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Coping with DR-CAFTA: Assessing the Impact of the Agreement and Designing Adjustment Programs for Sensitive Agriculture in Honduras

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ABSTRACT

Honduras has for almost two decades embraced economic integration as a way to achieve sustained economic growth. The DR-CAFTA agreement signed in 2004 represents another step towards economic openness. The agreement generated a heated debate about the benefits and costs to the Honduran economy. Previous assessments suggest that Honduras will have a marginal aggregate benefit from DR-CAFTA. The findings from this study suggest that the agreement might actually yield a marginal loss vis-à-vis the counterfactual.

Previous studies also stress the potential for large losses resulting from the agreement, particularly for some traditional and sensitive agricultural sectors. The findings from this study suggest that, in aggregate, the welfare of basic grain households will decrease only marginally as a result of DR-CAFTA.

This study contributes to the existing literature by providing a new assessment of the agreement on the Honduran economy, employing a new social accounting matrix and a dynamic computable general equilibrium model particularly developed for this study. Furthermore, this study expands the previous literature, assessing the feasibility of alternative interventions, and developing a policy proposal that could serve as a road map for future public intervention aimed at easing the transition to more competitive domestic agricultural markets. The proposed intervention consists of three components, namely, (1) a technical assistance program, (2) a short-term agricultural financing program, and (3) a medium-term agricultural financing program.

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Finally, I want to thank all my friends for their unconditional support. Without naming names, they all must know how proud and thankful I am for having them by my side.

Finally and simply, I want to thank God for what I am and have.

DEDICATION

To my family and friends; they are the solid ground on which I sustain my achievements. A special thank to my grandfather; he taught me so much about valuing the simple things in life, and inspired me to always be humbled. I will always remember and admire him.

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1. INTRODUCTION

The Honduran economy has gone through significant changes over the last fifteen years. The increasing contributions to the gross domestic product (GDP) by industries like manufactures, primarily textiles and apparels, and tourism contrasts with the decreasing role of traditional agriculture[1]. The share of agriculture to GDP decreased from 20 percent in 1990 to 11.5 percent in 2004, while at the same time the contribution of manufactures grew from 14.5 percent in 1990 to 18.1 percent in 2004. Moreover, the share of traditional agricultural exports decreased from 77 percent of total merchandise trade in 1990 to 33 percent in 2005; exports of non-traditional agricultural products increased significantly during this period.

Despite its decreasing economic importance, agriculture still employs approximately 27 percent of the Honduran labor force, and is the primary, and in many cases the only, source of employment in rural areas, where roughly half of the Honduran population lives. A further contraction of the agricultural sector would likely exacerbate the already high level of poverty seen in many rural areas, primarily in the South and Southwest[2], unless job creation in urban areas is sufficient to absorb the increase in labor supply resulting from rural-urban migration. Furthermore, a decrease in agricultural activity would most likely put pressure on illegal migration to other nations, primarily the U.S.[3]

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[1] Traditional agriculture refers to those agricultural products that have historically accounted for most of Honduran agricultural GDP and/or agricultural exports, such as bananas, coffee, corn, and beans (Sanders, Ramirez and Morazan 2006). Non-traditional agriculture, on the other hand, refers to activities that have either been introduced recently or that have not historically contributed significantly to agricultural GDP, such as tropical fruits and Asian vegetables.

[2] For a detailed analysis of the geographical distribution of rural poverty, see Falk (2003).

[3] There are no estimates on rural-urban migration in Honduras; international migration rates were estimated at 6 and 4.6 migrants per 1,000 inhabitants for the 1995-00 and 2000-05 periods, respectively (Economic

Since the early 1990s, Honduran public officials have seen trade liberalization as one of the keys to economic growth and acted upon this belief. Accordingly, Honduras has become a member of the World Trade Organization (WTO) in 1995, and has been active in the regional arena as well, signing trade agreements with a large number of nations, such as Mexico, Venezuela, and Chile. As a result of this process of economic integration, Honduras went from having the highest average tariffs in Central America in 1990 (42 percent) to the lowest in the region in 1995, estimated at 9.7 percent (Lederman, Perry and Suescun 2002). At the same time, trade openness, measured as the ratio of imports plus exports over GDP, increased from 77 percent in 1990 to 92 percent in 1995, well before the Dominican Republic-Central American Free Trade Agreement (DR-CAFTA) was negotiated. The relevance of trade taxes as a source of government revenue decreased from 30 percent of total tax revenue in 1991 to 17 percent in 1998 and only 8 percent since 2003 (Gomez-Sabaini 2003, Direccion Ejecutiva de Ingresos 2006). However, the tariff averages above hide relevant asymmetries in protection among sectors. Honduras maintains high import tariffs on a number of agricultural products while it imposes very low import tariffs on industrial products (Morley, Nakasone and Piñeiro 2008). However, for many agricultural products, there is a significant difference between the applied and bounded tariffs; this wedge undermines the predictability of conditions for access to the Honduran market. Table 1.1 below shows the average import tariffs applied in 2003.

Commission for Latin American and The Caribbean n.d.). Most of the estimated 250,000 Hondurans living in the U.S. come from rural areas, and send more than USD 1.1 billion dollars per year in remittances (Serna 2007).

Table 1.1. Applied import tariffs in 2003[a] by WTO category

	NUMBER OF LINES	AVERAGE TARIFF APPLIED (%)	RANGE (%)	SD (%)	CV
Total	6,259	6.1	0-55	6.7	1.1
Agricultural products	923	10.1	0-55	7.8	0.8
Live animals and animal products	121	14.6	0-50	9.8	0.7
Dairy products	31	12.6	0-15	4.6	0.4
Coffee and tea, cocoa, sugar, etc.	165	10.9	0-40	5.7	0.5
Cut flowers and plants	59	5.6	0-15	7.0	1.3
Fruit and vegetables	201	13.1	0-15	4.5	0.3
Cereals	23	13.9	0-45	16.8	1.2
Beverages and spirits	54	13.5	0-30	5.4	0.4
Tobacco	19	8.7	0-55	12.3	1.4
Non-agricultural products (excluding petroleum)	5,313	5.4	0-15	6.2	1.2
Textiles and clothing	932	11.3	0-15	5.0	0.4
Leather, rubber, footwear and travel goods	207	7.6	0-15	5.7	0.7

Source: World Trade Organization (2003)

a. In order to incorporate the products under the price band system into the Honduran MFN tariff calculation, the simple average tariff applied in 2002 was calculated for each of these products, on the basis of information provided by the Honduran authorities.

Honduras maintains a price band system for corn and sorghum, and applies tariff escalation schedules for numerous industrial products as well as agricultural goods such as rice. It also administers purchase agreements for corn, sorghum, and rice, through which the processing industry and the primary production sectors negotiate the reference prices and volumes to be purchased every year. Associated with these purchase agreements, the government of Honduras also applies performance requirements, which make the right to import conditional on the purchases of domestic production (World Trade Organization 2003, Unidad de Apoyo Tecnico 2005). The significance of agricultural import tariffs, along with the fact that the U.S. is the largest trade partner for the most sensitive agricultural products, implies that DR-CAFTA would potentially bring about significant changes in many domestic agricultural markets, at least in the long run.

Another relevant fact that would affect the outcome of DR-CAFTA is the already low import tariffs that the U.S. applies on a large number of agricultural products coming from Honduras as a result of unilateral concessions that the U.S. has offered to the Central American region for over 20 years through agreements such as the Caribbean Basin Initiative (CBI) and the Caribbean Basin Trade Partnership Act (CBTPA) (Unidad de Apoyo Tecnico 2005, Morley, Nakasone and Piñeiro 2008). The already free access granted by the U.S. to most Honduran agricultural products implies that most gains to Honduran producers and U.S. consumers from trade liberalization have already materialized. However, the assessment of the impact of DR-CAFTA should be compared not to the situation before DR-CAFTA, but to the scenario without the concessions granted by the CBI and the CBTPA, given that the continuation of these concessions was subject to the approval of DR-CAFTA and would have otherwise expired in 2008 (Morley 2006).

The situation depicted above leads us to infer that DR-CAFTA would likely impose great challenges to the Honduran agricultural sector. But would that likely be the case? We can infer which agricultural sectors would likely benefit and lose from DR-CAFTA; much less obvious is to infer the magnitudes of the changes, and the impacts of these changes throughout the whole economy. The assessment of these effects is one of the primary goals of this study.

1.1 THE DR-CAFTA AGREEMENT

Signed in 2004 by the U.S., Costa Rica, the Dominican Republic, El Salvador, Guatemala, Honduras, and Nicaragua, and ratified by all members[4], DR-CAFTA represents another step in the reform process undertaken by most Central American countries during the 1990s towards the outward orientation of their economies. While this region has benefited since 1983 from the unilateral concessions granted by the U.S. through the CBI and CBTPA, DR-CAFTA implies (1) a stronger institutional framework for these concessions (making them permanent and not subject to Congressional approval from time to time), (2) enhanced market access for a number of new products, including sensitive agricultural products such as corn and sugar, and (3) extended application of the rules of law into other areas such as intellectual property rights and trade in services (World Bank 2005).

DR-CAFTA is a highly comprehensive agreement, encompassing areas such as market access in goods and services, investment protection, intellectual property rights, dispute settlements, labor, and environment. While acknowledging the relevance of all areas, the discussion in this section focuses primarily on market access of goods, primarily agricultural goods.

Through tariff reductions, expansions of zero-tariff quotas, and a combination of both, DR-CAFTA commits parties to eliminate tariffs for most tariff lines. Negotiations on market access were done on a product and country-specific basis. Tariff elimination is

[4] DR-CAFTA was signed in May of 2004 by all members except the Dominican Republic, which signed it in August of the same year. The ratification process was highly politicized in some countries such as Costa Rica, where the agreement was ratified through a referendum in 2007. Honduras, El Salvador, and Guatemala were the first countries to ratify the agreement in 2005.

done according to negotiated schedules: immediate, 5 years, 10 years, 12 years, 15 years, and 18-20 years for poultry parts, rice, and some dairy products (see Table 1.2 below).

