76%	13.02%	12.79%	11.51%	11.44%	8.58%	11.84%	11.23%	8.41%	8.03%	5.94%
Ext poverty severity	8.93%	8.39%	8.21%	7.27%	7.23%	5.19%	7.54%	7.09%	5.09%	4.85%	3.47%
Theil - per capita HH income	0.88	0.88	0.87	0.85	0.86	0.82	0.88	0.87	0.83	0.83	0.92
Gini - per capita HH income	0.60	0.60	0.60	0.59	0.59	0.58	0.60	0.60	0.58	0.58	0.59

Source: Author worksheets

Table VII.2: Standard errors and confidence intervals for poverty and distribution estimates in 2020

	baseline-2020			tarcut1-2020			Maquila-2020			All Cafta-2020			FDI--2020		
	Mean	95% Conf Interval		Mean	95% Conf Interval		Mean	95% Conf Interval		Mean	95% Conf Interval		Mean	95% Conf Interval	
National															
Labor income	3469.5	3469.1	3469.8	3477.4	3477.1	3477.7	3463.9	3463.6	3464.2	3470.4	3470.1	3470.6	3449.3	3449.0	3449.5
Theil - labor income	0.963	0.963	0.963	0.963	0.963	0.963	0.954	0.954	0.954	0.954	0.954	0.954	0.947	0.947	0.947
Gini - labor income	0.640	0.640	0.640	0.641	0.641	0.641	0.639	0.639	0.639	0.640	0.640	0.640	0.638	0.638	0.638
Per capita Hh income	1833.3	1833.1	1833.4	1880.9	1880.8	1881.1	2115.0	2114.9	2115.2	2165.0	2164.8	2165.1	2602.6	2602.5	2602.8
Poverty incidence	66.38%	66.33%	66.42%	65.33%	65.29%	65.37%	59.10%	59.04%	59.15%	57.99%	57.93%	58.05%	50.84%	50.77%	50.91%
Poverty gap	37.13%	37.11%	37.15%	36.08%	36.05%	36.11%	30.38%	30.35%	30.41%	29.48%	29.44%	29.51%	24.35%	24.32%	24.39%
Poverty severity	25.67%	25.65%	25.70%	24.76%	24.73%	24.79%	19.95%	19.92%	19.99%	19.25%	19.22%	19.28%	15.28%	15.25%	15.30%
Ext poverty incidence	40.90%	40.85%	40.94%	39.71%	39.65%	39.76%	32.62%	32.55%	32.68%	31.50%	31.43%	31.58%	25.46%	25.39%	25.52%
Ext poverty gap	20.83%	20.80%	20.85%	19.95%	19.92%	19.98%	15.41%	15.37%	15.45%	14.78%	14.75%	14.82%	11.29%	11.26%	11.32%
Ext poverty severity	13.79%	13.77%	13.82%	13.12%	13.09%	13.15%	9.75%	9.71%	9.78%	9.31%	9.28%	9.34%	6.85%	6.83%	6.88%
Theil - per capita HH income	1.019	1.018	1.019	1.009	1.009	1.010	0.940	0.940	0.941	0.934	0.933	0.934	1.016	1.015	1.016
Gini - per capita HH income	0.648	0.648	0.648	0.645	0.645	0.645	0.625	0.625	0.625	0.623	0.623	0.623	0.628	0.628	0.628
Rural															
Labor income	1957.3	1954.7	1959.8	1973.8	1971.1	1976.5	2061.5	2058.7	2064.4	2072.4	2069.4	2075.4	2129.4	2125.8	2132.9
Theil - labor income	0.994	0.992	0.996	0.986	0.984	0.988	0.943	0.941	0.945	0.937	0.934	0.939	0.911	0.909	0.913
Gini - labor income	0.642	0.642	0.642	0.641	0.641	0.641	0.635	0.634	0.635	0.634	0.633	0.634	0.629	0.629	0.630
Per capita Hh income	980.5	979.5	981.6	1008.5	1007.4	1009.6	1170.1	1168.7	1171.5	1200.3	1198.7	1201.9	1467.8	1466.1	1469.6
Poverty incidence	75.88%	75.81%	75.96%	74.85%	74.80%	74.91%	68.06%	67.95%	68.16%	66.80%	66.68%	66.91%	59.20%	59.08%	59.33%
Poverty gap	46.01%	45.96%	46.06%	44.79%	44.74%	44.84%	37.85%	37.79%	37.92%	36.76%	36.69%	36.83%	30.65%	30.59%	30.70%
Poverty severity	33.15%	33.10%	33.20%	32.05%	32.00%	32.09%	25.93%	25.87%	26.00%	25.03%	24.97%	25.10%	20.03%	19.98%	20.08%
Ext poverty incidence	54.24%	54.16%	54.31%	52.87%	52.78%	52.96%	44.08%	43.98%	44.18%	42.70%	42.57%	42.83%	35.12%	35.01%	35.24%
Ext poverty gap	29.20%	29.14%	29.25%	28.06%	28.01%	28.12%	21.93%	21.86%	22.01%	21.07%	21.00%	21.14%	16.27%	16.21%	16.33%
Ext poverty severity	19.62%	19.57%	19.67%	18.73%	18.68%	18.78%	14.09%	14.02%	14.15%	13.46%	13.40%	13.51%	10.01%	9.96%	10.05%
Theil - per capita HH income	0.949	0.948	0.951	0.934	0.932	0.935	0.833	0.831	0.834	0.820	0.819	0.822	0.889	0.888	0.890
Gini - per capita HH income	0.622	0.622	0.622	0.618	0.617	0.618	0.589	0.589	0.590	0.586	0.585	0.586	0.587	0.586	0.587
Urban															
Labor income	4923.6	4921.1	4926.1	4915.6	4912.8	4918.4	4790.7	4787.8	4793.7	4791.5	4788.4	4794.6	4687.5	4684.0	4691.0
Theil - labor income	0.788	0.787	0.789	0.794	0.793	0.794	0.817	0.816	0.818	0.821	0.820	0.822	0.836	0.835	0.837
Gini - labor income	0.593	0.592	0.593	0.595	0.595	0.595	0.603	0.603	0.604	0.605	0.605	0.605	0.610	0.609	0.610
Per capita Hh income	2747.5	2746.4	2748.5	2816.2	2815.0	2817.3	3128.0	3126.4	3129.5	3199.1	3197.3	3200.8	3819.1	3817.3	3821.0
Poverty incidence	56.16%	56.11%	56.22%	55.10%	55.03%	55.16%	49.47%	49.39%	49.55%	48.53%	48.46%	48.61%	41.86%	41.76%	41.95%
Poverty gap	27.59%	27.56%	27.62%	26.72%	26.69%	26.75%	22.35%	22.30%	22.39%	21.66%	21.61%	21.70%	17.60%	17.55%	17.64%
Poverty severity	17.64%	17.61%	17.66%	16.93%	16.91%	16.96%	13.53%	13.49%	13.57%	13.03%	12.99%	13.07%	10.17%	10.14%	10.20%
Ext poverty incidence	26.57%	26.51%	26.63%	25.57%	25.51%	25.64%	20.30%	20.23%	20.38%	19.48%	19.39%	19.56%	15.08%	14.99%	15.16%
Ext poverty gap	11.84%	11.81%	11.87%	11.23%	11.20%	11.26%	8.41%	8.36%	8.45%	8.03%	7.99%	8.07%	5.94%	5.90%	5.97%
Ext poverty severity	7.54%	7.51%	7.56%	7.09%	7.06%	7.11%	5.09%	5.05%	5.12%	4.85%	4.82%	4.88%	3.47%	3.44%	3.49%
Theil - per capita HH income	0.878	0.877	0.879	0.872	0.871	0.872	0.828	0.828	0.829	0.825	0.824	0.826	0.921	0.920	0.921
Gini - per capita HH income	0.599	0.598	0.599	0.597	0.597	0.597	0.584	0.583	0.584	0.583	0.583	0.583	0.594	0.594	0.594

Source: Author worksheets

In the baseline scenario, without CAFTA, the model predicts that poverty will fall from 70% in 2004 to 66.4% in 2020, with slightly bigger percentage reductions in extreme poverty and the poverty gap, and slightly bigger improvements for the urban than for the rural poor. According to table VII-2 all of these changes are significant. Since according to the simulations per capita income is expected to rise by 0.7% per year, the implied poverty elasticity in this baseline scenario is only -0.5. Growth does help the poor, but not as much as it does in many other countries.

Because of the increase in relative wages for the skilled and the faster rate of growth in the urban sector, there is a slight increase in income inequality. The changes are small and they are largely confined to the urban sector.

Consider now the effect of CAFTA on poverty and inequality. To do that, compare the figures for 2020 for each of the CAFTA scenarios with those of the base line for that year. The most important result here is that according to the model, CAFTA unambiguously helps the poor, both rural and urban. Tariff cuts alone cut the national poverty incidence both rural and urban by roughly one percentage point. They also appear to reduce extreme poverty more in the rural than in the urban sector, with rural extreme poverty incidence falling by 1.5 percentage points compared to only 1 percentage point in the urban sector. All of these changes are statistically significant. (See table VII.2).

This result may seem surprising, particularly since protection in agriculture was reduced under CAFTA. The reason that the poor gain is that the growth rate of both employment and income is projected to be higher under CAFTA than it will be without it. And while it is true that protection for agriculture falls under CAFTA, there are two points to keep in mind. First the protection of sensitive products like corn, beans and rice is reduced very slowly. Second, the reductions in tariffs elsewhere permit expansions elsewhere that more than offset whatever negative effects CAFTA may have in particular subsectors.

Not only does the tariff reduction under CAFTA help the poor it also slightly improves the distribution of income. Compare the Theil coefficients in 2020 in the baseline and tariff cut scenarios. The Gini coefficient appears to be unchanged, but the Theil which gives more weight to the bottom of the distribution goes down by two points in the rural sector and one in the urban. Both changes are statistically significant. This is an important and somewhat surprising result. Recall that in the tariff cut scenario the rate of growth of skilled employment increases slightly over the baseline and so does the relative wage of the skilled. Those changes are small which is why the distribution of labor income is the same in both the baseline and tariff cut scenarios. At the household level the additional employment which adds the wage of formerly unemployed unskilled workers makes a sufficient difference at the bottom of the income pyramid to more than offset the absolute gains in employment and wages for the skilled.

The continuation of the special market access conditions for the maquila industry under CAFTA is even more favorable for the poor than the tariff reductions under CAFTA. Compare the MAQUILA column for 2020 in table VII.1 with either the baseline or

TARCUT. At the national level poverty falls by a remarkable seven percentage points relative to the baseline and six percentage points relative to tariff cuts. Even though the maquila industry is mainly an urban activity, poverty actually falls further in the rural sector than it does in the urban. The reason for that is that the additional employment and income generated in this sector increases the demand for agricultural commodities produced by the poor just as much as for things produced in the cities.

The progressive impact of this industry on the Honduran economy can also be seen in what happens to the distribution of household income in the maquila scenario. The distribution of labor income does not change very much because rising skill differentials for the skilled in the urban sector just about offset gains by the unskilled in the rural sector. But when we look at the change in distribution of family income, the picture is entirely different. There the additional income generated by job growth, particularly for the unskilled drives the national Gini down from 0.65 to 0.62 and the Theil, from 1.02 to 0.94, and both changes are statistically significant. And as one can by a closer look at the urban and rural distribution data, the favorable impact of maquila is actually greater in the rural sector than in the urban.