Table 1.2. Tariff categories and specification of reduction schedules in DR-CAFTA

TARIFF CATEGORY	SPECIFICATION	APPLIES TO
A	Immediate reduction to zero	All members
B	Linear reduction to zero in 5 years	All members
C	Linear reduction to zero in 10 years	All members
D	Linear reduction to zero in 15 years	All members
E	6-year grace period; 33%-reduction over the next 4 years; reduction to zero from year 12 to 15	All members
F	10-year grace period; linear reduction to zero over the next 10 years	All members
G	Already enjoy zero tariffs	All members
H	Excluded from reductions; tariff levels remain at the negotiated WTO level	All members
M	Non-linear reduction to zero: 2% first year; 8% annually from year 3 to 6; 16% annually from year 7 to 10	All members
N	Reduction to zero in 12 equal annual installments	All members
O	6-year grace period; reduction in 9 non-linear annual installments: 40% from year 7 to 11; 60% from year 12 to 15	El Salvador; Guatemala; Honduras; Nicaragua
P	10-year grace period; reduction in the following 7 years: 33% from year 11 to 14; 67% from year 15 to 18	El Salvador; Guatemala; Honduras; Nicaragua
Q	Non-linear reduction in 15 years: 15% in the first year; 33% from year 4 to 8; 67% from year 9 to 15	El Salvador; Nicaragua

Source: DR-CAFTA Agreement

While most tariffs will be reduced in equal annual installments, Central American nations were able to negotiate longer grace periods and back-loaded schemes for most of their sensitive products. Greater market access is also obtained through the creation and expansion of zero-duty quotas, which some Central American countries already had in place for sensitive products. Honduras has not included any products in its Uruguay Round schedule of concessions relating to TRQs for agricultural products (World Trade

Organization 2003); consequently, it currently administers only those TRQs introduced by DR-CAFTA. The agreement contemplates the gradual expansion of the quotas according to the annual economic growth rates estimated for the region, which vary from 2 to 5 percent (World Bank 2005).

The agreement contains agricultural safeguards for sensitive products; these safeguards activate automatically in the event that the quantity of imports expand beyond negotiated levels, thus allowing members to provide temporary protection to an industry. Countries are allowed to use agricultural safeguards in the event that the trigger level is reached, but just once during the phase-out period, and for no more than four consecutive years.

Regarding sanitary and phytosanitary measures, DR-CAFTA adopts the standards and procedures followed by the WTO. As it did during the negotiation phase, the U.S. committed itself to continue providing technical assistance to Central American partners to help them overcome sanitary hurdles, primarily for non-traditional agricultural exports.

Sugar received special attention during the negotiation of DR-CAFTA, given the political sensitivity of this commodity in the U.S., and the potential gains from trade that Central American countries could obtain. Although sugar was finally excluded from the tariff elimination schedules negotiated, the U.S. committed itself to double the zero-tariff quota granted to DR-CAFTA partners, of which roughly 70 percent occurred in the first year of DR-CAFTA, and the remaining 30 percent will be granted in the year 15 (Morley 2006).

Under the terms of DR-CAFTA, most Honduran products would enter the U.S. market free of duty; TRQs would remain in place for sugar and textiles and apparels, but DR-CAFTA implies an expansion in their volumes. DR-CAFTA introduces less stringent rules of origin for textiles and apparels, which according to analysts might generate the

most benefits for Central American nations by allowing specialization in an activity that uses intensively their relatively abundant factor of production, namely, labor (Morley, Nakasone and Piñeiro 2008).

Honduran exports to the U.S. enjoy a duty-free treatment in 97.8 percent of the tariff lines immediately after the implementation of the agreement; on the other hand, U.S. exports to Honduras have zero import duties in only 74.4 percent of the tariff lines. Honduras was able to negotiate better terms for its agricultural sector than its industrial sectors. For instance, imports under only 52 percent of the tariff lines considered to be agricultural products, which represent 53 percent of the value of agricultural imports from the U.S., would be subject to no import tariffs immediately after the implementation of DR-CAFTA; 9.9 percent of tariff lines (2.9 percent in value) would be traded freely in 5 years; 18.4 percent of tariff lines (7.3 percent in value) in 10 years; and 14.3 percent of tariff lines (7.9 percent in value) in 15 years. Only 7 tariff lines have a schedule of 20 years, including products such as prime and choice beef and some types of cheeses. Thirty-three agricultural tariff lines, representing roughly 4 percent of agricultural imports, have TRQs, and with the exception of the TRQ for white corn, all of them will be removed after 20 years. Among the goods for which Honduras maintains TRQs are dairy products, white and yellow corn, paddy and milled rice, chicken thighs, and pork meat.

Most of these commodities are considered sensitive either because (1) they represent a significant source of employment; (2) contribute significantly to the income of small farmers; or (3) because they are an important part of the diet, primarily among the poorest segments of the population. For most of the commodities subject to TRQs, the short and

medium-term effects of DR-CAFTA will be primarily through the expansion of the quota, given that the tariff schedules negotiated for them are back-loaded.

Table 1.3. Treatment of special product tariff lines for Honduras in DR-CAFTA

Product	Tariff Category	Initial quota (MT)	Annual Increase	Safeguard ** (%)	Initial MFN Tariff (%)
Dairy	F	2202	5%	130%	15%
Paddy rice	P	91800	2%	110%	45%
Milled rice	P	8925	5%	110%	45%
Yellow corn	E	190509	5%	---	45%
White corn	H	23460	460 mt	---	45%
Chicken thighs	P	534 *	534 mt	130%	164.4%
Pork meat	O	2150	7%	130%	15%
Black beans	D	---	---	---	15%
White beans	B	---	---	---	15%
Red beans	D	---	---	---	15%

Source: DR-CAFTA Agreement.
* From year 3 and beyond. ** Trigger level.

1.2 Competitiveness of Honduran Agriculture

An assessment of the competitiveness of sensitive agricultural sectors relative to the U.S. shows the poor performance of Honduran agriculture. Using 2002 data on (1) wholesale prices for domestic goods in San Pedro Sula; (2) prices for U.S. goods in San Pedro Sula, inclusive of import tariffs and inland transportation costs; and (3) c.i.f. prices for U.S. goods in Puerto Cortez, exclusive of import tariffs, the Secretary of Industry and Commerce (Secretaria de Industria y Comercio 2003) estimates that only two sensitive products, namely beef and white corn, out of nine sensitive products analyzed would be able to compete freely with imports from the U.S. (see Table 1.4 below). The situation is highly worrisome for chicken thighs and pork meat, where the ratio of (3) to (1) is close to 0.5, and for rice and fluid milk, with ratios of roughly 0.75. When import tariffs and inland transaction costs are accounted for, then only six products, namely white and yellow corn, paddy and milled rice, beef, and chicken breasts, are competitive in the

domestic market. Chicken thighs, pork meat, and fluid milk all remain uncompetitive. An update of this analysis for corn, rice, and beans to 2005 data shows a loss of competitiveness for white and yellow corn, and rice, whose wholesale prices are higher than those for U.S. products (Unidad de Apoyo Tecnico 2005). The loss of competitiveness could be the result of a tight supply as a result of a severe draught that affected the main areas of production during 2005. Nevertheless, the analysis sheds light on the even larger potential trade impact of DR-CAFTA in situations of short supply, a common scenario observed in many Honduran agricultural sectors due to the low level of infrastructure, primarily irrigation, and outdated technology.

These estimates highlight the potential impact of DR-CAFTA on highly protected agricultural sectors. Improving their competitiveness is a difficult task on which many governmental and non-governmental organizations are working.

Table 1.4. Price competitiveness of Honduran sensitive products relative to U.S. imports in 2002

		Price of U.S. imports			
Products	Wholesale price of Honduran product (1)	Inclusive of import tariffs and transaction costs (2)	Exclusive of import tariffs (3)	(2) / (1)	(3) / (1)
White corn [a]	159.0	229.4	162.0	1.44	1.02
Yellow corn [a]	159.0	190.2	135.4	1.20	0.85
Paddy rice [a]	203.0	225.3	155.4	1.11	0.77
Milled rice [a]	417.0	442.3	305.0	1.06	0.73
Beef [b]	0.94	1.72	1.38	1.82	1.46
Pork meat [b]	0.92	0.53	0.46	0.58	0.50
Chicken breasts [b]	0.74	0.81	0.61	1.09	0.82
Chicken thighs [b]	0.74	0.46	0.32	0.62	0.43
Fluid milk [c]	0.43	0.37	0.32	0.86	0.74

Source: Secretaria de Industria y Comercio (2003).
a: USD / mt; b: USD / lb; c: USD / liter.

Previous studies identify a significant number of Honduran agricultural products, varying from 75 for the period 1998-2000 to 100 in 2000-03[5], with revealed comparative advantages in the world but not against the U.S. (Monge-González 2004, Unidad de Apoyo Tecnico 2005). Among these products we find a large number of tropical fruits, palm oil, and tomato juice. These agricultural products represent a promising alternative to traditional, low value-added agriculture; consequently, policy interventions aimed at improving the welfare of agricultural households must to the extent possible facilitate the reallocation of resources into these high-value activities.

1.3 Adjustment Programs

The fact that DR-CAFTA contains relatively long, back-loaded tariff reduction schedules and safeguard provisions implies that sensitive agricultural sectors would still receive a considerable level of protection in the short to medium term. Moreover, adjustment programs can be implemented with the goal of minimizing the potentially negative impacts that trade liberalization might generate and helping those agents in need to cope with these changes. While the continuing provision of protection to producers comes at a cost to consumers, since they would not perceive the gains associated with lower market prices, it is evident from the terms negotiated that policymakers prioritized the welfare of producers, most of which in the case of sensitive products are poor farmers with serious constraints on their abilities to adjust to new market conditions.

A number of adjustment programs have been employed by other countries to help producers cope with the changes in market conditions, for instance, compensatory

[5] Agricultural products were defined according to the Central American Tariff System (SAC for its initials in Spanish) at the 8-digit level, which results in a total of 870 agricultural products.

decoupled payments, conditional cash transfers, technical assistance programs, and provision of public goods such as infrastructure and education (Soto-Baquero, Rogriguez-Fazzone and Falcioni 2007, Arias 2007).

An example of compensatory decoupled payments to producers is the Procampo program implemented by Mexico to cope with the changes introduced by the North American Free Trade Agreement (NAFTA). Mexico negotiated long and back-loaded tariff reduction schemes for 9 sensitive products including maize, rice, sorghum, beans, and soybeans. However, Mexico never invoked these provisions, opting instead for quick liberalization and temporary compensatory payments to those producers expected to be negatively affected. The Procampo program, initiated in 1994 and expected to end in 2008, provides fixed payments per hectare to farmers producing sensitive products prior to 1993. Payments go to the producer, regardless of whether he/she is the owner of the land or a tenant, and they are limited up to 100 hectares for irrigated and 200 hectares for rain-fed land, respectively (Yunez-Naude, Mexico: Politicas Compensatorias para la Agricultura Familiar frente a los Impactos de los TLC 2007, World Bank 2005). Findings from different evaluations suggest that the Procampo program has had a number of desirable effects, namely: (1) positive impacts on the incomes of recipients (the main goal the program pursued when the program was implemented), (2) protection against negative income shocks; (3) higher consumption levels among recipients; and (4) contribution to the reduction of rural poverty (Sadoulet, de Janvry and Davis 2001, Davis, et al. 2002, World Bank 2003). On the other hand, the evidence suggests that the Procampo program did not fulfill other goals attached to it latter, namely, it neither improved the competitiveness of the farm sector, nor created the incentives for farmers to transition

into more profitable activities. Recipients have channeled the receipts from this program primarily into consumption. Furthermore, by being targeted to producers, decoupled payment programs do not contribute to the welfare of hired rural labor, which may also be negatively affected by the market changes. Implementing a decoupled payment program requires a record of land ownership and production activities in order to determine who is an eligible recipient; furthermore, it requires budgetary funds to be allocated for this purpose, thus competing with other relevant areas such as education and health.