The reason for these favorable results is job creation, particularly for unskilled women. Employment growth overall in the maquila simulation rises from 2.7% in the baseline to 3.7%. For unskilled women the growth rate rises from 2.8% to 4.0%. This is the rare case of a growth and employment trajectory which is led by unskilled labor. It underlines the general point that the most effective way to reduce poverty is through job creation. If the leading sectors are themselves big employers of the unskilled, as maquila is, the result will be all the more favorable for the poor.

There is, however, a problem of perceptions with respect to maquila. CAFTA does not actually change current conditions for the domestic textile industry. Rather it makes permanent the liberalized rules of origin enjoyed by the industry since 2000. In the popular mind that may not seem like much of a benefit since the country already has it. But without CAFTA the temporary benefits granted in 2000 will expire. Our results say that if that happened, growth would fall by 1.4% per year and employment for unskilled and semiskilled labor would fall by 26% relative to what it can be expected to be with CAFTA[21]. Those are big effects, but one must keep in mind that they do not take into account possible changes in external conditions due to the end of the multifiber agreement in 2005.

The next scenario, ALLCAFTA applies the CAFTA tariff cuts and maquila market access conditions at the same time. The results are approximately equal to the sum of the two scenarios considered separately. Tariff cuts alone reduced poverty by about one percentage point relative to the baseline. Adding those same tariff cuts to maquila reduces poverty by about one percentage point relative to what was achieved under maquila alone. We see about the same favorable effect on the distribution statistics for

[21]/ This percentage is the difference between total employment for the unskilled and semiskilled male and female labor in 2020 in the maquila experiment compared to the baseline in 2020.

household income where the national Theil falls by one point relative to maquila just as it did relative to the baseline in the tarcut1 scenario.

The ALLCAFTA simulation is our best estimate of the effect that CAFTA is likely to have on poverty and the distribution of income.[22] If we compare the results of ALLCAFTA with those of MAQUILA, it is obvious that maquila is the part of the agreement that really makes a difference. Tariff cuts help. They are progressive and increase the rate of growth of employment slightly. Maquila is another story entirely. It generates a lot of employment, significantly reduces poverty levels both moderate and extreme in both the rural and urban sectors, and increases the overall growth rate of the economy. Of the total change in poverty in the ALLCAFTA simulation (8.4 percentage points) fully 87% comes from the MAQUILA component, and only 13% from tariff cuts. A lot of attention has been focused on the effect of CAFTA tariff cuts in agriculture. Our results indicate that this focus misses the main favorable impact of the agreement and that is making permanent the favorable market access conditions of the CBTPA.

The FDI simulation which we look at next underlines the key point we have just made about the central role of employment creation in poverty reduction. Recall that in the FDI simulation we ask what would happen if the CAFTA treatment of foreign direct investment did in fact result in an increased inflow of foreign funds that was linked to productive investments in the private sector. We repeat our earlier point that this simulation is purely speculative. We have no way of knowing whether or not foreign firms will reach favorably to CAFTA. Instead we are interested in examining what the implications would be if they did respond favorably.

To do that we assumed that FDI increased by 25% over the level of observed capital transfers to Honduras between 2000 and 2004. But the really important part of this simulation is the assumption that all this additional foreign exchange is channeled into productive investment. The results of this increase in capital formation are dramatic. In table VI-1 we see that per capita income in 2020 in the FDI run is fully 41% higher than the base run, and even 20% higher than in the ALLCAFTA simulation. Growth rises to 5.3% compared to 3.1% in our base run. All that additional growth and output mean more employment as well. With higher capital formation comes more employment with the total number of jobs now expanding at 5.8% per year, more than double the growth rate in the base run.

The results for poverty are as dramatic as those on employment and production. According to the table by 2020 the national poverty rate falls by seven points relative to the ALLCAFTA scenario and almost sixteen points compared to the baseline. Because this additional capital by assumption is available to all sectors, rural and urban, the benefits of FDI are seen in both the rural and the urban sectors, and for the extremely poor as well. This complements the point that we have made that employment creation is central element in sustainable poverty reduction. This simulation makes the additional

[22]/ The FDI simulation which we will examine next is far more speculative since it incorporates very uncertain reaction of foreign investors to changes in the treatment of intellectual property rights and legal protections for foreign investment.

point that the surest way to rapidly increase employment is through higher rates of capital formation. Indeed the rate of job creation in this simulation is so high that it is unclear that it is feasible.

While more FDI has a big positive impact on poverty, it also increases inequality. Partly that seems to result from increases in inequality in the urban sector that more than offset an increase in equality in the rural sector. Overall, the distribution of labor income is about constant, compared to the baseline scenario according to the Theil, and actually improves slightly using the Gini. In the rural sector the distribution of labor income is significantly more equitable in the FDI simulation than in the baseline, and just the opposite in the urban sector. These differences are accentuated by the profit component. The profit rate goes down in the FDI simulation, but that is more than offset by the very big increase in the total supply of capital and in the incomes of the holders of capital in the survey. This is particularly obvious if one compares the distributions of household income in the ALL CAFTA and the FDI simulations. In the all CAFTA simulation all the distribution statistics show rising equality reflecting higher employment growth led by the unskilled. In the FDI simulation the rate of employment growth is even higher and is led by the unskilled. But there is a big increase in inequality in the household distribution particularly at the national level even though the distribution of wage income in the rural sector is actually more equal in the FDI than in the ALL CAFTA according to the Theil. That has to reflect the influence of returns to capital.

Decomposing the changes in poverty and distribution: The changes in poverty and distribution that we displayed in table VII.1 for our different scenarios are the result of changes in employment, changes in the skill composition of the employed labor force and changes in relative wages. We can use our microsimulation methodology to get an idea of how important each of these changes is to the final observed changes that are shown in table VII.1.

The microsimulation procedure used in deriving the results displayed in Table VII.1 is a way of estimating the poverty and distributional impact of the changes in the labor market determined by a CGE equilibrium solution including changes in unemployment. Labor force structure or skill composition and relative wages. Since in the microsimulation we make these changes sequentially, one can make a "quasi" decomposition of the overall change in poverty or distribution according to poverty and distribution statistics calculated separately at each stage of the microsimulation. In other words we can ask what would the poverty or distribution level have been if the overall employment growth had been as it was in the CGE solution, but with labor force structure and relative wages held constant. We can repeat this same procedure at each step of the microsimulation and calculate the change in poverty and distribution resulting from the particular change in the labor market solution. We have done this and display the results in Table VII-2. We are calling this a "quasi decomposition" because one cannot build up to the final CGE solution in this way. The CGE was not asked to determine the rate of growth of total employment, holding labor force structure constant. If it had been, almost certainly the overall rate of growth of employment would have been lower than the one determined by the CGE. We can ask what the effect on poverty is of a change in total

employment, holding the labor force structure constant, but that is not a CGE solution nor is it a part of the CGE solution. Indeed the whole point of the CGE is that overall growth will almost certainly involve changes in labor force structure and relative wages. Having said this, it is still instructive to make this "quasi" decomposition to get an idea of which of the various changes in the labor market seem to have had the biggest impact on poverty and the distribution.

Table VII.3 shows three columns for each of our scenarios for the year 2020. The first, labeled E, gives the results coming from employment growth alone, holding both the skill composition and relative wages at their 2005 levels. It applies the rate of growth of total employment in each scenario to each category of labor. For example, in the baseline scenario, total employment grows at 2.7% per year between 2005 and 2020. That rate is applied to all the categories of labor used in the model. The microsimulation brings enough workers out of unemployment or inactivity to reach that rate, and then assigns them the average wage observed in the base year for that particular type of labor.

The second column, labeled S changes the skill composition of the employed labor force so that in 2020 the rate of growth by skill category and gender of the labor force is consistent with the CGE model solution for 2020. In this case the microsimulation brings enough workers out of unemployment or inactivity to reach the rate of growth of employment for each skill class generated by the CGE model for 2020. It assigns to each new workers the average wage by skill observed in the base year. Finally in the column labeled W we show the effect of changing relative wages by giving each of the workers in the S or skill level solution the wage shown in the CGE solution for 2020 rather than the one from the base year. The W columns for each scenario are identical to the columns for 2020 in Table VII.1.

There are three main points to be gleaned from Table VII.3. First, the growth in total employment is far and away the most important driver of poverty reduction in all of the scenarios. Second, employment in each of the growth strategies, even maquila, is led by skilled labor. Third, despite the rise in the wage differential in favor of the better educated, poverty incidence is lower when we incorporate the higher differential into household income. We now discuss the evidence supporting these conclusions and the implications.

Consider the employment effect first. To see how big a component of the total change in poverty it is, compare the change in poverty between 2004 and the column labeled E with the total change from 2004 in column W. For example for the tariff cut scenario we see that national poverty falls from 70.1% in 2004 to 66% in 2020 just from employment creation, holding skill structure and relative wages constant. When we allow both of those other factors to vary as well in column W, poverty falls an additional 0.7 percentage points to 65.3%. In other words out of the total change of 4.74 percentage points in poverty induced by CAFTA, 85% comes from employment growth alone. As the reader can see the same pattern is repeated in each of the other scenarios. The faster the economy grows, the more employment it creates and the more poverty reduction there is, even if that growth is skill-intensive as is the case in the FDI scenario.

All the growth strategies including the baseline generate a demand for skilled labor higher than unskilled labor. That is why in each scenario the poverty incidence in the column labeled S is higher than the one labeled E. Recall that by definition in the sequential microsimulation exercise, the E column tells us what poverty incidence would be if the structure of employment was unchanged from the base, and employment in each skill class grew at the average rate of growth of total employment generated by the CGE model. In the S column simulation we permit employment for different skill classes to grow at the rate determined by the CGE. At the national level in every case skilled labor force growth was higher than the average rate of growth of total employment, which meant that employment for the unskilled underlying column S is lower than in the E column. This is what makes the poverty rates slightly higher in S than in E. What is also interesting is that the degree of skill intensity appears to be slightly lower in the tariff cut scenario than in the base run. In the latter increasing skill intensity drives up poverty by 0.06% between E and S, whereas in the Tarcut1 microsimulation the increase in poverty is only 0.03%. That says that growth under the CAFTA-induced trade liberalization is less skill-intensive than it would have been in the absence of CAFTA. There are some rather curious divergences between the rural and urban sectors. In the base run rural poverty incidence rises quite a bit in response to more skill intensive growth. It rises by less in each of the other simulations, and in fact falls in both maquila and the all-cafta simulations which says that CAFTA increases the rate of growth of unskilled labor in the rural sector relative to what it would have been otherwise. The opposite is true in the urban sector. In both the base run and tarcut1 poverty is lower with the simulated change in skill-intensity and that is only reversed when we require much higher overall growth rates of employment in the maquila, all cafta and FDI simulations.

The third result to be taken from the table is that increasing the skill differential which we do in each of the W columns reduces the incidence of poverty. Furthermore, if one compares the FDI columns with any of the others, one sees that the faster the rise in the wage differential and the bigger the employment creation for the skilled, the bigger the reduction in poverty. This is a surprising result. Recall that in our model real wages for the unskilled are constant whereas employment and wages are endogenously determined for skilled labor. The faster the rate of growth in the demand for the skilled, the bigger the wage differential will be. The difference between columns E and S is the isolated effect of the wage changes coming from the CGE since employment growth by skill is the same in both columns. What this means is that there must be many poor households with educated members who are either unemployed or out of the labor force in the base year 2004. Putting them to work even at the base period wage is one of the reasons that the poverty rate falls from 2004 to the E column of each of the simulations. When, in addition to the additional employment we add on the rise in the relative wage, we reduce poverty even more. So in the base run for example, at the national level the additional employment of skilled and unskilled labor (column S) reduces the poverty rate from 70.1% to 67%. Since we are assuming a constant real wage for the unskilled, the only change between columns S and W is that in W we increase the relative wage of the skilled by 12% relative to its base level. And that reduces poverty from 67% to 66.4%. One sees the same result in each of the other simulations, and for both the rural and the

urban sectors. Rising skill intensity and rising skill differentials obviously help richer households. The distribution of labor income becomes less equal. But our results say that they help the poor as well.

Table VII-3: Decomposition of CAFTA effects in 2020

		baseline			Tarcut1			maquila			allcafta			FDI		
	2004	E	S	W	E	S	W	E	S	W	E	S	W	E	S	W
National																
Labor income	3349.1	3358.9	3376.2	3469.5	3357.2	3378.8	3477.4	3341.1	3344.2	3463.9	3341.4	3345.6	3470.4	3315.6	3291.1	3449.3
Theil - labor income	0.93	0.93	0.93	0.96	0.92	0.93	0.96	0.91	0.91	0.95	0.91	0.91	0.95	0.89	0.89	0.95
Gini - labor income	0.63	0.63	0.63	0.64	0.63	0.63	0.64	0.63	0.63	0.64	0.63	0.63	0.64	0.63	0.62	0.64
Per capita Hh income	1643.7	1751.5	1756.2	1833.3	1783.0	1790.6	1880.9	1971.8	1972.6	2115.0	2006.8	2007.6	2165.0	2142.9	2129.4	2602.6
Poverty incidence	70.07%	66.95%	67.01%	66.38%	66.02%	66.05%	65.33%	60.08%	60.13%	59.10%	58.93%	59.07%	57.99%	54.44%	54.48%	50.84%
Poverty gap	40.68%	37.45%	37.55%	37.13%	36.49%	36.59%	36.08%	31.03%	31.08%	30.38%	30.12%	30.24%	29.48%	26.46%	26.45%	24.35%
Poverty severity	28.77%	25.91%	26.01%	25.67%	25.04%	25.16%	24.76%	20.43%	20.48%	19.95%	19.71%	19.81%	19.25%	16.80%	16.77%	15.28%
Ext poverty incidence	45.27%	41.31%	41.43%	40.90%	40.15%	40.29%	39.71%	33.43%	33.49%	32.62%	32.29%	32.46%	31.50%	27.88%	27.85%	25.46%
Ext poverty gap	23.81%	21.02%	21.13%	20.83%	20.17%	20.30%	19.95%	15.82%	15.87%	15.41%	15.17%	15.27%	14.78%	12.55%	12.51%	11.29%
Ext poverty severity	16.08%	13.93%	14.01%	13.79%	13.25%	13.37%	13.12%	10.02%	10.06%	9.75%	9.56%	9.64%	9.31%	7.70%	7.66%	6.85%
Theil - per capita HH income	1.03	0.98	0.98	1.02	0.96	0.96	1.01	0.87	0.87	0.94	0.86	0.86	0.93	0.80	0.79	1.02
Gini - per capita HH income	0.65	0.64	0.64	0.65	0.63	0.64	0.65	0.61	0.61	0.62	0.61	0.61	0.62	0.59	0.59	0.63
Rural																
Labor income	1879.3	1945.0	1942.9	1957.3	1957.9	1958.7	1973.8	2045.6	2043.3	2061.5	2054.7	2053.6	2072.4	2107.8	2105.4	2129.4
Theil - labor income	1.01	0.98	0.98	0.99	0.97	0.97	0.99	0.93	0.93	0.94	0.92	0.92	0.94	0.89	0.89	0.91
Gini - labor income	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Per capita Hh income	879.6	955.6	953.2	980.5	975.8	975.3	1008.5	1115.4	1115.2	1170.1	1137.1	1138.9	1200.3	1247.5	1246.1	1467.8
Poverty incidence	79.54%	76.14%	76.29%	75.88%	75.22%	75.31%	74.85%	68.81%	68.78%	68.06%	67.61%	67.58%	66.80%	62.45%	62.51%	59.20%
Poverty gap	50.20%	46.24%	46.41%	46.01%	45.21%	45.28%	44.79%	38.58%	38.56%	37.85%	37.53%	37.53%	36.76%	32.89%	32.92%	30.65%
Poverty severity	37.02%	33.36%	33.52%	33.15%	32.39%	32.48%	32.05%	26.55%	26.53%	25.93%	25.67%	25.68%	25.03%	21.82%	21.83%	20.03%
Ext poverty incidence	59.54%	54.67%	54.82%	54.24%	53.46%	53.49%	52.87%	45.10%	45.07%	44.08%	43.74%	43.82%	42.70%	37.95%	38.06%	35.12%
Ext poverty gap	33.17%	29.40%	29.56%	29.20%	28.40%	28.50%	28.06%	22.54%	22.52%	21.93%	21.69%	21.70%	21.07%	17.97%	17.97%	16.27%
Ext poverty severity	22.74%	19.77%	19.91%	19.62%	18.96%	19.08%	18.73%	14.54%	14.52%	14.09%	13.91%	13.92%	13.46%	11.21%	11.18%	10.01%
Theil - per capita HH income	0.99	0.91	0.92	0.95	0.89	0.90	0.93	0.78	0.78	0.83	0.76	0.76	0.82	0.69	0.69	0.89
Gini - per capita HH income	0.63	0.62	0.62	0.62	0.61	0.61	0.62	0.58	0.58	0.59	0.57	0.58	0.59	0.55	0.55	0.59
Urban																
Labor income	4779.9	4720.3	4754.5	4923.6	4696.5	4737.1	4915.6	4564.0	4575.0	4790.7	4549.8	4566.7	4791.5	4448.0	4403.5	4687.5
Theil - labor income	0.74	0.75	0.75	0.79	0.76	0.76	0.79	0.77	0.77	0.82	0.77	0.77	0.82	0.77	0.77	0.84
Gini - labor income	0.58	0.58	0.58	0.59	0.58	0.58	0.59	0.59	0.59	0.60	0.59	0.59	0.60	0.59	0.59	0.61
Per c					2648.3	2664.5	2816.2	2889.8	2891.6	3128.0	2939.0	2938.9	3199.1	3102.7	3076.3	3819.1
Pove					56.14%	56.10%	55.10%	50.70%	50.84%	49.47%	49.60%	49.93%	48.53%	45.85%	45.86%	41.86%
Pove					27.13%	27.25%	26.72%	22.92%	23.05%	22.35%	22.17%	22.41%	21.66%	19.55%	19.49%	17.60%
Poverty severity	19.91%	17.90%	17.94%	17.64%	17.15%	17.29%	16.93%	13.86%	13.98%	13.53%	13.31%	13.51%	13.03%	11.41%	11.33%	10.17%
Ext poverty incidence	29.94%	26.96%	27.05%	26.57%	25.87%	26.10%	25.57%	20.89%	21.06%	20.30%	19.99%	20.26%	19.48%	17.07%	16.89%	15.08%
Ext poverty gap	13.76%	12.02%	12.07%	11.84%	11.34%	11.49%	11.23%	8.60%	8.72%	8.41%	8.18%	8.36%	8.03%	6.73%	6.64%	5.94%
Ext poverty severity	8.93%	7.65%	7.67%	7.54%	7.11%	7.24%	7.09%	5.16%	5.26%	5.09%	4.89%	5.04%	4.85%	3.94%	3.88%	3.47%
Theil - per capita HH income	0.88	0.84	0.84	0.88	0.83	0.83	0.87	0.76	0.76	0.83	0.75	0.76	0.83	0.71	0.71	0.92
Gini - per capita HH income	0.60	0.59	0.59	0.60	0.58	0.59	0.60	0.57	0.57	0.58	0.56	0.56	0.58	0.55	0.55	0.59

E is employment, holding labor force structure and relative wages constant. S is the effect of changing skill composition of the labor force, holding relative wages constant, W is the effect of changing both overall growth rate, skill compostion and relative wages.

Source: Authors' worksheets

VIII: Conclusions

In order to calculate the impact of CAFTA, we built a dynamic CGE model with which to compare to trajectory of employment and output with and without CAFTA. This comparison shows that the impact of the trade liberalization under CAFTA will be small but positive. Even with constant rates of capital formation it unambiguously increases the amount of employment for the unskilled and helps the poor in both the rural and urban sectors. At the same time in all the alternative CAFTA scenarios the relative wage for the skilled rises. Yet poverty declines, and in spite of the rise in the wage differential, the distribution of household income actually improves slightly because so many of the new workers in the CAFTA scenarios come from poor families.

Critics of CAFTA have complained that smallholders would be hurt by the removel of tariff protection for sensitive products such as corn, rice, beans and pork that are produced and consumed by the poor. Our results do not support this view. Both agriculture in general and subsistence agriculture in particular grow faster under CAFTA that they could be expected to otherwise. The increases in the growth rate are not large, but they are positive. Partly that is because tariffs for many sensitive products will be reduced very slowly or not at all and partly it is because the rise of employment in other sectors more than compensates for any loss of employment in the sensitive sectors themselves.

In spite of the importance of agriculture in the Honduran economy, it appears that the CAFTA provisions regarding the maquila sector are actually more significant for poverty, employment and growth. Making permanent the liberalized ruls of origin of the CBTPA treaty increases the annual rate of growth of GDP by 1.3% and employment growth by 1.4% relative to what they would have been had CAFTA not been approved. That has a dramatic impact on poverty and the distribution of household income because so many of the new workers are unskilled women from poor families. We estimate that maquila lowers the poverty rate in 2020 by six percentage points and the Gini Coefficient by three percentage points relative to the tax cut scenario. All of these results underline the critical importance of job creation in increasing the growth rate of the economy and lowering its poverty rate. However, because of the fact that the maquila benefits under CAFTA are not a change from current treatment, but rather a conversion from a temporary to a permanent benefit, the approval of CAFTA will not raise the growth rate of the economy by 1.3% relative to its current growth trajectory. Rather, without CAFTA, we project that the economy would grow by 1.3% less than it will with the maquila benefits of the CBTPA made permanent.

The key to growth and poverty reduction in Honduras is finding a way to create more jobs , particularly for the unskilled. Maquila is one way to do this. It changes skill intensity in the economy in a very progressive way without increasing overall capital requirements. But CAFTA needs to be complemented by policies that stimulate more capital formation as well. Higher rates of capital formation as demonstrated in our FDI scenario have a very large and very positive impact on growth, employment and poverty. Unfortunately, there is no assurance that the CAFTA conditions on foreign investment

will actually lead to the higher rates of investment that we used in our simulation. CAFTA is not a magic bullet. By itself it will not solve Honduras problem of poverty and slow growth. For that complementary policies that make agriculture more productive and/or that stimulate higher rates of capital formation are needed.