Several Latin American countries, such as Brazil, Chile, Colombia, Nicaragua, and Honduras, have opted lately for conditional cash transfers[6], namely, providing cash transfers to poor families living in selected areas conditional on these families making the necessary investment in their children's human capital: sending them to school, maintaining regular health checkups, having their children vaccinated, etc. Conditional cash transfers have two main objectives: (1) reduce current poverty, and (2) promote accumulation of human capital, primarily of children. The rationale for these programs is that poor families, even if aware of the positive future implications of their children's education and good health, cannot currently afford to provide them. Therefore, the cash transfer will help them achieve certain predetermined goals regarding their children's human development, thus potentially breaking the pattern of inter-generational transmission of poverty (World Bank 2005). Conditional cash transfers are an interesting option particularly when the targeted sector hires significant labor and/or when land

[6] For more information on these particular programs see Soto-Baquero, Rodriguez-Fazzone, and Falcioni (2007).

keeping and production records do not exist. Although it is generally true that the mobility of hired labor allows them to relocate more easily to higher-wage sectors, when the affected sector is concentrated regionally, moving to a better job might imply relocating to a new region, which in itself might imply an unaffordable cost to hired workers. Evaluations of the Progresa program in Mexico and the Red de Proteccion Social in Nicaragua show the positive impact on the consumption of the targeted population, educational level, and the health of children (Rawlings and Rubio 2003). Like decoupled compensatory payments, the evidence suggests that farmers receiving conditional cash transfers use the cash flow primarily to improve the consumption profile of the household instead of making a productive investment (Rawlings and Rubio 2003, World Bank 2005). The use of receipts predominantly for consumption is expected given the high poverty level commonly observed among eligible households. However, the use of receipts for investment might be improved if recipients realize the temporary nature of these programs. Unquestionably, complementing conditional cash transfers with other programs such as technical assistance on production techniques and marketing, and investment in infrastructure, would likely improve the odds that households will wisely use the receipts for production purposes.

The conditional cash transfer program Family Allowances Program (PRAF for its initials in Spanish) was initiated in 1990 with the goal of compensating the income of extremely poor Hondurans for the negative economic impact resulting from the structural adjustment programs implemented during the 1990s. The compensation was conditional on achieving certain obligations depending on the particular components of the program. PRAF is a nationwide program reaching an average of 233,000 people in average

between 1992 and 1997, and expanding to reach 318,000 in 1998 and remaining close to that level thereafter. The original PRAF (also known as PRAF-I) had 6 components, namely: (1) a School Voucher program; (2) a Maternal and Child Voucher program; (3) a Comprehensive Female Development program; (4) a School Materials program; (5) a Senior Citizens Voucher program; and finally (6) a Nutritional Voucher program. Hence, PRAF-I focused only on demand-side interventions, leaving interventions in the supply side in the hands of other institutions such as the Honduran Fund for Social Investment (FHIS for its initials in Spanish) and the Ministries of Health and Education (Moore, 2008).

A pilot project known as PRAF-II was launched in 1998 under the auspices of the Inter-American Development Bank (IADB). Designed by the IADB and the International Food Policy Research Institute (IFPRI) based on the strengths and shortcomings of PRAF-I, PRAF-II proposed an improved, more objective and transparent targeting mechanism, better oversight of beneficiaries' compliance (PRAF-I did not enforced the conditionality of the program, thus becoming more a cash transfer program rather than a conditional cash transfer program) and, more importantly, addressed some supply-side variables such as school and health center infrastructure and formation of teachers and nurses. PRAF-II reached 70 municipalities and expanded to include 110,000 beneficiaries before its expiration in 2006. The design of PRAF-II included an evaluation scheme that would allow for a statistical assessment of both supply and demand interventions relative to a control group. In practice, though, this evaluation was never conducted due to a number of complications such as delays in the implementation of the interventions, and public interventions in control areas that changed the counterfactual (Inter-American

Development Bank, 2006). The results from an intermediate and a final evaluation (this last one from secondary data) suggest that PRAF-II transfers were too small to induce a significant change in the standards of living of the beneficiaries; PRAF-II transfers amounted to less than 4 percent of initial household expenditures on average, compared to 20 percent of Mexico's Oportunidades program and 18 percent of Nicaragua's Red de Proteccion Social program (Inter-American Development Bank, 2006). Furthermore, the transfer was done in two annual installments, hindering beneficiaries from connecting co-responsibility fulfillment and the receipt of payments (Moore, 2008). The most relevant recommendations for future improvements in the administration of PRAF were, at the institutional level, the need for depoliticizing this institution, and at the policy level, design feasible evaluation programs, avoiding complexities that hinder the assessment of program's outcomes.

A new pilot project known as PRAF-III was launched in 2007 with the goal of absorbing the best practices of PRAF-II within the existing PRAF-I program (PRAF-I continued concomitantly, although with some changes in form, throughout the duration of PRAF-II). Financed primarily by the Inter-American Development Bank, this pilot project will benefit some 20,000 households for 4.5 years, providing conditional transfers in the order of 18 percent to 20 percent of the expenditures of extremely poor rural families in four annual installments. PRAF-III expands the benefits granted by PRAF-II to children attending from first to sixth grade in order to encourage primary school completion (Moore, 2008).

The experiences in Honduras with the administration of PRAF have relevance in that they highlight the potential shortcomings that a new policy might face, and consequently

identify areas where careful design would be needed for a program to reach its intended goal/s. Furthermore, having a program like PRAF already working in Honduras could lower the cost of implementing a similar program targeted to those people or regions that are most likely to lose from the liberalization of the markets for sensitive products (World Bank 2007a). It also highlights geographical areas where agricultural adjustment programs might have a higher potential of success, benefiting from the efforts already being made by other public institutions as well as civil society organizations.

Technical assistance programs are also an alternative to help uncompetitive farmers become more efficient or transition into other production activities. The productivity of traditional agriculture in Honduras is the lowest among all Central American countries; the insufficient supply of capital to the sector (due primarily to its high economic risk) and the low human capital endowment of the rural population constrain the adoption of more appropriate technologies, which together with the decreasing level of public investment in agriculture, lead to low productivity levels (Sanders, Ramirez and Morazan 2006, Serna 2007). The low productivity of agriculture, which has remained practically unchanged for most basic grains over the past 15 years, has contributed to the reduction in the contribution of agriculture to GDP. Furthermore, along with the imperfect nature of input and output markets for most agricultural commodities, the low productivity of agriculture leads to low farm income levels, which increases the level of indebtedness and reduces the access to credit (Serna 2007).

Several developing countries have implemented technical assistance programs with the goal of improving the productivity of agriculture. Unlike conditional cash transfers, technical assistance programs are more heterogeneous. Some of them are designed to

address the adoption of new technologies and information without a financial component; others are designed to address both issues, which in developing countries are usually associated with each other. For instance, Argentina implemented Cambio Rural in 1994 with the goal of improving the competitiveness of small and medium-size farms through (1) the reorganization of their production activities, (2) the introduction of new technology, (3) the association among farms to improve their market leverage and increase their profits, and (4) the improved access to credit (Albanesi, et al. 2002). Financed by the Argentinean government, professionals, primarily agronomists and veterinarians, organize groups of eligible farmers, namely those whose net income was below a predetermined level. The most successful groups are those in which members have more homogeneous endowments of resources; numerous groups failed and were discontinued because of the limitations of working associatively with heterogeneous farmers. Although no comprehensive evaluation of the program has been done, a partial evaluation of the program, based on the information of a small number of groups, suggests that while the program fulfilled objectives (1) through (3) above, it failed to facilitate access to credit, despite the fact that members filled significantly more solicitations for credit than non-members (Albanesi, et al. 2002). All in all, Cambio Rural is still seen as a valuable and central program by producers, farm organizations, and the government.

The Basic Grain National Plan (PNGB for its initials in Spanish) implemented in Honduras in 2006 is another example of a technical assistance program aimed at improving the productivity and sustainability of basic grain agriculture. The PNGB is a flexible program, employing different interventions depending on the characteristics of

the target population. For commercial farms, the plan contemplates improving access to capital through the capitalization of the state-own National Bank for Agricultural Development (BANADESA for its initials in Spanish), and facilitating access to technical assistance through agronomists hired to attend the demands of farmers. For small, primarily subsistence farms, the PNGB introduced the Technological Stamp program (BT for its initials in Spanish), through which eligible farmers have access to inputs, namely, seeds and fertilizer, at subsidized prices, which have to be repay at designated institutions after harvest. The funds collected from the program are kept for financing future production. Thus, the BT programs is expected to contribute to improving the use of inputs among small basic grain farms and facilitating their access to credit, and consequently improving the productivity of these farms and improving food security among basic grain households.

No systematic assessments of either the PNGB or the BT program exist. Reports on particular experiences with regard to the BT program shed light on the main challenges faced when implementing the program, namely, ensuring the coordination among the public and private organization in charge of administering the program. Evidence from case studies also results in suggestions to improve the effectiveness of the program in achieving its target goals, namely, working towards better coordination among institutions involved with the administration of the program, making the program more flexible to account for differences among regions where the program is applied, and expanding the services that BT program offers to include technical assistance regarding production and financial management (Lainez et al 2007).

Another example of a technical assistance program operating in Honduras is the Farmer Training and Development program (EDA for its initials in Spanish). Financed by the Millennium Challenge Account, this program has the overarching goal of improving the income level and sustainability of some 8,000 target farmers (roughly 15,000 hectares, which indicates that participants are predominantly smallholders) by providing technical assistance in the sustainable production of high-value vegetables, promoting organization and cooperation among farmers, improving marketing strategies, and facilitating market access through business rounds with retailers and wholesalers. Eligibility to the program is conditional on a number of factors, such as willingness of farmers to adopt new technologies of production or to relocate resources into alternative products and to cooperate with program coordinators in the provision of crucial economic information for program assessment, and the availability of water resources (Farmer Training and Development Program n.d.). The large number of success stories reported by program administrators is the only evidence about the positive impact of the program, since no systematic assessment has been conducted to date. The information provided by administrators about the cost of the program leads us to infer that up scaling a program like this to reach a large share of basic grain farmers would be financially unfeasible in Honduras unless there is a significant increase in the funds that the government and donor organizations allocate into agriculture.

In conclusion, there are several alternatives to consider for adjustment programs, each having different goals, targets, and requirements for their implementation. Assuming a negative impact of DR-CAFTA on basic grain sectors, this study attempts to design and propose an adjustment program suitable for Honduras, taking into consideration both the

major limitations prevailing in this nation, and past as well as current experiences with programs aimed at improving the standards of living among the rural population in this nation.

1.4 OBJECTIVES

The overarching goal of this study is to evaluate the impact of DR-CAFTA on the basic grain sector of Honduras, that is, rice, corn (white and yellow), and beans, and to formulate policies that the government of Honduras could adopt in order to ease the potentially negative impacts that individuals involved in the production of basic grains might experience as a result of the increased competition resulting from DR-CAFTA.

The main hypothesis to be tested in this study is:

> *While DR-CAFTA will have a positive impact on economic growth in Honduras, households depending on basic grains as a source of income will suffer a significant decrease in their economic welfare.*

Consequently, the null hypotheses to be tested can be defined as follows:

1. *DR-CAFTA will have a negative impact on economic growth in Honduras.*
2. *Households depending on basic grains as a source of income will suffer a significant increase in their economic welfare.*

This study seeks to assess the economic, political, and administrative feasibility of alternative adjustment programs, and to advance in the proposal of the program(s) that could serve as roadmaps for serious policy discussion.

The driving hypothesis will be tested using a dynamic computable general equilibrium model, arguably the most sophisticated method for the analysis of economy-wide policy changes such as those implied by DR-CAFTA. The model is developed for this study and adjusted to the extent possible to reflect the particular characteristics of the Honduran

economy. The dataset to which the model calibrates is also developed particularly for this study based on information obtained from numerous public offices such as the Central Bank of Honduras and the National Institute of Statistics. Both the model and the dataset will be facilitated to public officials and any other organization with interest in expanding their analytical capabilities, thus fulfilling another goal of this study, that is, to contribute to the innovation in research methods used for policy analysis in Honduras.

2. BACKGROUND

Compared with the rest of the Latin American region, Honduras is a highly populated country, with roughly 7.2 million people in an area of 112,000 square kilometers (64 inhabitants/ km^2), and a population growth rate currently estimated at 2.5 percent[7]. Approximately 52 percent of the population is rural, and 80 percent of the rural population lives on the hillside. Its territory is dominated by hills, which occupy approximately 80 percent of the land. Only 15 percent of the total land, roughly 1.7 million hectares, is suitable for agriculture.

Despite the high rate of economic growth observed since 2000 and estimated at an average 5.6 percent annually, Honduras remains a relatively small economy compared with other Latin American nations, with an estimated GDP of USD 10.7 billion and an average per-capita annual income of USD 1,430 in 2006 (Banco Central de Honduras 2007b). The most relevant economic sectors are manufactures (primarily textiles and apparel), agriculture[8], and financial services, each accounting in average for around 21 percent, 14 percent, and 7.5 percent of the value-added in the period 2000-06. These sectors of the economy have experienced significant growth during the same period; for instance, the value of agricultural output grew over 25 percent from 2000 to 2006; for manufactures and financial services, the accumulated growth is much more significant,

[7] However, when compared with the Central American and Caribbean nations, Honduras is among the less populated territories.

[8] When agriculture is combined with manufacturing of agricultural products, the share increases significantly to over 30 percent.

reaching 39 percent and 190 percent, respectively[9]. The textile and apparel industry has grown significantly since the U.S. granted it new preferential treatment under the Caribbean Basin Trade Partnership Act (CBTPA).

Despite its significant expansion, the percentage contribution of agriculture to GDP has decreased significantly over the last several years. In fact, agriculture is the only economic activity whose percentage contribution to GDP has decreased in the last decade. Nevertheless, it continues to employ roughly a third of the total labor force, and remains by far the largest employer in rural areas. Moreover, and despite the decrease in its relative contribution (accounting for more than 70 percent of total exports in 1990), exports of agricultural products represent around 30 percent of the total value of exports over the last 5 years (Serna 2007).

The distribution of income in Honduras is highly unequal, with a Gini coefficient estimated at 0.53 in the early 2000s for Honduras as a whole, and 0.60 for rural areas only (De Ferranti, et al. 2003, Serna 2007). Income inequality is closely related with other basic needs such as access to health and education services. School drop-out and illiteracy rates increase significantly as income decreases. In the same way, demand for public health services also shows the same negative relationship with income; when this is contrasted with the poor conditions of the public health system, it is evident that the low income population faces severe constraints for accessing these services (United Nations Development Program 2006).

[9] The incredibly large growth of financial services coincides with a rapid increase in the value of remittances sent primarily from the U.S.

Economic growth in Honduras happens primarily in the so-called “development-T”, consisting of a central, north-south corridor from Puerto Cortez to Choluteca, and an east-west corridor on the Atlantic coastline. Over 60 percent of the population lives in the development-T; it includes the most important cities, receives most of the investment in infrastructure (airports, ports, roads, telecommunications, electricity, and water) and encompasses the most fertile valleys, such as Sula, Aguan, Comayagua, and Choluteca. The development-T excludes most small, poor rural communities (Falk 2003).

Poverty is, undoubtedly, the most urgent problem in Honduras. Over 75 percent of the population is poor, and roughly 55 percent lives in extreme poverty. The problem is even worse in rural areas, where poverty and extreme poverty affect 86 and 69 percent of the population, respectively (Serna 2007, World Bank 2005). Despite the relative macroeconomic stability attained during the 1990s, poverty and unemployment have grown. Governmental and non-governmental organizations designed and implemented numerous programs to help ameliorate the poverty problem. At the individual level, large migration, both domestically (rural-urban) and internationally (mainly to the U.S.) took place as a way to escape poverty. For instance, remittances amounted to USD 440 million in 2000 (6 percent of GDP), and the preliminary numbers estimated by the Central Bank of Honduras suggest they increased to USD 2.3 billion in 2006 (21 percent of GDP) (Banco Central de Honduras 2007a). Despite these efforts, poverty rates in Honduras continue on the rise.

In a somewhat contradictory way, however, economic well-being or standard of living as measured by the Human Development Index (HDI) has increased in Honduras from 0.5 in 1990 to 0.657 in 2003 and 0.664 in 2004. According to the United Nations

Development Program (2006), this improvement in the standard of living is the consequence of a more stable political environment, which enabled investment in health and education services. Nevertheless, in terms of standard of living as measured by the HDI, Honduras still ranks 115th among 175 nations worldwide and 30th among 33 Western Hemisphere nations, highlighting the still poor performance of this economy.

2.1 THE HONDURAN AGRICULTURAL SECTOR

Honduras is an agricultural country. Despite the growing importance of the textile and apparel industry, agriculture continues being the driving economic activity in most rural communities and, through its upward and to a less extent downward linkages, a relevant activity for urban areas as well.

The Honduran agricultural sector has had an erratic growth pattern, with an aggregate marginal growth over the last 30 years. While population and the GDP of non-agricultural sectors grew an average of 3.3 percent and 4.3 percent annually over the last 10 years, respectively, agricultural GDP grew at only 2.3 percent. Associated with this slow growth of agriculture is the relative low income generated by this sector, and the increase in poverty in rural areas where agriculture is the main economic activity (Gobierno de Honduras 2004).

The low average growth of agriculture hides important differences between agricultural sectors. For instance, sectors such as fruits and vegetables, oil palm, and shrimp have experienced extraordinary annual average growth rates, in some cases above 10 percent; on the other hand, traditional sectors such as bananas, cotton, or rice have decreased 3 percent per year on average. Other important sectors such as maize, beans, and coffee have achieved marginal growth rates over the last 30 years (Gobierno de Honduras 2004).

The relevance of agricultural exports has decreased significantly over the last several years, from 70 percent of total Honduran exports in 1990 to 33 percent in 2005; nevertheless, agricultural exports still represent a significant source of foreign exchange. The composition of agricultural exports has also shifted from predominantly traditional products such as coffee and banana, to non-traditional products such as tropical fruits, oriental vegetables, and fish.

2.1.1 TRADITIONAL AGRICULTURE

Traditional agriculture includes products such as banana, coffee, sugarcane, and basic grains, namely, beans, rice and maize. These activities have traditionally contributed to more than 70 percent of agricultural GDP, 50 percent of exports, and employed roughly 25 percent of the total labor force. However, their relevance in recent years has diminished as a result of low commodity prices, primarily for coffee, and substitution by non-traditional products such as melons, watermelons, pineapple, palm oil, vegetables, and numerous tropical fruits.

Following is a brief presentation of the basic grain sector, the focus of this study.

2.1.1.1 Corn

Corn, most of which is white, is the largest crop in term of area planted and volume of production, with an average of 335 thousand hectares and 492 thousand metric tons (tmt) between 2000 and 2006, respectively. The production in 2007 reached a historical record of 616 tmt, with a planted area of 395 thousand hectares, stimulated by the high prices,

the benefits of the Basic Grain National Plan[10] implemented by the government in 2006, and good weather conditions. According to the National Institute of Statistics (Instituto Nacional de Estadistica 2007), there were around 328,000 farms producing corn in the 2007-08 season[11]. Comparing this figure with that obtained by the Escuela Agricola Panamericana (2004), which suggests that there were some 70,000 commercial corn farms[12] in Honduras in 2003, we can infer that only 20 percent of the farms reporting corn production are commercial, meaning they produce primarily for the market. The figures in Appendix Table 1 show that all segments (by size) of farmers report market sales, and that this share is not negligible even for small farmers, which still sell roughly 25 percent of their aggregate production[13].

Corn is the second largest contributor to agricultural GDP after coffee, accounting for an average 8.2 percent over the last decade. However, its importance *vis-a-vis* other agricultural activities has decreased significantly over the last two decades as shown in Figure 2.1.