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Annex 1

Table A-1 Growth rates of trade by sector

	INITIAL SHA	BASE	CAFTA	MAQUILA	QUOTAS	ALL CAFT	FDI
	1997*	Annual Percentage growth rate (1997-2020)					
EXPORTS							
Banana	7.71	1.01	1.49	1.38	1.01	1.80	4.02
Coffee	7.08	2.01	2.33	2.68	2.01	2.95	5.69
Mining	2.65	2.08	2.54	2.55	2.08	2.91	5.09
Livestock	0.40	2.92	3.12	4.93	2.92	5.08	5.35
non-trad. A	11.28	2.45	2.58	3.21	2.45	3.32	5.14
Subsist. Ag	0.06	3.02	3.17	4.57	3.02	4.69	5.28
Food	25.74	2.88	3.09	4.27	2.88	4.45	5.47
Textiles	5.26	2.19	2.34	3.31	2.19	3.43	5.16
Paper	2.64	2.30	2.48	2.95	2.30	3.09	5.15
Cemicals	1.20	2.25	2.45	3.11	2.25	3.27	4.29
Metals	0.44	2.70	2.91	3.50	2.70	3.68	5.09
other mfg	12.57	2.23	2.71	3.00	2.24	3.41	4.89
elec,water,	0.06	2.67	2.83	3.40	2.67	3.53	5.14
Hotels	8.09	2.50	2.68	4.60	2.50	4.71	5.03
Transport	4.82	2.69	2.95	3.29	2.69	3.51	5.54
Finance	1.00	2.43	2.52	3.00	2.44	3.07	4.85
governmer	5.33	2.60	2.70	3.11	2.60	3.19	5.17
other svc	3.67	2.74	2.84	3.47	2.74	3.55	5.33
TOTAL	100.00						
IMPORTS							
Banana	0.03	3.37	3.62	4.37	3.37	4.62	5.08
Coffee	0.00	3.94	4.21	5.14	3.94	5.42	6.69
Mining	10.62	2.94	3.16	3.91	2.94	4.11	5.42
Livestock	4.73	3.42	3.68	4.51	3.43	4.75	5.44
non-trad. A	4.82	3.36	3.63	4.80	3.36	5.06	5.46
Subsist. Ag	0.01	3.55	3.71	4.66	3.56	4.81	5.45
Food	0.00	3.57	3.64	4.64	3.58	4.71	5.61
Textiles	6.46	3.39	3.65	-24.56	3.40	-24.37	5.43
Paper	3.54	2.87	3.12	3.92	2.88	4.13	5.25
Cemicals	7.58	3.04	3.30	4.08	3.05	4.30	4.9
Metals	6.35	3.26	3.48	4.37	3.27	4.56	5.36
other mfg	15.51	3.32	3.48	4.32	3.32	4.47	5.53
elec,water,	0.15	3.17	3.52	4.73	3.17	5.05	5.17
Constructio	0.08	3.76	3.99	4.92	3.76	5.14	5.65
Hotels	2.27	3.41	3.51	4.47	3.42	4.56	5.2
Transport	11.95	3.34	3.46	4.47	3.34	4.58	5.74
Finance	2.00	3.38	3.56	4.65	3.39	4.80	5.41
Personal s	1.65	3.37	3.49	4.42	3.38	4.52	5.47
governmer	0.25	3.65	3.76	4.75	3.65	4.85	5.66
other svc	21.98	3.38	3.50	4.49	3.39	4.60	5.41
TOTAL	100.00						

Source: authors worksheets.

Annex 2: Documentation of the Social Accounting Matrix and household survey for Honduras and Technical Description of the Recursive Dynamic CGE.

The Social Accounting Matrix for 1997[23].

As noted in the paper, the Social Accounting Matrix (SAM) used in this study is based on the 1997 SAM developed by Jose Cuesta and described in Cuesta (2005). This SAM distinguishes between accounts for "activities" (the entities that carry out production) and "commodities" (markets for goods and services). The receipts are valued at producer prices in the activity accounts and at market prices in the commodity accounts (i.e. including indirect commodity taxes and transaction costs). Activity outputs are either exported or sold domestically, while commodities comprise of domestic supply and imports. This separation of activities from commodities is preferred because it permits activities to produce multiple commodities (for example, a dairy activity may produce cheese and milk that are delivered into different commodity markets) while any commodity may be produced by multiple activities (for example, different activities for small scale and large-scale maize production may both produce the same maize commodity).

Second, the matrix explicitly associates trade flows with transactions (trade and transportation) costs, also referred to as marketing margins. For each commodity, the SAM accounts for the transaction costs associated with domestic, import, and export marketing. For domestic marketing of domestic output, the marketing margin represents the cost of moving the commodity from the producer to the domestic market. For imports, it represents the cost of moving the commodity from the border (adding to the c.i.f. price) to the domestic market, while for exports; it shows the cost of moving the commodity from the producer to the border (reducing the price received by producers relative to the f.o.b. price).

Third, the government is disaggregated into a core government account and different tax collection accounts, one for each tax type. This disaggregation is often necessary because the economic interpretation of some payments may otherwise be ambiguous. In any given

[23] / This section was taken from Cuesta (2005).

application, the SAM may exclude any (or all) of these specific tax collection accounts. In the SAM, payments between the government and the other domestic institutions represent government transfers.

Fourth, the domestic non-government institutions in the SAM consist of households and enterprises. The enterprises earn factor incomes (reflecting their ownership of capital and/or land) and may also receive transfers from other institutions. Enterprises pay corporate (direct) taxes, save, and transfer profits to other institutions. Assuming that the relevant data are available, it is preferable to have one or more accounts for enterprises when these have tax obligations and savings behavior that are independent of and different from the household sector. Enterprises should be disaggregated in a manner that captures differences across various enterprise types in terms of tax rates, savings rates, and the shares of retained earnings that are received by different household types.

Finally, the SAM distinguishes between own home consumption, which is activity-based, and marketed consumption, which is commodity-based. Home consumption, which in the SAM appears as household payments to activities, is valued at producer prices. Household consumption of marketed commodities appears as payments from household accounts to commodity accounts, the values of which include marketing margins and commodity taxes.

The 1997 macro SAM for Honduras uses as data sources the National Accounts by the Central Bank; information on capital flows from the Ministry of Finance; data on labor behavior, and on income and expenditure from the EPH and ENIGH household surveys, respectively. Final household consumption, private investment, public investment, government recurrent and investment expenditures, value added, remittances, net capital inflows, interest payments, and (other) factor payment abroad all come from the National Accounts and Balance of Payments. Exports (at f.o.b.), imports (at c.i.f.), government savings, and all categories of taxes come from the Ministry of Finance statistical sourcebook. The proportion of self consumption on total household consumption is estimated at 12.6% from the ENIGH 1997 household survey. The distribution of value added between households and firms results from initially pro-rating total value added

with a 60%-40% thumb-rule for labor and capital, respectively. Government transfers to firms include net public transfers to public enterprises providing electrical, water, sanitation, telephone and forestry related services.

Government transfers to households include subsidy schemes to public transportation, residential electricity consumption, family allowances (*PRAF* subsidy), schooling grants and scholarships, among others. Transactions costs are estimated assuming a 15% share of the gross domestic supply, exports and imports, respectively. This estimated share is in line with estimated margin costs in the transportation of food, agricultural products and manufactures reported by Gehlhar (1998) as part of the GTAP[24] worldwide project. The net domestic supply entry is estimated as the difference between gross domestic output, exports, households' self consumption and transaction costs. Government investment deficit is the residual that balances out the total government recurrent column while intermediate demand is the entry that allows the gross output total to balance out. Categories of taxes are aggregated into two indirect taxes (one on production, the other on sales), tariffs, export taxes, export subsidies, and direct income taxes.

Activities and commodities are disaggregated in twenty four categories. Each activity is the only producer of its respective commodity. Agriculture is disaggregated into subsistence products (mainly, grains), traditional, and non traditional exports. Traditional agriculture exports further separate banana, coffee, and sugar, which in addition to non-agricultural traditional exports (i.e., forestry, livestock and mining) constitute the most relevant traditional exports in Honduras. As for manufactures, textile – mainly in the form of maquila production- can be singled out from paper, chemical and other manufactures. Given its importance on consumption, and ultimately, on poverty, the category of food, beverages and tobacco manufactures is also accounted separately from other manufactures.

[24] / The University of Purdue's Center for Global Trade Analysis conducts the Global Trade Analysis Project, which provides among other things information on the composition of domestic production and trade for a large set of commodities and countries in the world.

Public and private services are initially separated as well. Government services aggregate defense, administration, and social security into a single category. Private services are disaggregated into hospitality; transportation; financial; personal, social and community services; and other services. Interestingly, other services refer mainly to housing services, thus distinguishing them from financial services. This is a practice followed by the National Accounts themselves, and avoids a misleading perception that a joint financial and housing sector dominates the Honduran economy. Electricity, gas and water provision constitute another independent activity. Oil, commerce and construction are also considered as three individual activities. As a result, activities and commodities are disaggregated in the following categories: banana, coffee, sugar, mining, livestock, forestry, non-traditional exports, subsistence agriculture, oil; food, beverages and tobacco manufactures, textiles manufactures, paper manufactures, chemical manufactures, metal, mineral and machinery manufactures, other manufactures; electricity, gas and water; construction; commerce; hotel and restaurant services, transportation services, financial services, personal, social and community services, and government services.

The intermediate demand total is disaggregated by commodities and activities using a special tabulation provided by the Central Bank of Honduras. This tabulation provides the proportion of commodities that a given activity requires for its normal production. The disaggregation of commodities and activities for the 1997 micro SAM follows the same categorization of the system provided by the Central Bank except for a minor aggregation of formal and informal commerce into a single category. As for the disaggregation of domestic supply, the available information on the value added of each activity is added to its estimated intermediate demand to come up with a gross domestic supply per activity.

Sectors and sub-sectors		Description
1. Agriculture, Mining, Fishing and Livestocks		
1.a) Traditional exports	BAN_A	Banana
	COF_A	Coffee
	SUG_A	Sugar
	MIN_A	Mining

	LIV_A	Livestock
	WOO_A	Wood
1.b) Non traditional exports	NTA_A	Non traditional exports
1.c) Subsistence agricultural	SUB_A	Subsistence agricultural products
1.d) Oil and derivatives	OIL_A	Oil
2. Manufactures	ALI_A	Food, beverage and tobacco manufactures
	TEX_A	Textile manufactures
	PAP_A	Paper manufactures
	CHE_A	Chemical manufactures
	MET_A	Metal, mineral and machinery manufactures
	OMA_A	Other manufactures
3. Construction	CON_A	Construction
4. Commerce	COM_A	Commerce
5. Services	HOT_A	Hotel and restaurants
	TPT_A	Transport, storage and communication
	FIN_A	Financial and insurance services
	PER_A	Personal, social and community services
	GOV_A	Government services
	OTH_A	Other services (real estate services)

Source: Cuesta 2005.

The factorial classification in the 1997 micro SAM distinguishes two production factors, that is, labor and capital. The capital factor also includes land, given that estimating stocks and value added for land from existing EPH household surveys is a completely unreliable possibility. Labor factors are disaggregated into statistically meaningful categories as much as data permit. Labor is separated according to skill, occupation (between wage earners vs. self employed) and gender. An intermediate skill (5-9 schooling years) category is differentiated from low (0-4) and high (10 or more) skill levels. This distinction between unskilled and intermediate skilled or labor by gender could be useful in future policy simulations but it played no part in the simulations reported in the paper since we set the wages of the two labor categories for the two genders equal and assumed an excess supply of both factors. The combination of skill,

occupation and gender categories results in twelve labor factor types. Wage earners are defined as those receiving wages and salaries as their primary source of (labor) income. The remaining category brings together employers, self employed and unpaid relatives in a single category.