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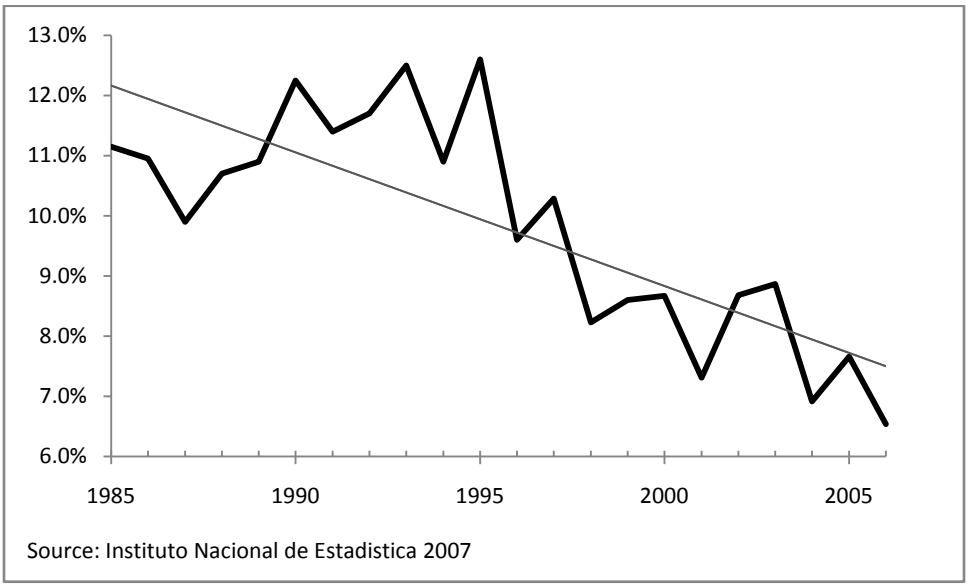
[10] The Basic Grain National Plan was implemented in 2006 with the goal of increasing production of corn and beans and thus contributing to food security, particularly among poor rural households. More information about the plan is provided below in this chapter.

[11] The minimum acreage to qualify as a basic grain farm is very low, roughly 0.08 ha. The total number of corn producers might be biased upward, since some farms might produce corn twice in the same year. However, according to comments from INE, this is not a common practice among corn farms, thus suggesting that the upward bias might actually be marginal.

[12] Commercial corn farms are defined as those participating actively in the market. Thus, subsistence farms, with sporadic participation in the market, are excluded from the definition of commercial farms.

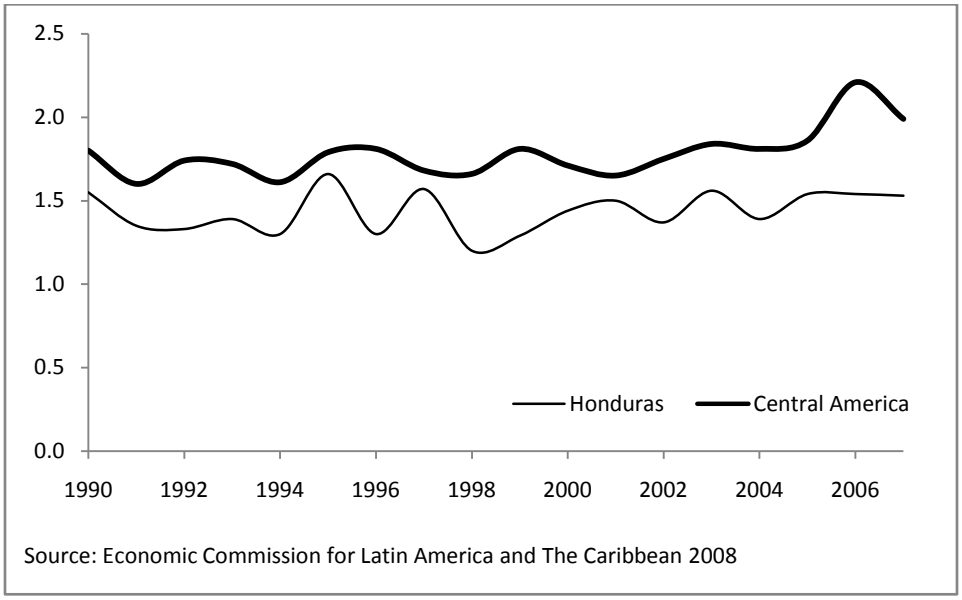
[13] This is in line with regional findings presented by Soto-Baquero, Rogriguez-Fazzone and Falcioni (2007), which suggest that even small subsistence family farms sell most of their production to the market. Hence, commercial farms as defined by the EAP must not be understood as commercial agriculture as defined by Soto-Baquero, Rogriguez-Fazzone and Falcioni.

Figure 2.1. Corn contribution to agricultural GDP



Overall, the average corn farm size in Honduras is small, roughly less than a hectare; at the same time, corn yields are very poor, even for regional standards, and have remained fairly stagnant at 1.5 mt/ha for the period 2000-07 (Figure 2.2 below).

Figure 2.2. Past trends in corn yields for Honduras and the Central American region.



The northeastern region (Department of Olancho) is the largest producer of corn with roughly 28 percent of the total volume of production and 26 percent of the corn land,

followed by the middle-east and northern regions. Corn farms in the northeastern region are characterized by their relative large size and high yield (an average of 13 hectares and 4 mt/ha, respectively).

Commercial production of corn is concentrated in the departments of Olancho, Colon, Yoro, and El Paraiso, where roughly 85 percent of the national production occurs (see Table 2.1 below).

An important feature of the Honduran corn and bean sectors is the large number of subsistence farms (see Appendix Table 1). Subsistence farms tend to concentrate on the hillside, and are characterized by their small size and rudimentary production techniques (SICTA 2007).

Table 2.1. Geographical distribution of commercial corn production, average size farm, and average yield.

Regions	Average farm size (ha)	Average yield (mt/ha)	Production (% of total)
Olancho	13	4	52%
Colon	15	4	16%
Yoro	5	3.5	16%
El Paraiso	6	3.5	13%
Other regions*	2.5	2.7	3%

Source: Escuela Agricola Panamericana, 2004.
* Atlantida, Comayagua, Copan, and Santa Barbara.

Regarding technologies of production, roughly half of commercial farms, operating half of the total area planted, employ traditional technology, meaning marginal use of inputs such as fertilizers, pesticides, and high quality hybrid seeds. Tilling in most of these farms is still performed with animals, and planting is primarily done by hand. The average yield of traditional corn farms approximates 1 mt per hectare, and their cost of production per mt is estimated to be 50 percent higher than that of large farms.

Traditional farming tends to be the predominant production method among small farms (Escuela Agricola Panamericana, 2004).

Medium-size commercial farms, planting an average of 3 hectares, generally employ better production technologies and have traditionally obtained yields of around 3.2 mt per hectare. Nevertheless, their performance is still poor compared with that of large farms, which obtain on average 4.2 mt per hectare at a cost 35 percent lower than medium and small farms (Escuela Agricola Panamericana 2004).

In aggregate, around 45 percent of the total commercial production of corn is self-consumed by farm households and the remaining 55 percent is commercialized. Food processors are the primary purchaser of corn, accounting for roughly half of the total volume of trade. The remaining is purchased by wholesalers and other intermediaries such as truckers. The relevance of self-consumption by farm households is much higher for small farmers, which in many cases do not market grain at all (Instituto Nacional de Estadistica 2007, SICTA 2007).

The importance of the different marketing channels depends on the size of the farms. Small farms tend to rely heavily on intermediaries, primarily truckers dedicated to collecting production in remote areas, given that their low volume of production, associated in many cases with poor accessibility, makes it economically infeasible to negotiate directly with the industry or the final retailer. As a result, small farms tend to receive the lowest price for their product, quality differences aside. Medium-size farms also rely heavily on wholesalers, although some direct sells to the industry and final retailers is reported. Finally, large farms allocate most of their output directly to the processing industry, thus obtaining the best prices.

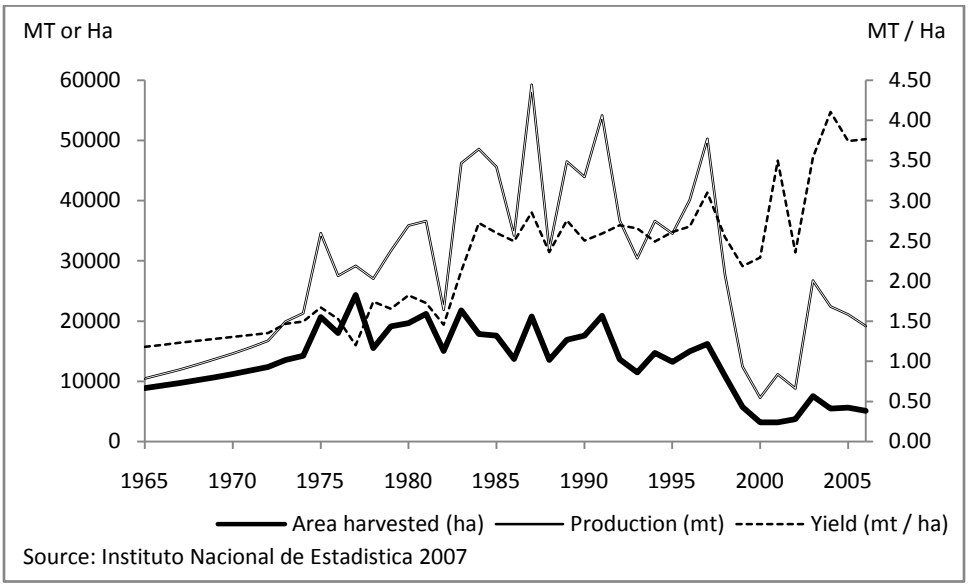
White corn is the primary source of calories in the basic food basket, contributing 28 percent and 48 percent of the caloric intake in urban and rural areas, respectively. Most maize is purchased as plain grain and processed by households. Corn is also used for the production of snacks and flour. The food processing industry sources roughly 20 percent of its demand for corn from domestic supplier, and 80 percent from imports (Escuela Agricola Panamericana 2004). Honduras is a net importer of corn; around a third of the total domestic consumption, equivalent to some 220 tmt a year over the last several years, has been satisfied by foreign suppliers, primarily the U.S. In fact, all yellow corn consumed by Honduras is imported, and used by the food processing industry for the production of animal feeds and, to a less extent, the production of snacks for human consumption (SICTA 2007). Imports of white corn have also increased significantly over the last years, from an average of 15 tmt per year during the period 1995-2000, up to 44 tmt annually for 2002-07, with a record high of 71 tmt (roughly 15 percent of domestic production) in 2005. Almost all imports of white corn come from the U.S. (Secretaria de Integracion Economica de Centroamerica 2008).

2.1.1.2 Rice

The relevance of the rice sector decreased dramatically during the 1990s, primarily due to its low competitiveness in the face of stronger foreign competition. In 1991, and due to food security concerns as a result of adverse weather conditions, the government of Honduras decided to drastically reduce import tariffs on paddy rice. Production dropped by more than a third in one year, recovered during the 1995-1998 period as a result of high world commodity prices, but fell sharply again to the lowest levels as a result of depressed commodity prices during the late 1990s and early 2000s (Figure 2.3). On

average, only 5,000 hectares per year have been planted since 2000, with an average output of 17 tmt. Despite a rising trend in land productivity, yields are far from their potential, and remain below regional averages.

Figure 2.3. Trend in rice production, area harvested, and yields over the last 40 years.