Labor Category	Description Skill	Schooling years	Occupation	Gender
TUWM	Unskilled	0-4	Wage earner	Male
TUNM	Unskilled	0-4	Non wage earner	Male
TIWM	Semi-skilled	5-9	Wage earner	Male
TINM	Semi-skilled	5-9	Non wage earner	Male
TSWM	Skilled	10+	Wage earner	Male
TSNM	Skilled	10+	Non wage earner	Male
TUWF	Unskilled	0-4	Wage earner	Female
TUNF	Unskilled	0-4	Non wage earner	Female
TIWF	Semi-skilled	5-9	Wage earner	Female
TINF	Semi-skilled	5-9	Non wage earner	Female
TSWF	Skilled	10+	Wage earner	Female
TSNF	Skilled	10+	Non wage earner	Female

Source: Cuesta 2005.
Note: The composition of the labor factor does not add up to 100% due to rounding error. Total labor factor amounts to 2,145,753 individuals.

Formally, factors generate value added to the economy. The aggregated value added of labor is distributed among activities proportionally to their share in the labor income mass reported by the EPH 1997. Despite this disaggregation of labor value added is straightforward, the capital value added generated among activities is more troublesome. Honduras lacks estimates on capital stocks, left alone its distribution by activity. Following the stylization by Wobst (1998) using GTAP worldwide data, capital value added is first assigned among agricultural and non-agricultural activities. Capital value added among agricultural activities assumedly amounts to 60% of total value added in these activities (Wobst, 1998). For the remaining activities, capital value added represents only 40% of their total value added. Then, these two sub-categories of capital value added are further disaggregated using world-wide average estimates on specific activities as reported in Wobst (1998). Although this option does not truly reflect a Honduras-specific distribution of capital value added (but a world-wide average, instead), alternative options are regarded nonsensical. Among such alternatives, one might have

pro-rated the distributions of capital and labor value added alike. Also, the number of activities considered makes us reject an arbitrary allocation of shares of capital value added based on perceptions of what constitutes a capital intensive sector in the Honduran economy.

As for households, these receive incomes from labor factors, an 'operating surplus' from firms and remittances from the rest of the world. EPH 1997 data on labor incomes and economic sector allow the estimation of the proportion on labor value added generated by each category of labor factor, and its reception among different categories of households. Firms' transfers to households are distributed following the proportion on total interest and dividends of each household category as reported by the EPH 1997. Similarly, remittances are assigned to each category of households according to the proportion on total remittances reported by the EPH 1997 survey.

From an expenditure point of view, households produce goods that are self-consumed; consume other goods and services; pay taxes; and save. The distribution of consumption by household category accrues from the ENIGH 1998/9 survey, assuming that the composition of consumption between 1997 and the period of the survey does not change significantly. Given the low level of individuals reporting self-consumption in the ENIGH survey, the distribution of this category of household consumption is pro-rated according to the share of each household category in final household consumption. Savings are estimated as the average difference between incomes and expenditures reported by each category of households in the ENIGH survey. The relative share of each household category on total savings is then applied to the 1997 macro SAM figure to obtain the micro SAM consistent distribution of savings.

As for the remaining transactions, taxes on sales are specified proportionally to the relative weight that each commodity represents on total domestic supply. Sales taxes as well as production taxes (save for special production taxes on cigarettes, beer and non-alcoholic drinks, and oil) are subject to balancing adjustments (see next section). Income taxes are assigned among household categories on proportional basis with respect to their

reported average total income. Similarly, both private and public investments are assigned proportionally to the relative weight that each commodity has on total intermediate demand. Finally, transaction costs are distributed by commodities also in proportion to the share of each commodity in domestic supply, imports and exports, respectively.

Final Adjustments-The entropy approach was used to obtain the final balanced SAM used in this project. (See Robinson et al. (2002). However, in 1997 there is a large payment from enterprises to the rest of the world which is not consistent with national accounts data for preceding years, and unlikely to represent future behavior. We eliminated this flow by 2005 which is one of the reasons that the model has a different trajectory between 1997 and 2005 from the later growth path to 2020.

The actual SAM is a square 87x87 matrix comprised of 24 activity accounts, 24 commodity accounts, 13 factor of production accounts, (12 labor and one capital) one enterprise account, six government accounts five of which disaggregate tax receipt, 16 different types of households depending on residence and gender head, a saving-investment account, an external account, and row-column sums. The actual matrix is available on the IFPRI website.

Figure A.1. National SAM used in the CGE model

Receipts	Expenditures								
	Activities	Commodities	Factors	Households	Enterprises	Government	Savings - Investment	Rest of the World	TOTAL
Activities		marketed outputs							Activity income
Commodities	intermediate inputs			private consumption		government consumption	investment	exports	Demand
Factors	value-added								factor income
Households			factor income to households	inter-household transfers	surplus to households	transfers to households		transfers to households	household income
Enterprises			factor income to enterprises			transfers to enterprises		transfers to enterprises	enterprise income
Government	producer and value - added tax	sales taxes, tariffs, export taxes	factor taxes	transfers, direct taxes	direct taxes			transfers to government	government income
Savings - Investment				household savings	enterprise savings	government savings		foreign savings	savings
Rest of the World (RoW)		imports	factor income to RoW		surplus to RoW	government transfers			foreign exchange outflow
TOTAL	activity expenditures	commodity supply	factor expenditures	household expenditures	enterprise expenditures	government expenditures	investment	foreign exchange inflow	

Source: Adapted from Lofgren et al (2001).

Annex 3: A Formal Statement of the Dynamic CGE Model

SETS

Symbol	Explanation	Symbol	Explanation
$a \in A$	activities	$c \in CMN (\subset C)$	commodities not in *CM*
$a \in ACES (\subset A)$	activities with a CES function at the top of the technology nest	$c \in CT (\subset C)$	transaction service commodities
$a \in ALEO (\subset A)$	activities with a Leontief function at the top of the technology nest	$c \in CX (\subset C)$	commodities with domestic production
$c \in C$	commodities	$f \in F$	factors
$c \in CD (\subset C)$	commodities with domestic sales of domestic output	$i \in INS$	institutions (domestic and rest of world)
$c \in CDN (\subset C)$	commodities not in *CD*	$i \in INSD (\subset INS)$	domestic institutions
$c \in CE (\subset C)$	exported commodities	$i \in INSDNG (\subset INSD)$	domestic non-government institutions
$c \in CEN (\subset C)$	commodities not in *CE*	$h \in H (\subset INSDNG)$	households
$c \in CM (\subset C)$	imported commodities	$fls \in F$	factors with supply curve

PARAMETERS

$cwts_c$	weight of commodity c in the CPI	$\overline{qg}_c$	base-year quantity of government demand
$dwts_c$	weight of commodity c in the producer price index	$\overline{qinv}_c$	base-year quantity of private investment demand
ica_{ca}	quantity of c as intermediate input per unit of activity a	$shif_{if}$	share for domestic institution i in income of factor f
$icd_{cc'}$	quantity of commodity c as trade input per unit of c' produced and sold domestically	$shii_{ii'}$	share of net income of i' to i (i' ∈ INSDNG'; i ∈ INSDNG)
$ice_{cc'}$	quantity of commodity c as trade input per exported unit of c'	ta_a	Tax rate for activity a
$icm_{cc'}$	quantity of commodity c as trade input per imported unit of c'	te_c	export tax rate
$inta_a$	quantity of aggregate intermediate input per activity unit	tf_f	direct tax rate for factor f
iva_a	quantity of aggregate intermediate input per activity unit	$\overline{tins}_i$	exogenous direct tax rate for domestic institution i
$\overline{mps}_i$	base savings rate for domestic institution i	$tins01_i$	0-1 parameter with 1 for institutions with potentially flexed direct tax rates
$mps01_i$	0-1 parameter with 1 for institutions with potentially flexed direct tax rates	tm_c	import tariff rate
pwe_c	export price (foreign currency)	tq_c	rate of sales tax
pwm_c	import price (foreign currency)	$trnsfr_{i\,f}$	transfer from factor f to institution i
$qdst_c$	quantity of stock change	tva_a	rate of value-added tax for activity *a*

$etals_f$	parameter in labor supply equation		
$INVSHR1_a$	capital shares	PK_r	price of capital
$DKAPS_{fa}$	gross fixed capital formation	QF_{fa}	next period sectoral capital stock
$WFXAV$	average capital rental rate	$deprate^k$	capital stock depreciation rate

Greek Letters

α_a^a	efficiency parameter in the CES activity function	δ_c^t	CET function share parameter
α_a^{va}	efficiency parameter in the CES value-added function	δ_{fa}^{va}	CES value-added function share parameter for factor *f* in activity *a*
α_c^{ac}	shift parameter for domestic commodity aggregation function	γ_{ch}^m	subsistence consumption of marketed commodity c for household h
α_c^q	Armington function shift parameter	γ_{ach}^h	subsistence consumption of home commodity c from activity a for household h
α_c^t	CET function shift parameter	θ_{ac}	yield of output c per unit of activity a
β_{ach}^h	marginal share of consumption spending on home commodity c from activity a for household h	ρ_a^a	CES production function exponent
β_{ch}^m	marginal share of consumption spending on marketed commodity c for household h	ρ_a^{va}	CES value-added function exponent
δ_a^a	CES activity function share parameter	ρ_c^{ac}	domestic commodity aggregation function exponent
δ_{ac}^{ac}	share parameter for domestic commodity aggregation function	ρ_c^q	Armington function exponent
δ_c^q	Armington function share parameter	ρ_c^t	CET function exponent

VARIABLES

$\overline{CPI}$	consumer price index	$\overline{MPSADJ}$	savings rate scaling factor (= 0 for base)
$\overline{DTINS}$	change in domestic institution tax share (= 0 for base; exogenous variable)	$\overline{QFS}_f$	quantity supplied of factor
$\overline{FSAV}$	foreign savings (FCU)	$\overline{TINSADJ}$	direct tax scaling factor (= 0 for base; exogenous variable)
$\overline{GADJ}$	government consumption adjustment factor	$\overline{WFDIST}_{fa}$	wage distortion factor for factor f in activity a
$\overline{IADJ}$	investment adjustment factor		

VARIABLES

$DMPS$	change in domestic institution savings rates (= 0 for base; exogenous variable)	QF_{fa}	quantity demanded of factor f from activity a
DPI	producer price index for domestically marketed output	QG_c	government consumption demand for commodity
EG	government expenditures	QH_{ch}	quantity consumed of commodity c by household h
EH_h	consumption spending for household	QHA_{ach}	quantity of household home consumption of commodity c from activity a for household h
EXR	exchange rate (LCU per unit of FCU)	$QINTA_a$	quantity of aggregate intermediate input
$GOVSHR$	government consumption share in nominal absorption	$QINT_{ca}$	quantity of commodity c as intermediate input to activity a
$GSAV$	government savings	$QINV_c$	quantity of investment demand for commodity
$INVSHR$	investment share in nominal absorption	QM_c	quantity of imports of commodity
MPS_i	marginal propensity to save for domestic non-government institution (exogenous variable)	QQ_c	quantity of goods supplied to domestic market (composite supply)
PA_a	activity price (unit gross revenue)	QT_c	quantity of commodity demanded as trade input
PDD_c	demand price for commodity produced and sold domestically	QVA_a	quantity of (aggregate) value-added
PDS_c	supply price for commodity produced and sold domestically	QX_c	aggregated quantity of domestic output of commodity
PE_c	export price (domestic currency)	$QXAC_{ac}$	quantity of output of commodity c from activity a
$PINTA_a$	aggregate intermediate input price for activity a	$TABS$	total nominal absorption
PM_c	import price (domestic currency)	$TINS_i$	direct tax rate for institution i (i $\in$ INSDNG)
PQ_c	composite commodity price	$TRII_{ii'}$	transfers from institution i' to i (both in the set INSDNG)
PVA_a	value-added price (factor income per unit of activity)	$WFREAL_f$	average real price of factor
PX_c	aggregate producer price for commodity	WF_f	average price of factor
$PXAC_{ac}$	producer price of commodity c for activity a	YF_f	income of factor f
QA_a	quantity (level) of activity	YG	government revenue
QD_c	quantity sold domestically of domestic output	YI_i	income of domestic non-government institution
QE_c	quantity of exports	YIF_{if}	income to domestic institution i from factor f