As a result of these rapid changes in market conditions, the structure of the rice sector was significantly altered. The number of farmers decreased sharply from an estimated 25,000 during the 1980s to slightly over a 1,000 in 2001. It is estimated that this activity employed directly and indirectly some 150 thousand workers in 1990; as of 2001, this figure shrunk to around 5,000 (OXFAM 2004); according to the National Institute of Statistics (INE for its initials in Spanish), there were only roughly 2,000 rice producers in 2006-07 (see Appendix Table 1).

The rice milling industry is highly concentrated, with only four firms accounting for over 90 percent of the total volume of rice milled domestically. It is important to notice that rice imports are almost entirely of paddy rice, to a large extent as a result of the significant tariff escalation on rice imports. This tariff structure generates large rents for

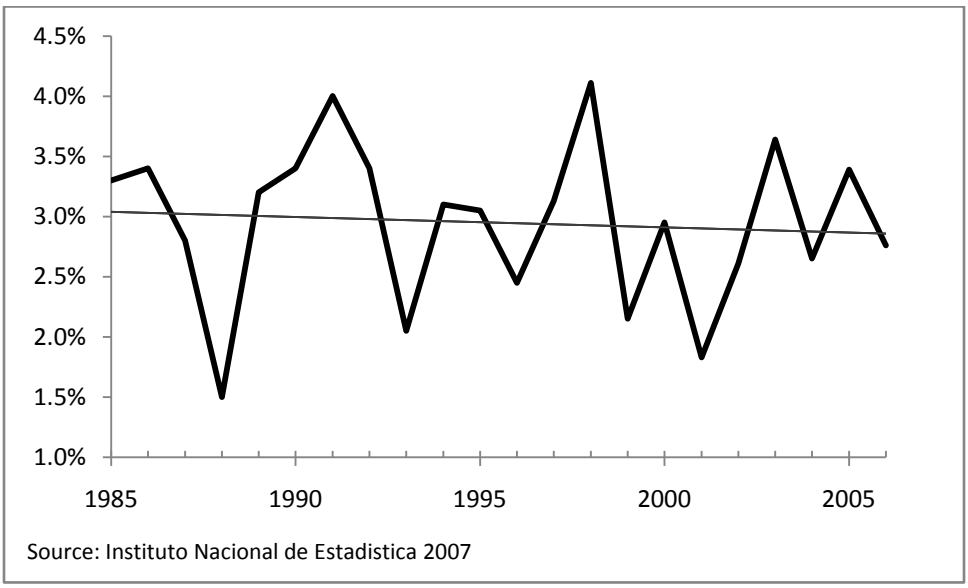
domestic millers, whose eligible volume of imports is a function of their purchase of domestic rice (performance requirement).

Domestic consumption amounted to approximately 150 tmt annually over the last five years, 87 percent of which is imported predominantly from the U.S. The high cost of production makes Honduran rice uncompetitive against U.S. rice. Farmers have been able to sell their production thanks to the performance requirements processors are subject to.

2.1.1.3 Beans

After corn, red beans represent the largest crop in terms of area planted and total production, with an average of 108,000 hectares and 73 tmt over the last ten years. In terms of contribution to agricultural GDP, it accounts for 3 percent on average over the same period, ranking sixth after coffee, corn, banana, sugarcane, and oil palm. As shown in Figure 2.4, despite its high variability, its average contribution to agricultural GDP has remained almost unchanged over the last several years.

Figure 2.4. Bean contribution to agricultural GDP



According to INE, there were 40,000 producers of beans in the 2006-07 period (see Appendix Table 1). The information from the National Agricultural Roundtable reveals that there were some 103,000 bean producers in the 1998-99 season; finally, the latest agricultural census of 1993 suggests the existence of 114,000 farmers whose primary activity was beans. These estimates reveal a sharp decreasing trend in the number of bean producers since the early 1990s.

This sector encompasses a large number of producers with different production capabilities. Sixty three percent of them operate less than 3.5 hectares and account for 50 percent of the area harvested and 45 percent of total bean production. On the other hand, producers operating more than 14 hectares of beans represent 16 percent of the total, account for 25 percent of the area harvested, and 32 percent of total bean production (see Appendix Table 1).

Beyond the strong yearly cycles observed, there is a negative trend in the area of production, with a yearly decrease of 6,600 hectares and an accumulated decrease of almost 50 percent from 1997-98 (144,000 hectares) to 2006-07 (77,000 hectares). This trend is partially offset by an increase in yields of around 20 percent during the same period; nevertheless, the volume of production has decreased 36 percent over the last ten years.

Like corn, there are a large number of subsistence farmers producing beans, and the fact that half of the production is self-consumed by farm households is evidence of it (Instituto Nacional de Estadistica 2007). Moreover, most small subsistence bean farmers produce on the hillside; this has relevant environmental implications given the ecological

fragility of these areas and the poor technological level characteristic of this group of farmers.

Commercial production of beans is concentrated in few regions, and is predominant in the valleys. For instance, the production in the departments of Olancho, El Paraiso, and Comayagua represent roughly 80 percent of commercial production (Table 2.2Table 2.2). There exist significant differences in terms of productivity among farms; large farms achieve yields that average 1.35 mt/ha; medium and small-size farms obtain averages of 1.2 mt/ha and 1 mt/ha, respectively.

Table 2.2. Geographical distribution of bean production, average size farm, and average yield

REGIONS	AVERAGE FARM SIZE (HA)	AVERAGE YIELD (MT/HA)	PRODUCTION (% OF TOTAL)
Olancho	2.5	1.4	38%
El Paraiso	2.5	1.3	30%
Comayagua	1.3	1.4	13%
Yoro	2.1	1.2	10%
Other regions*	1.4	1.1	9%

* Atlantida, Colon, Copan, and Santa Barbara.
Source: Escuela Agricola Panamericana, 2004.

Bean production is labor-intensive. For large farms, the cost of labor represents roughly 45 percent of total variable cost; for small farms, this share is around 54 percent (Escuela Agricola Panamericana 2004). Information obtained personally from DICTA indicates that for 2008 the share of labor cost to total variable costs for large farms is estimated at 32 percent, while for small farms it is estimated at 56 percent. Intermediate inputs represent roughly the same share of total variable costs for all bean farms. However, the use of capital, primarily machinery for tilling, is exclusive of large farms, and represents around 26 percent of total variable costs.

According to a study by the Escuela Agricola Panamericana (2004), the producer price represents approximately 75 percent of the retail price. This high share reflects the low

value added in the supply chain. The margins obtained by the different intermediaries are low, and their economic subsistence conditional on large volumes of trade.

Consequently, and unlike corn, the importance of the food-processing industry as a purchaser is marginal, and the role of intermediaries such as truckers is relevant, accounting for roughly 60 percent of the volume commercialized over the last several years (Instituto Nacional de Estadistica 2007, Escuela Agricola Panamericana 2004). Thus, the purchase price paid by intermediaries has become the reference price for beans.

Beans are a staple in Honduras, representing a cheap source of proteins and minerals, mainly iron. Per-capita consumption has grown slowly from around 6 kg to roughly 10 kg annually. All production and consumption consists of small red beans and, unlike corn, all production goes into human consumption. Beans are consumed primarily as grain, and only a marginal part is processed into fried and canned beans.

Had it not been for the large post-harvest losses, Honduras would have been self-sufficient with regards to red beans every year for the last ten years. However, losses of around 11.4 percent generate a deficit in the market that has been covered by imports. Imports of red beans grew from a marginal 503 mt or 0.5 percent of the total human consumption in 1998 to 10,000 mt or 17.5 percent of the consumption in 2006 (Instituto Nacional de Estadistica 2007).

2.2 Limitations of Basic Grain Supply Chains

In 2002, the Secretary of Agriculture conducted the National Agricultural Roundtable, a series meetings with key agricultural sectors (20 in total) to discuss the situation of the different supply chains in light of future trade negotiations Honduras was entering into, and to suggest future lines of work aimed at improving the competitiveness of Honduran agriculture, but also taking into consideration issues of food security and poverty, so

worrisome in this nation. Relevant information emerged from these meetings between government and representatives of the different agricultural sectors regarding the limitations to increase productivity and competitiveness. The information presented in this section originates primarily from this source.

Based on the findings from the Agricultural Roundtable, Sanders, Ramirez, and Morazan (2006) analyze the limitations by agent of the agricultural supply chains (see Table 2.3 below). These problems were enumerated by agents of the different supply chains, and can be seen as primarily, but not exclusively, traditional-agriculture problems. These limitations highlight the areas where assistance, either private or public, is needed. Evidence on the impact of outdated technology on the productivity of basic grains has been already presented, with significant differences in yield among farms, and a low national average compared to international and regional standards. An important aspect highlighted by processors and retailers is the poor quality of the products generated by these supply chains; this poor quality is closely related to the outdated production and post-harvest technology cited by all producers. Another limitation cited by all agents is the poor infrastructure and high cost of services that undermine the competitiveness of agricultural supply chains (Sanders, Ramirez and Morazan 2006). Limitations cited specifically by small farmers are the limited availability of financial resources and limited access to market information.

It is important to notice that there are several supply chains that have achieved a high level of competitiveness and have gained significant markets overseas. Such are the cases of the melon/watermelon industry, and the palm oil industry. These sectors share the

characteristic of being highly concentrated in intermediate stages, from transportation to final supply to retailers.

Table 2.3. Most relevant problems affecting the different agents throughout the agricultural supply chains.

Small farmers	• Outdated production and storage technology that limits both their productivity and quality of production. • Limited financial resources needed to adopt better production technologies. • Limited access to market information. • Poor infrastructure, such as roads, electricity, and irrigation. • High cost of services, such as electricity, and inputs.
Medium and large-size farmers	• Outdated production and post-harvest technology that limits primarily their productivity and, to some extent, the quality of production. • Poor infrastructure, such as roads, electricity, and irrigation. • High cost of services, such as electricity, and inputs.
Wholesaler	• Poor quality of product, which constrains the marketing opportunities for these products. • Poor infrastructure, primarily roads, which increases transaction costs.
Processor	• Poor quality of product and high price due to inefficiencies in previous stages of the supply chain, which lowers the competitiveness of the sector. • Limited financial resources needed to adopt better processing technologies. • High cost of inputs, such as electricity.
Final retailer	1) Poor quality of domestic products, which at similar prices cannot compete with higher-quality imports from other countries.

Source: Sanders, Ramirez, and Morazan (2006).

Appendix Table 2 presents the limitations cited by all agents and organized in 8 main areas of interest, namely (1) market and business development; (2) institutional development; (3) financing; (4) rural infrastructure; (5) promotion of technological innovation and production diversification; (6) sanitary and phytosanitary measures; (7) sustainability of natural resources; and (8) education and training.

As can be seen, agents identified numerous areas where assistance is needed. Given the variety of concerns, attending all of them would require coordination between different levels of government, between the private and public sector, and among agents of each supply chain. Furthermore, it would likely imply an increase in the resources, both public

and private, that need to be allocated to the basic grain sector, and a reallocation of public resources into more efficient uses.