EQUATIONS

#	Equation	Domain	Description
Price Block			
1	$PM_c = pwm_c \cdot (1+tm_c) \cdot EXR + \sum_{c' \in CT} PQ_{c'} \cdot icm_{c'c}$ $\begin{bmatrix} import\ price \\ (LCU) \end{bmatrix} = \begin{bmatrix} import\ price \\ (FCU) \end{bmatrix} \cdot \begin{bmatrix} tariff\ adjust- \\ ment \end{bmatrix} \cdot \begin{bmatrix} exchange\ rate \\ (LCU\ per \\ FCU) \end{bmatrix} + \begin{bmatrix} cost\ of\ trade \\ inputs\ per \\ import\ unit \end{bmatrix}$	$c \in CM$	Import Price
2	$PE_c = pwe_c \cdot (1-te_c) \cdot EXR - \sum_{c' \in CT} PQ_c \cdot ice_{c'c}$ $\begin{bmatrix} export \\ price \\ (LCU) \end{bmatrix} = \begin{bmatrix} export \\ price \\ (FCU) \end{bmatrix} \cdot \begin{bmatrix} tariff \\ adjust- \\ ment \end{bmatrix} \cdot \begin{bmatrix} exchange\ rate \\ (LCU\ per \\ FCU) \end{bmatrix} - \begin{bmatrix} cost\ of\ trade \\ inputs\ per \\ export\ unit \end{bmatrix}$	$c \in CE$	*Export Price*
3	$PDD_c = PDS_c + \sum_{c' \in CT} PQ_{c'} \cdot icd_{c'c}$ $\begin{bmatrix} domestic \\ demand \\ price \end{bmatrix} = \begin{bmatrix} domestic \\ supply \\ price \end{bmatrix} + \begin{bmatrix} cost\ of\ trade \\ inputs\ per \\ unit\ of \\ domestic\ sales \end{bmatrix}$	$c \in CD$	Demand price of domestic non-traded goods
4	$PQ_c \cdot (1-tq_c) \cdot QQ_c = PDD_c \cdot QD_c + PM_c \cdot QM_c$ $\begin{bmatrix} absorption \\ (at\ demand \\ prices\ net\ of \\ sales\ tax) \end{bmatrix} = \begin{bmatrix} domestic\ demand\ price \\ times \\ domestic\ sales\ quantity \end{bmatrix} + \begin{bmatrix} import\ price \\ times \\ import\ quantity \end{bmatrix}$	$c \in (CD \cup CM)$	Absorption
5	$PX_c \cdot QX_c = PDS_c \cdot QD_c + PE_c \cdot QE_c$ $\begin{bmatrix} producer\ price \\ times\ marketed \\ output\ quantity \end{bmatrix} = \begin{bmatrix} domestic\ supply\ price \\ times \\ domestic\ sales\ quantity \end{bmatrix} + \begin{bmatrix} export\ price \\ times \\ export\ quantity \end{bmatrix}$	$c \in CX$	Marketed Output Value
6	$PA_a = \sum_{c \in C} PXAC_{ac} \cdot \theta_{ac}$ $\begin{bmatrix} activity \\ price \end{bmatrix} = \begin{bmatrix} producer\ prices \\ times\ yields \end{bmatrix}$	$a \in A$	Activity Price
7	$PINTA_a = \sum_{c \in C} PQ_c \cdot ica_{ca}$ $\begin{bmatrix} aggregate \\ intermediate \\ input\ price \end{bmatrix} = \begin{bmatrix} intermediate\ input\ cost \\ per\ unit\ of\ aggregate \\ intermediate\ input \end{bmatrix}$	$a \in A$	Aggregate intermediate input price

8	$PA_a \cdot (1-ta_a) \cdot QA_a = PVA_a \cdot QVA_a + PINTA_a \cdot QINTA_a$ $\begin{bmatrix} activity\ price \\ (net\ of\ taxes) \\ times\ activity\ level \end{bmatrix} = \begin{bmatrix} value\text{-}added \\ price\ times \\ quantity \end{bmatrix} + \begin{bmatrix} aggregate \\ intermediate \\ input\ price\ times \\ quantity \end{bmatrix}$	$a \in A$	Activity revenue and costs
9	$\overline{CPI} = \sum_{c \in C} PQ_c \cdot cwts_c$ $\begin{bmatrix} CPI \end{bmatrix} = \begin{bmatrix} prices\ times \\ weights \end{bmatrix}$		Consumer price index
10	$DPI = \sum_{c \in C} PDS_c \cdot dwts_c$ $\begin{bmatrix} Producer\ price\ index \\ for\ non\text{-}traded\ outputs \end{bmatrix} = \begin{bmatrix} prices\ times \\ weights \end{bmatrix}$		Producer price index for non-traded market output

Production and commodity block

11	$QA_a = \alpha_a^a \cdot \left(\delta_a^a \cdot QVA_a^{-\rho_a^a} + (1-\delta_a^a) \cdot QINTA_a^{-\rho_a^a} \right)^{-\frac{1}{\rho_a^a}}$ $\begin{bmatrix} activity \\ level \end{bmatrix} = CES \begin{bmatrix} quantity\ of\ aggregate\ value\text{-}added, \\ quantity\ aggregate\ intermediate\ input \end{bmatrix}$	$a \in ACES$	CES technology: activity production function
12	$\frac{QVA_a}{QINTA_a} = \left(\frac{PINTA_a}{PVA_a} \cdot \frac{\delta_a^a}{1-\delta_a^a} \right)^{\frac{1}{1+\rho_a^a}}$ $\begin{bmatrix} value\text{-}added - \\ intermediate\text{-} \\ input\ quantity \\ ratio \end{bmatrix} = f \begin{bmatrix} intermediate\text{-}input \\ - value\text{-}added \\ price\ ratio \end{bmatrix}$	$a \in ACES$	CES technology: Value—Added—Intermediate—Input ratio
13	$QVA_a = iva_a \cdot QA_a$ $\begin{bmatrix} demand\ for \\ value\text{-}added \end{bmatrix} = f \begin{bmatrix} activity \\ level \end{bmatrix}$	$a \in ALEO$	Leontief technology: Demand for aggregate value-added
14	$QINTA_a = inta_a \cdot QA_a$ $\begin{bmatrix} demand\ for\ aggregate \\ intermediate\ input \end{bmatrix} = f \begin{bmatrix} activity \\ level \end{bmatrix}$	$a \in ALEO$	Leontief technology: Demand for aggregate intermediate input
15	$QVA_a = \alpha_a^{va} \cdot \left(\sum_{f \in F} \delta_{f\,a}^{va} \cdot QF_{f\,a}^{-\rho_a^{va}} \right)^{-\frac{1}{\rho_a^{va}}}$ $\begin{bmatrix} quantity\ of\ aggregate \\ value\text{-}added \end{bmatrix} = CES \begin{bmatrix} factor \\ inputs \end{bmatrix}$	$a \in A$	Value-added and factor demands

16	$W_f \cdot \overline{WFDIST}_{fa} = PVA_a \cdot (1 - tva_a) \cdot QVA_a \cdot \left(\sum_{f \in F'} \delta_{f\,a}^{va} \cdot QF_{f\,a}^{-\rho_a^{va}} \right)^{-1} \cdot \delta_{f\,a}^{va} \cdot QF_{f\,a}^{-\rho_a^{va}-1}$ $\left[\begin{array}{c} \text{marginal cost of} \\ \text{factor } f \text{ in activity } a \end{array} \right] = \left[\begin{array}{c} \text{marginal revenue product} \\ \text{of factor } f \text{ in activity } a \end{array} \right]$	$a \in A$ $f \in F$	Factor demand
17	$WFREAL_f = \frac{YF}{CPI * \sum_a QF_{f,a}}$ $\left[\begin{array}{c} \text{average real wage} \\ \text{per factor unit} \end{array} \right] = \left[\begin{array}{c} \text{average wage corrcected} \\ \text{by consumer index price} \end{array} \right]$	$f \in F$	Real wages
18	$QFS_f = QFS0 * \left[\frac{\frac{WF_f * WFDIST_f * QF_f}{QFS_f}}{\frac{CPI}{\frac{WF0_f}{CPI0}}} \right]^{etals_f}$	$f \in F$	Labor supply
19	$QINT_{c\,a} = ica_{c\,a} \cdot QINTA_a$ $\left[\begin{array}{c} \text{intermediate demand} \\ \text{for commodity c} \\ \text{from activity a} \end{array} \right] = f \left[\begin{array}{c} \text{aggregate intermediate} \\ \text{input quantity} \\ \text{for activity a} \end{array} \right]$	$a \in A$ $c \in C$	Disaggregated intermediate input demand
20	$QXAC_{a\,c} + \sum_{h \in H} QHA_{ach} = \theta_{a\,c} \cdot QA_a$ $\left[\begin{array}{c} \text{marketed quantity} \\ \text{of commodity c} \\ \text{from activity a} \end{array} \right] + \left[\begin{array}{c} \text{household home} \\ \text{consumption} \\ \text{of commodity c} \\ \text{from activity a} \end{array} \right] = \left[\begin{array}{c} \text{production} \\ \text{of commodity c} \\ \text{from activity a} \end{array} \right]$	$a \in A$ $c \in CX$	Commodity production and allocation
21	$QX_c = \alpha_c^{ac} \cdot \left(\sum_{a \in A} \delta_{a\,c}^{ac} \cdot QXAC_{a\,c}^{-\rho_c^{ac}} \right)^{-\frac{1}{\rho_c^{ac}-1}}$ $\left[\begin{array}{c} \text{aggregate} \\ \text{marketed} \\ \text{production of} \\ \text{commodity c} \end{array} \right] = CES \left[\begin{array}{c} \text{activity-specific} \\ \text{marketed} \\ \text{production of} \\ \text{commodity c} \end{array} \right]$	$c \in CX$	Output Aggregation Function
22	$PXAC_{a\,c} = PX_c \cdot QX_c \left(\sum_{a \in A'} \delta_{a\,c}^{ac} \cdot QXAC_{a\,c}^{-\rho_c^{ac}} \right)^{-1} \cdot \delta_{a\,c}^{ac} \cdot QXAC_{a\,c}^{-\rho_c^{ac}-1}$ $\left[\begin{array}{c} \text{marginal cost of com-} \\ \text{modity c from activity a} \end{array} \right] = \left[\begin{array}{c} \text{marginal revenue product of} \\ \text{commodity c from activity a} \end{array} \right]$	$a \in A$ $c \in CX$	First-Order Condition for Output Aggregation Function