2.3 Alternatives to Basic Grain Production

Given the increase in competition in basic grain markets expected as a result of the implementation of DR-CAFTA, the government and other organizations with interest in agricultural and rural issues must evaluate the challenges for those who depend on basic grains as a relevant source of income, and work towards developing the conditions for viable income-generating strategies that help them afford a reasonable standard of living. For producers with production potential in more competitive markets, assistance must focus on (1) transferring new technology of production and post-harvest handling; (2) investing in infrastructure, primarily roads [14], irrigation systems, and drying and storage facilities, and (3) promoting more efficient markets, such as developing market information systems available to all agents in the supply chain.

Small commercial farms and subsistence farms face a number of limitations that would likely impede most of them to compete under the new market conditions. For these basic grain producers, it is imperative to identify potential alternatives and work on developing the conditions for these alternatives to become viable options. Among the alternatives we can cite (1) switching to the production of export products, preferably those with expanding markets; and (2) shifting resources into the production of commodities with increasing opportunities in the domestic market.

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[14] A study by the World Bank (World Bank 2007b) shows that, for Honduras, (1) investment in roads is below average regional levels (1.3 percent of GDP a year for the period 2002-2005); (2) the road service is below average regional standards (0.45 km/ 1,000 people compared to 0.63 for the Central American region); (3) and the road density is also below average regional standards (29 km/1,000 km^2 compared to 55 for Central America). On the other hand, Honduras ranks high regarding quality of roads.

An analysis of past trends in agricultural exports shows that Honduras has lost market share for many agricultural and food products in the U.S., and this has occurred primarily in shrinking U.S. markets (see Appendix Table 3). These ex-post analyses highlight the need for Honduras to diversify agricultural production and exports, finding markets in the U.S. and elsewhere for products for which Honduras has proved to be competitive.

In fact, there are numerous agricultural and food products for which Honduras has advantages in other markets worldwide but the U.S.

Using the revealed comparative advantage index (RCA), Monge-González (2004) identifies a large list of products Honduras should consider for export promotion (see Appendix Table 4).

An analysis of more recent trade data shows that new agricultural trade is being created for a number of products. After their introduction in the mid 1990s, export of oriental or Asian vegetables such as bittermelon, Japanese eggplant, and oriental squash, most of which goes to the U.S., have increased rapidly from 900 mt exported to the U.S. in 1998 to 6,750 mt in 2006. The production of oriental vegetables has expanded primarily among small independent farmers in the Comayagua Valley. There are currently 4 firms authorized to export to the U.S. (Fundacion Hondureña de Investigacion Agricola 2007).

Policies are needed also for workers currently employed in the basic grain sector. The reduction in the number of primarily small labor-intensive farms would release a large number of workers, which are not likely to be absorbed by expanding, medium and large basic grain farms, creating an excess labor supply in rural areas where basic grains are concentrated. This excess supply would have to be allocated into either new agricultural activities, new rural businesses, or migrate to other regions (within and outside the

country) in search of new, and hopefully better income opportunities. Hence, policies should aim at creating the conditions necessary for workers to relocate into other production activities.

The transformation of basic grain production, which in turn depends partially on the development of proper policies as cited previously in this section, would likely be associated with the generation of new businesses (input and service suppliers) in rural areas (also dependent on the creation of proper policies and incentives). The expansion of agriculture into alternative, higher-value crops based on resources freed-up by basic grains will also demand workers and likely spark the expansion of businesses into these rural areas. From the above we can see that the fate of workers currently employed in the basic grain supply chains depends greatly on the private and, to a larger extent, public policies adopted to deal with the changing market environment implied by DR-CAFTA.

2.4 The Political Context in Honduras

Poverty and crime have been the most relevant underlying issues in the formal agendas of government since the early 2000s. Regarding poverty, in 2001, and after a fluent dialog between the government and different representatives of society, Honduras developed the Poverty Reduction Strategy (ERP for its initials in Spanish). The ERP is a long-term state policy strategy, built on the basis of the World Bank/United Nations Millennium Development Goals, that guides public action regarding poverty reduction, with the overarching goal of reducing poverty by 24 percent in 15 years through specific actions in 6 main areas: (1) stimulating sustainable economic growth; (2) reducing rural poverty; (3) reducing urban poverty; (4) investing in human capital; (5) improving welfare protection for specific groups; and (6) ensuring the sustainability of ERP.

The government of President Maduro (2002-06) was in charge of implementing the ERP, obtaining most of the funds for its implementation through foreign debt relief and international cooperation. Despite the efforts made to fight poverty during the first half of the current decade, the national poverty rate actually increased slightly between 2001 and 2005. However, poverty decreased over 5 percentage points between 2005 and 2007, possibly as a result of the accumulated effects of the ERP over the years (Unidad de Apoyo Tecnico, 2007b).

Significant reform has been undertaken at the public level since 2006 to facilitate the implementation of the ERP. The new administration advocates for a change in governability based on three pillars, namely (1) increasing the participation of the society in the policy process at all levels, (2) improving the transparency in the use of resources, and (3) taking strong actions to fight poverty. To that end, numerous laws were enacted and institutional reforms undertaken; to date, however, no assessments of the impact of these reforms have been conducted.

With regard to rural poverty in particular, the efforts of the government during the year 2006[15] centered in the following areas: (1) improving the conditions of proprietorship in rural areas, with the release of some 9,000 titles of property ownership; (2) strengthening the funding of the National Program for Sustainable Rural Development (PRONADERS for its initials in Spanish), through which producers receive technical and financial assistance; (3) strengthening the funding of other programs aimed at promoting the sustainability of natural resources in the most vulnerable areas of the nation; (4) improving the information services provided through INFOAGRO; (5) implementing the

[15] This is the latest year for which a report on the progress on the ERP is available.

Technological Stamp Program; and (6) endowing financial institutions serving the rural sector to improve their services in these areas (Unidad de Apoyo Tecnico 2007a).

Although the political rhetoric seems to indicate that the current government of President Zelaya has emphasized more the fight against poverty than its predecessor, this does not translate into the allocation of more resources to this end. ERP funds have averaged 8.2 percent of the GDP (USD 650 million) for the 2000-06 period. Furthermore, analysts argue that the allocation of these resources is still sub-optimal, with salaries and wages for education and health accounting for 45 percent of the budget dedicated to fighting poverty (World Bank 2007). Furthermore, while the most worrisome poverty estimates are in rural areas, only 7 percent of the ERP budget went to the reduction of poverty in rural areas in 2006 and 2007 (Unidad de Apoyo Tecnico 2007b).

With the goal of improving the efficiency in the use of resources devoted to the fight against poverty, the President created the Red Solidaria (Solidarity Network) in 2006. This institution, administered by the Office of the First Lady, acts as a link between the activities of the government and civil society organizations with the goal of coordinating and complementing their actions aimed at improving the living conditions of the poor. In spirit, the goal of the Red Solidaria is very important, and has the potential to increase the effectiveness of pro-poor interventions. However, analysts question the political viability of the Red Solidaria beyond the current administration, since it is seen as a government rather than a state policy and, consequently, subject to changes with the electoral cycle (Moore, 2008). Furthermore, transferring the administration of ERP programs to Red Solidaria might also hinder progress on the implementation of this state policy initiative.

In conclusion, the political context is prone to accept the introduction of new issues related to poverty and crime in the relevant formal agendas. Hence, it is advisable to define the problem of basic grain producers in light of DR-CAFTA in such a way as to make the linkage between it and the fight on poverty clear.

2.5 Agricultural Policy Framework

Based on the findings from the National Agricultural Roundtable and the consensus of relevant groups with a stake in agriculture and rural issues, the Government of Honduras defined its policy plan for the agricultural, food, and rural sectors. The State Policy for Agriculture, Food, and Rural Environment 2004-2021 (PESA for its initials in Spanish) serves as the guide for future agricultural and rural policies. It advocates for a new, broader view of agriculture, which encompasses the sectors that are linked backward and forward to primary production and that constitute the agricultural and food supply chains; furthermore, it acknowledges the linkages between agriculture, the rural sector, and the entire economy (Table 2.4). This new paradigm demands significant reform at the institutional level to cope with the new responsibilities of the relevant public agencies, some of which was already undertaken.

The overarching goals of PESA are: (a) to transform the agricultural and food sector with the objective of increasing its contribution to economic growth, and (b) to reduce rural poverty and enhance food security, not through public assistance but through genuine economic growth.

Table 2.4. Elements in the new agricultural paradigm

ELEMENTS OF THE NEW APPROACH	IMPLICATIONS
Broad view of agricultural sector	• Grant increasing importance and attention to other sectors participating in the supply chain • Policies expand beyond the domain of the Secretary of Agriculture
Recognition of the strong linkages between the agricultural and rural sectors	• Improve the cooperation and networking among public agencies and private interests, creating the forums where this interaction can take place in an organized way
Decentralization of functions traditionally performed by the Secretary of Agriculture	• Create a smaller, more efficient administration with the primary goal of promoting the creation of markets for basic services such as research and extension

Source: Gobierno de Honduras, 2004.

PESA calls for close coordination of policies at different levels in order to promote agricultural and rural development, and for the development of proper multi-sector policies in areas of food security and rural development, for which the coordination of activities between health, education, and agricultural agencies, among others, is crucial. Finally, with the goal of (a) improving agricultural competitiveness and quality; and (b) stimulating agricultural production and supply chain integration, PESA highlights the eight main areas agricultural policy must focus on, namely (1) market development and trade negotiations; (2) food safety and quality; (3) technological development; (4) investment in human capital (improvement of education in agricultural schools, training workers and producers, promoting agribusiness development); (5) promotion of agricultural investment and risk management techniques; (6) rural infrastructure development; (7) natural resource sustainability; and (8) improvement of access to land and private property rights (see Appendix Table 5).

PESA promotes institutional reform aimed at increasing the efficiency and transparency in the use of resources and strengthening the legitimacy of policies, programs, and

services. To this end, decentralization of activities, facilitation of channels for public participation in the formulation of policies and programs, and increasing the social capital of public agencies are among the reforms PESA encourages. Furthermore, PESA highlights the importance of encouraging the participation of the private sector in the market for numerous services such as extension and research. Up until the early1990s, the government financed most of the agricultural technology and extension services. Despite the significant public resources devoted to research and development, these programs proved to be inefficient, and the achieved levels of productivity were far inferior to the target level (Serna 2007, SICTA 2007). Increasing the participation of the private sector is seen as the only option to improve the supply of services in rural areas, including agriculture. Consequently, PESA advocates for a change in the role of the government from intervention in the market to regulator and facilitator of private markets for rural services.