23	$QX_c = \alpha_c^t \cdot \left(\delta_c^t \cdot QE_c^{\rho_c^t} + (1 - \delta_c^t) \cdot QD_c^{\rho_c^t} \right)^{\frac{1}{\rho_c^t}}$ $\left[\begin{array}{c} \text{aggregate marketed} \\ \text{domestic output} \end{array} \right] = CET \left[\begin{array}{c} \text{export quantity, domestic} \\ \text{sales of domestic output} \end{array} \right]$	$c \in (CE \cap CD)$	Output Transformation (CET) Function
24	$\frac{QE_c}{QD_c} = \left(\frac{PE_c}{PDS_c} \cdot \frac{1 - \delta_c^t}{\delta_c^t} \right)^{\frac{1}{\rho_c^t - 1}}$ $\left[\begin{array}{c} \text{export-domestic} \\ \text{supply ratio} \end{array} \right] = f \left[\begin{array}{c} \text{export-domestic} \\ \text{price ratio} \end{array} \right]$	$c \in (CE \cap CD)$	Export-Domestic Supply Ratio
25	$QX_c = QD_c + QE_c$ $\left[\begin{array}{c} \text{aggregate} \\ \text{marketed} \\ \text{domestic output} \end{array} \right] = \left[\begin{array}{c} \text{domestic market} \\ \text{sales of domestic} \\ \text{output [for} \\ c \in (CD \cap CEN)] \end{array} \right] + \left[\begin{array}{c} \text{exports [for} \\ c \in (CE \cap CDN)] \end{array} \right]$	$c \in (CD \cap CEN) \cup (CE \cup CDN)$	Output Transformation for Non-Exported Commodities
26	$QQ_c = \alpha_c^q \cdot \left(\delta_c^q \cdot QM_c^{-\rho_c^q} + (1 - \delta_c^q) \cdot QD_c^{-\rho_c^q} \right)^{-\frac{1}{\rho_c^q}}$ $\left[\begin{array}{c} \text{composite} \\ \text{supply} \end{array} \right] = f \left[\begin{array}{c} \text{import quantity, domestic} \\ \text{use of domestic output} \end{array} \right]$	$c \in (CM \cap CD)$	Composite Supply (Armington) Function
27	$\frac{QM_c}{QD_c} = \left(\frac{PDD_c}{PM_c} \cdot \frac{\delta_c^q}{1 - \delta_c^q} \right)^{\frac{1}{1+\rho_c^q}}$ $\left[\begin{array}{c} \text{import-domestic} \\ \text{demand ratio} \end{array} \right] = f \left[\begin{array}{c} \text{domestic-import} \\ \text{price ratio} \end{array} \right]$	$c \in (CM \cap CD)$	Import-Domestic Demand Ratio
28	$QQ_c = QD_c + QM_c$ $\left[\begin{array}{c} \text{composite} \\ \text{supply} \end{array} \right] = \left[\begin{array}{c} \text{domestic use of} \\ \text{marketed domestic} \\ \text{output [for} \\ c \in (CD \cap CMN)] \end{array} \right] + \left[\begin{array}{c} \text{imports [for} \\ c \in (CM \cap CDN)] \end{array} \right]$	$c \in (CD \cap CMN) \cup (CM \cap CDN)$	Composite Supply for Non-Imported Outputs and Non-Produced Imports
29	$QT_c = \sum_{c' \in C'} \left(icm_{c\,c'} \cdot QM_{c'} + ice_{c\,c'} \cdot QE_{c'} + icd_{c\,c'} \cdot QD_{c'} \right)$ $\left[\begin{array}{c} \text{demand for} \\ \text{transactions} \\ \text{services} \end{array} \right] = \left[\begin{array}{c} \text{sum of demands} \\ \text{for imports, exports,} \\ \text{and domestic sales} \end{array} \right]$	$c \in CT$	Demand for Transactions Services

Institution block

30	$YF_f = \sum_{a \in A} WF_f \cdot \overline{WFDIST}_{f\,a} \cdot QF_{f\,a}$ $\left[\begin{array}{c} \text{income of} \\ \text{factor } f \end{array} \right] = \left[\begin{array}{c} \text{sum of activity payments} \\ \text{(activity-specific wages} \\ \text{times employment levels)} \end{array} \right]$	$f \in F$	Factor Income

31	$$YIF_{i\,f} = shif_{i\,f} \cdot \left[\left(1 - tf_f\right) \cdot YF_f - trnsfr_{row\,f} \cdot EXR \right]$$ $$\left[\begin{array}{c}\text{income of}\\ \text{institution } i\\ \text{from factor } f\end{array}\right] = \left[\begin{array}{c}\text{share of income}\\ \text{of factor } f \text{ to}\\ \text{institution } i\end{array}\right] \cdot \left[\begin{array}{c}\text{income of factor } f\\ \text{(net of tax and}\\ \text{transfer to RoW)}\end{array}\right]$$	$i \in INSD$ $f \in F$	Institutional factor incomes
32	$$YI_i = \sum_{f \in F} YIF_{i\,f} + \sum_{i' \in INSDNG'} TRII_{i\,i'} + trnsfr_{i\,gov} \cdot \overline{CPI} + trnsfr_{i\,row} \cdot EXR$$ $$\left[\begin{array}{c}\text{income of}\\ \text{institution } i\end{array}\right] = \left[\begin{array}{c}\text{factor}\\ \text{income}\end{array}\right] + \left[\begin{array}{c}\text{transfers}\\ \text{from other domestic}\\ \text{non-government}\\ \text{institutions}\end{array}\right] + \left[\begin{array}{c}\text{transfers}\\ \text{from}\\ \text{government}\end{array}\right] + \left[\begin{array}{c}\text{transfers}\\ \text{from}\\ \text{RoW}\end{array}\right]$$	$i \in INSDNG$	Income of domestic, non-government institutions
33	$$TRII_{i\,i'} = shii_{i\,i'} \cdot (1 - MPS_{i'}) \cdot (1 - TINS_{i'}) \cdot YI_{i'}$$ $$\left[\begin{array}{c}\text{transfer from}\\ \text{institution } i' \text{ to } i\end{array}\right] = \left[\begin{array}{c}\text{share of net income}\\ \text{of institution } i'\\ \text{transfered to } i\end{array}\right] \cdot \left[\begin{array}{c}\text{income of institution}\\ i', \text{ net of savings and}\\ \text{direct taxes}\end{array}\right]$$	$i \in INSDNG$ $i' \in INSDNG'$	Intra-Institutional Transfers
34	$$EH_h = \left(1 - \sum_{i \in INSDNG} shii_{i\,h}\right) \cdot \left(1 - MPS_h\right) \cdot (1 - TINS_h) \cdot YI_h$$ $$\left[\begin{array}{c}\text{household income}\\ \text{disposable for}\\ \text{consumption}\end{array}\right] = \left[\begin{array}{c}\text{household income, net of direct}\\ \text{taxes, savings, and transfers to}\\ \text{other non-government institutions}\end{array}\right]$$	$h \in H$	Household Consumption Expenditure
35	$$QH_{c\,h} = \gamma_{c\,h} + \frac{\beta^m_{ch} \cdot \left(EH_h - \sum_{c' \in C} PQ_{c'} \cdot \gamma^m_{c'h} - \sum_{a \in A} \sum_{c' \in C} PXAC_{ac'} \cdot \gamma^h_{ac'h} \right)}{PQ_c}$$ $$\left[\begin{array}{c}\text{quantity of}\\ \text{household demand}\\ \text{for commodity } c\end{array}\right] = f \left[\begin{array}{c}\text{household}\\ \text{consumption}\\ \text{spending,}\\ \text{market price}\end{array}\right]$$	$c \in C$ $h \in H$	Household Consumption Demand for Marketed commodities
36	$$QHA_{ach} = \gamma^h_{ach} + \frac{\beta^h_{ach} \cdot \left(EH_h - \sum_{c' \in C} PQ_{c'} \cdot \gamma^m_{c'h} - \sum_{a \in A} \sum_{c' \in C} PXAC_{ac'} \cdot \gamma^h_{ac'h} \right)}{PXAC_{ac}}$$ $$\left[\begin{array}{c}\text{quantity of}\\ \text{household demand}\\ \text{for home commodity } c\\ \text{from activity } a\end{array}\right] = f \left[\begin{array}{c}\text{household}\\ \text{disposable}\\ \text{income,}\\ \text{producer price}\end{array}\right]$$	$a \in A$ $c \in C$ $h \in H$	Household Consumption Demand for Home Commodities
37	$$QINV_c = \overline{IADJ} \cdot \overline{qinv}_c$$ $$\left[\begin{array}{c}\text{fixed investment}\\ \text{demand for}\\ \text{commodity } c\end{array}\right] = \left[\begin{array}{c}\text{adjustment factor}\\ \text{times}\\ \text{base-year fixed}\\ \text{investment}\end{array}\right]$$	$c \in CINV$	Investment Demand

38	$$QG_c = \overline{GADJ} \cdot \overline{qg}_c$$ $$\begin{bmatrix} \text{government} \\ \text{consumption} \\ \text{demand for} \\ \text{commodity } c \end{bmatrix} = \begin{bmatrix} \text{adjustment factor} \\ \text{times} \\ \text{base-year government} \\ \text{consumption} \end{bmatrix}$$	$c \in C$	Government Consumption Demand
39	$$YG = \sum_{i \in INSDNG} TINS_i \cdot YI_i + \sum_{f \in F} tf_f \cdot YF_f + \sum_{a \in A} tva_a \cdot PVA_a \cdot QVA_a$$ $$+ \sum_{a \in A} ta_a \cdot PA_a \cdot QA_a + \sum_{c \in CM} tm_c \cdot pwm_c \cdot QM_c \cdot EXR + \sum_{c \in CE} te_c \cdot pwe_c \cdot QE_c \cdot EXR$$ $$+ \sum_{c \in C} tq_c \cdot PQ_c \cdot QQ_c + \sum_{f \in F} YF_{gov\ f} + trnsfr_{gov\ row} \cdot EXR$$ $$\begin{bmatrix} \text{government} \\ \text{revenue} \end{bmatrix} = \begin{bmatrix} \text{direct taxes} \\ \text{from} \\ \text{institutions} \end{bmatrix} + \begin{bmatrix} \text{direct taxes} \\ \text{from} \\ \text{factors} \end{bmatrix} + \begin{bmatrix} \text{value-} \\ \text{added} \\ \text{tax} \end{bmatrix}$$ $$+ \begin{bmatrix} \text{activity} \\ \text{tax} \end{bmatrix} + \begin{bmatrix} \text{import} \\ \text{tariffs} \end{bmatrix} + \begin{bmatrix} \text{export} \\ \text{taxes} \end{bmatrix}$$ $$+ \begin{bmatrix} \text{sales} \\ \text{tax} \end{bmatrix} + \begin{bmatrix} \text{factor} \\ \text{income} \end{bmatrix} + \begin{bmatrix} \text{transfers} \\ \text{from} \\ \text{RoW} \end{bmatrix}$$		Government Revenue
40	$$EG = \sum_{c \in C} PQ_c \cdot QG_c + \sum_{i \in INSDNG} trnsfr_{i\ gov} \cdot \overline{CPI}$$ $$\begin{bmatrix} \text{government} \\ \text{spending} \end{bmatrix} = \begin{bmatrix} \text{government} \\ \text{consumption} \end{bmatrix} + \begin{bmatrix} \text{transfers to domestic} \\ \text{non-government} \\ \text{institutions} \end{bmatrix}$$		Government Expenditures

System Constraint Block

41	$$\sum_{a \in A} QF_{f\ a} = \overline{QFS}_f$$ $$\begin{bmatrix} \text{demand for} \\ \text{factor } f \end{bmatrix} = \begin{bmatrix} \text{supply of} \\ \text{factor } f \end{bmatrix}$$	$f \in F$	Factor market
42	$$QQ_c = \sum_{a \in A} QINT_{c\ a} + \sum_{h \in H} QH_{c\ h} + QG_c$$ $$+ QINV_c + qdst_c + QT_c$$ $$\begin{bmatrix} \text{composite} \\ \text{supply} \end{bmatrix} = \begin{bmatrix} \text{intermediate} \\ \text{use} \end{bmatrix} + \begin{bmatrix} \text{household} \\ \text{consumption} \end{bmatrix} + \begin{bmatrix} \text{government} \\ \text{consumption} \end{bmatrix}$$ $$+ \begin{bmatrix} \text{fixed} \\ \text{investment} \end{bmatrix} + \begin{bmatrix} \text{stock} \\ \text{change} \end{bmatrix} + \begin{bmatrix} \text{trade} \\ \text{input use} \end{bmatrix}$$	$c \in C$	Composite Commodity Markets
43	$$\sum_{c \in CM} pwm_c \cdot QM_c + \sum_{f \in F} trnsfr_{row\ f} = \sum_{c \in CE} pwe_c \cdot QE_c + \sum_{i \in INSD} trnsfr_{i\ row} + \overline{FSAV}$$ $$\begin{bmatrix} \text{import} \\ \text{spending} \end{bmatrix} + \begin{bmatrix} \text{factor} \\ \text{transfers} \\ \text{to RoW} \end{bmatrix} = \begin{bmatrix} \text{export} \\ \text{revenue} \end{bmatrix} + \begin{bmatrix} \text{institutional} \\ \text{transfers} \\ \text{from RoW} \end{bmatrix} + \begin{bmatrix} \text{foreign} \\ \text{savings} \end{bmatrix}$$		Current Account Balance for RoW (in Foreign Currency)
44	$$YG = EG + GSAV$$ $$\begin{bmatrix} \text{government} \\ \text{revenue} \end{bmatrix} = \begin{bmatrix} \text{government} \\ \text{expenditures} \end{bmatrix} + \begin{bmatrix} \text{government} \\ \text{savings} \end{bmatrix}$$		*Government Balance*

45	$$TINS_i = \overline{tins}_i \cdot \left(1 + \overline{TINSADJ} \cdot tins01_i\right) + \overline{DTINS} \cdot tins01_i$$ $$\begin{bmatrix} \text{direct tax} \\ \text{rate for} \\ \text{institution } i \end{bmatrix} = \begin{bmatrix} \text{base rate adjusted} \\ \text{for scaling for} \\ \text{selected institutions} \end{bmatrix} + \begin{bmatrix} \text{point change} \\ \text{for selected} \\ \text{institutions} \end{bmatrix}$$	$i \in INSDNG$	Direct institutional tax rates
46	$$MPS_i = \overline{mps}_i \cdot \left(1 + \overline{MPSADJ} \cdot mps01_i\right) + DMPS \cdot mps01_i$$ $$\begin{bmatrix} \text{savings} \\ \text{rate for} \\ \text{institution } i \end{bmatrix} = \begin{bmatrix} \text{base rate adjusted} \\ \text{for scaling for} \\ \text{selected institutions} \end{bmatrix} + \begin{bmatrix} \text{point change} \\ \text{for selected} \\ \text{institutions} \end{bmatrix}$$	$i \in INSDNG$	Institutional savings rates
47	$$\sum_{i \in INSDNG} MPS_i \cdot \left(1 - TINS_i\right) \cdot YI_i + GSAV + EXR \cdot \overline{FSAV} =$$ $$\sum_{c \in C} PQ_c \cdot QINV_c + \sum_{c \in C} PQ_c \cdot qdst_c$$ $$\begin{bmatrix} \text{non-govern-} \\ \text{ment savings} \end{bmatrix} + \begin{bmatrix} \text{government} \\ \text{savings} \end{bmatrix} + \begin{bmatrix} \text{foreign} \\ \text{savings} \end{bmatrix} =$$ $$\begin{bmatrix} \text{fixed} \\ \text{investment} \end{bmatrix} + \begin{bmatrix} \text{stock} \\ \text{change} \end{bmatrix}$$		Savings-Investment Balance
48	$$TABS = \sum_{h \in H} \sum_{c \in C} PQ_c \cdot QH_{ch} + \sum_{a \in A} \sum_{c \in C} \sum_{h \in H} PXAC_{ac} \cdot QHA_{ach}$$ $$+ \sum_{c \in C} PQ_c \cdot QG_c + \sum_{c \in C} PQ_c \cdot QINV_c + \sum_{c \in C} PQ_c \cdot qdst_c$$ $$\begin{bmatrix} \text{total} \\ \text{absorption} \end{bmatrix} = \begin{bmatrix} \text{household} \\ \text{market} \\ \text{consumption} \end{bmatrix} + \begin{bmatrix} \text{household} \\ \text{home} \\ \text{consumption} \end{bmatrix}$$ $$+ \begin{bmatrix} \text{government} \\ \text{consumption} \end{bmatrix} + \begin{bmatrix} \text{fixed} \\ \text{investment} \end{bmatrix} + \begin{bmatrix} \text{stock} \\ \text{change} \end{bmatrix}$$		Total Absorption
49	$$INVSHR \cdot TABS = \sum_{c \in C} PQ_c \cdot QINV_c + \sum_{c \in C} PQ_c \cdot qdst_c$$ $$\begin{bmatrix} \text{investment-} \\ \text{absorption} \\ \text{ratio} \end{bmatrix} \cdot \begin{bmatrix} \text{total} \\ \text{absorption} \end{bmatrix} = \begin{bmatrix} \text{fixed} \\ \text{investment} \end{bmatrix} + \begin{bmatrix} \text{stock} \\ \text{change} \end{bmatrix}$$		Ratio of Investment to Absorption
50	$$GOVSHR \cdot TABS = \sum_{c \in C} PQ_c \cdot QG_c$$ $$\begin{bmatrix} \text{government} \\ \text{consumption-} \\ \text{absorption} \\ \text{ratio} \end{bmatrix} \cdot \begin{bmatrix} \text{total} \\ \text{absorption} \end{bmatrix} = \begin{bmatrix} \text{government} \\ \text{consumption} \end{bmatrix}$$		Ratio of Government Consumption to Absorption
51	$$WFKAV_{ft}^{a} = \sum_{a} \left[\left(\frac{QF_{fat}}{\sum_{a'} QF_{fa't}} \right) \cdot WF_{ft} \cdot WFDIST_{fat} \right]$$ $$\begin{bmatrix} \text{average capital} \\ \text{rental rate} \end{bmatrix} = \begin{bmatrix} \text{weighted sum of sectors'} \\ \text{capital rental rates} \end{bmatrix}$$		average economy-wide rental rate of capital

52	$$INVSHR1^{a}_{f\,a\,t} = \left(\frac{QF_{f\,a\,t}}{\sum_{a'} QF_{f\,a'\,t}} \right) \cdot \left(\beta^{a} \cdot \left(\frac{WF_{f,t} \cdot WFDIST_{f\,a\,t}}{WFKAV^{a}_{f\,t}} - 1 \right) + 1 \right)$$ $$\left[\begin{array}{c} share\ of \\ new\ capital \end{array} \right] = \left[\begin{array}{c} share\ of \\ existing\ capital \end{array} \right] \cdot \left[\begin{array}{c} capital\ rental \\ rate\ ratio \end{array} \right]$$		sector's share of the new capital investment
53	$$\Delta DKAPS^{a}_{f\,a\,t} = INVSHR1^{a}_{f\,a\,t} \cdot \left(\frac{\sum_{c} PQ_{c\,t} \cdot QINV_{c\,t}}{PK_{f\,t}} \right)$$ $$\left[\begin{array}{c} quantity\ of\ new \\ capital\ by\ sector \end{array} \right] = \left[\begin{array}{c} share\ of \\ new\ capital \end{array} \right] \cdot \left[\begin{array}{c} total\ quantity\ of \\ new\ capital \end{array} \right]$$		Allocate gross fixed capital formation
54	$$PK_{f\,t} = \sum_{c} PQ_{c\,t} \cdot \frac{QINV_{c\,t}}{\sum_{c'} QINV_{c'\,t}}$$ $$\left[\begin{array}{c} unit\ price \\ of\ capital \end{array} \right] = \left[\begin{array}{c} weighted\ market\ price \\ of\ investment\ commodities \end{array} \right]$$		price of capital
55	$$QF_{f\,a\,t+1} = QF_{f\,a\,t} \cdot \left(1 + \frac{\Delta INVSHR1^{a}_{f\,a\,t}}{QF_{f\,a\,t}} - deprate_{f} \right)$$ $$\left[\begin{array}{c} average\ capital \\ rental\ rate \end{array} \right] = \left[\begin{array}{c} weighted\ sum\ of\ sectors' \\ capital\ rental\ rates \end{array} \right]$$		Updating quantity of capital
56	$$QFS_{f\,t+1} = QFS_{f\,t} \cdot \left(1 + \frac{\sum_{a} \Delta INVSHR1_{f\,a\,t}}{QFS_{f\,t}} - deprate_{f} \right)$$ $$\left[\begin{array}{c} average\ capital \\ rental\ rate \end{array} \right] = \left[\begin{array}{c} weighted\ sum\ of\ sectors' \\ capital\ rental\ rates \end{array} \right]$$		Updating quantity of capital

III. The microsimulation module

The basic input for the microsimulations of the poverty and distribution impact of the CAFTA scenarios was the 2004 national household survey entitled Encuesta Nacional de Condiciones de Vida. (MECOVI) It comprises a national sample of 8175 households. We used the solution of the CGE for 2005 to get the base period distribution of the labor force across the households represented in the survey. We then used the random procedure described in Vos (2002) and in more detail in Appendix J of Sanchez (2004) to get an estimate of the hypothetical level of poverty and distribution of income that would be observed in each of the CAFTA scenarios. Each microsimulation was repeated 100 times to get a mean estimate and a standard error enabling us to make statements regarding the significance of the changes we found. The procedure was done sequentially, first for the change coming from the total growth in employment, holding skill structure and relative wages constant, and then sequentially allowing for changes in skill structure and relative wages.

The poverty lines are taken from CEPAL (2005), adjusted from 2002 to 2004 by changes in inflation. For the moderate line the adjustment is by the change in the CPI, while for the extreme poverty line we adjusted by the change in the price of food. The lines for the urban sector are 1604 lempiras per month per person for the upper line and 772 for the lower. For the rural sector the lines are 988 for the moderate line and 544 for extreme poverty. In dollars of 2004 those lines translate to $88 per month for moderate urban poverty and $54 for extreme poverty, and $42 and $28 for rural poverty. We note that relative to other countries these poverty lines are quite high particularly given that Honduras is a relatively poor country which is one of the reasons that the level of poverty in all of our microsimulations is so high.