Within this policy umbrella, the government implements some programs targeted exclusively to the basic grain sector; some of these programs date back to the 1990s, while others have been implemented more recently under the guidelines of PESA.

2.6 Public Programs for Basic Grains

Honduras maintains a number of programs involving basic grains with the goal of protecting the domestic market from foreign competition and promoting domestic production. Following is a brief description of the most relevant interventions.

2.6.1 Import Price Bands

A system of import price bands has been in place since 1992 for corn, corn flour, and sorghum (at some point it also included rice); it was implemented with the goal of ameliorating the domestic impact of fluctuation in international prices. When the

reference international price decreases (increases) below (above) certain level, a duty is added (discounted) to the fixed, 15-percent ad-valorem import tariff so as to avoid a proportional decrease (increase) of prices in domestic markets (Unidad de Apoyo Tecnico 2005).

The reference price is estimated by the Honduran Institute of Agricultural Marketing (IHMA for its initials in Spanish), who every year defines the price bands based on an international reference price (Gulf of Mexico) and transaction cost estimates. The specific import duties are estimated and collected by the Executive Directorate of Income (DEI for its initials in Spanish). The latest available information on applied import tariffs correspond to the marketing seasons 2002-03 and 2003-04, and show that the average applied import tariff was 15 percent and 10 percent for corn and 13 percent and 10 percent for sorghum, respectively.

2.6.2 STRATEGIC RESERVES

The IHMA also administers the strategic reserves of beans and white corn, aimed at preventing a market deficit and food security crisis. The reserves, which by law should be equivalent to 3 percent of the annual national consumption of beans and corn, must be made readily available in those markets where a deficit is observed. These reserves have lately been used to counter the behavior of speculators and maintain the market price at reasonable levels.

2.6.3 PURCHASE AGREEMENTS

Another approach taken to protect basic grain producers from increasing competition is the signing of purchase agreements between food processors and organized farmers[16]. These agreements set the purchase price[17] that the industry commits to pay, as well as the volumes they are willing to purchase from domestic producers. As counterparts, food processors obtain import rights according to the amount of domestic production they purchase, these relationships being of the order of 4 to 1 (imports to domestic) for yellow corn and paddy rice, and 2 to 1 for white corn. These import rights are subject to a lower import tariff of 1 percent for corn and sorghum and zero for paddy rice. Most imports of corn and rice are performed under these conditions, and consequently only a marginal tariff revenue is collected (Unidad de Apoyo Tecnico 2005). The marginal effective tariff on these staples explains why most analyses of DR-CAFTA forecast only marginal changes in the domestic markets for basic grains. However, the comparative advantage of the U.S. in the production corn and rice suggests that the impact could be much more significant.

Although it is not clear from the text of the DR-CAFTA agreement that these sectoral accords would expire after certain time, it is the understanding of analysts and public officials that they will remain in place until DR-CAFTA is fully implemented for each of the commodities involved, that is, year 18 and 15 for rice and yellow corn, respectively

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[16] Large, organized farmers reap most of the benefits obtained from these agreements. Small farmers, constrained by their lack of association, usually do not participate of these negotiations with the food processing industry.

[17] The purchase price is estimated based on a formula that takes into consideration (1) the reference import price (for yellow corn, this is U.S. No 2, CBT; plus (2) transaction costs associated with the movement of the product from the production areas to the export board, and from the import board to the storage facility; plus (3) freight and insurance costs; plus (4) a 20-percent price premium.

(Unidad de Apoyo Tecnico, 2005). The expiration of these sectoral accords associated with the full implementation of DR-CAFTA would likely lead to the substitution of U.S. yellow corn for domestic white corn used by food processors [18]. Considering that the industry absorbs roughly 15 percent of the domestic production of corn and 70 percent of the domestic supply of rice, this could have a significant impact for many households whose income depends greatly on these basic grains.

2.6.4 NATIONAL PLAN FOR BASIC GRAINS

The government implemented the Basic Grain National Plan (PNGB for its initials in Spanish) in 2006 with the goal of improving food security among the rural population and the generation of surpluses among small farmers producing basic grains through the improvement of their productivity resulting from the use of more appropriate technologies of production. This plan contemplates improving the financial resources available to producers of basic grains, reducing the risk of production by encouraging the adoption of agricultural insurance, and subsidizing inputs to small farmers, thus ensuring a higher production and the adoption of high-quality seeds.

The principal component of PNGB for small farmers is the Technological Stamp program (BT for its initials in Spanish), a certificate emitted by the government to eligible farmers that can be used for the purchase of fertilizer and certified seeds for up to 0.7 hectares, conditional on the future repayment of the loan to eligible, local microfinance institutions, which are also in charge of distributing the stamps in all communities. These

[18] According to personal comments from industry leaders, today it is economically rational to purchase domestic white rice for processing, since by doing this they get to import yellow corn at preferential rates. With the expiration of the sectoral agreements and the full liberalization of trade, they argue it is likely that the industry will substitute yellow for white corn to a large extent.

institutions hold the repayments and use them for financing future production, thus improving small farmers' access to capital in rural areas. The PNGB also contemplates the provision of technical assistance to farmers through group meetings, for which 140 professionals were hired during the 2006-07 season.

According to the Secretary of Agriculture, there are some 80,000 farmers eligible for the BT program, namely, those operating less than 4 hectares, dedicated to basic grains. The program is administered by the Direction of Agricultural Science and Technology (DICTA for its initials in Spanish), dependent of the Secretary of Agriculture. In turn, DICTA delegates most of the administrative activities of the BT program to the Inter-American Institute for Cooperation on Agriculture (IICA).

The cost of the program was roughly L 100 million (USD 5.3 million) in 2006, and was financed by a number of projects, such as PRONADEL (National Local Development Program) and the Rural Productivity and Forests Project. Roughly L 120 million are available for the implementation of the BT program and another additional L 30 million for the provision of technical assistance in the 2008-09 production year.

As part of the PNGB and primarily targeted to commercial farms, the government of Honduras funds a trust for the financing the production of basic grains; the trust is administered by the National Bank for Agricultural Development (BANADESA for its initials in Spanish). Sixty percent of the L 500 million available for the 2006-07 season were actually borrowed by some 9,000 producers. The remaining L 200 million were offered as collateral to agricultural loans offered by private banks. The funds available for financing the production of basic grains in the current season are almost double those available in previous years. Furthermore, the interest rate on these loans is set at

preferential levels, several points lower than the rate in the financial market, to encourage on-farm investment. Furthermore, the government, through a fund of L 25 million administered also by BANADESA, offers a 50-percent subsidy rate on agricultural insurance; this program has benefited some 500 producers of basic grains per year since 2006.

The trust created by the government as part of the PNGB came to revert years of decreasing financial resources available to agriculture through the public banking system. On average, BANADESA devoted some L 80 million a year during the 1990s to finance agriculture, and most of these funds were employed specifically to finance basic grains, primarily corn. The number of agricultural loans granted by BANADESA decreased significantly from 60,000 in 1991 to 10,000 in 2004. All credits are short-term, basically to finance current production.

Financial resources available for agriculture through private banks have decreased over the last several years, particularly after hurricane Mitch. For instance, the Honduran Coffee Bank (BANHCAFE for its initials in Spanish), a private bank created with capital from coffee growers with the objective of financing agricultural production, today devotes only 30 percent of its resources to agriculture as a result of the high risk of these loans (Villalobos, Deugd and Ochoa 2006). From the L 50 million available in 2001 and 2002, agricultural loans from private banks decreased to L 10 million in 2004. According to the private banking sector, the main reasons leading to such a low service to agriculture are:

1. Farmers' culture of no-repayment, partially encouraged by the government and its policy of writing off agricultural debt.

2. Lack of assets that can be accepted as collateral. Land represents the main asset farmers own and almost the only asset for small farmers. Although most farmers own their lands, many do not have property titles. This situation is more common among small, subsistence farmers.
3. High risk of agricultural production due to poor technological level, no diversification of production, scarce technical assistance, insufficient on-farm and off-farm infrastructure, and poor management of risks, which consequently leads to the high risk of financing the agricultural sector.

As a result of these limitations, roughly 93 percent of the financial resources were allocated among a few hundred large farmers owning over 1,500 hectares with their respective property titles. Overall, only 3 percent of farms dedicated to basic grain production received some type of financing by formal institutions (Instituto Nacional de Estadistica 2007).

Besides banks, there are other institutions offering financial services, such as cooperatives and development organizations. Although quantitative data on the allocation of financial resources from these institutions is hard to find, it is estimated that these non-traditional financial institutions allocate more funds to agriculture than private banks. For instance, cooperatives allocated roughly L 1,100 million to finance agricultural production in 2004. However, there is a trend to move their services out from agriculture and into other urban activities (Villalobos, Deugd and Ochoa 2006).

Finally, another important source of financing are input suppliers, wholesalers, and other upper-level intermediaries participating in the different agricultural supply chains. Unfortunately, it is hard to quantify how much of the production is financed in this way;

what is commonly accepted is that the cost of these loans are significantly higher than those offered by other institutions (Villalobos, Deugd and Ochoa 2006).

2.7 Estimation of Agricultural Support

Honduras's support to agriculture was estimated at USD 107 million in 2003, the only year for which the total support estimate (TSE[19]), as defined by the Organization for Economic Cooperation and Development (OECD), has been estimated.

According to the Total Support Estimate (TSE), Honduras is among the lowest supporters of agriculture (in nominal terms) among Central American nations; only Nicaragua and Panama devote less resources, in nominal terms, to agriculture. In relative terms, however, Honduras provides the lowest level of support to agriculture, with the TSE representing only 1.5 percent of GDP, and 13 percent of agricultural GDP[20] (compared these figures with the 2.14 percent and 17 percent for Central America as a whole, and 0.86 percent and 78 percent for the U.S.).

The Producer Support Estimate (PSE[21]) represents 90 percent of the TSE, the remaining corresponding to General Service Support Estimate (GSSE[22]). Within the PSE, the main

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[19] *Total Support Estimate (TSE)*: An indicator of the annual monetary value of all gross transfers from taxpayers and consumers arising from policy measures that support agriculture, net of the associated budgetary receipts, regardless of their objectives and impacts on farm production and income, or consumption of farm products.

20 Serna (2007) also highlights the insufficient and decreasing trend of public expenditure in agriculture. It went from 11 percent of the public budget in 1990 to 3.5 percent in 2005.

21 *Producer Support Estimate (PSE)*: An indicator of the annual monetary value of gross transfers from consumers and taxpayers to support agricultural producers, measured at farm gate level, arising from policy measures that support agriculture, regardless of their nature, objectives, or impacts on farm production or income. PSE contributions can be further disaggregated into market price support (MPS) and fiscal support.

22 *General Services Support Estimate (GSSE)*: An indicator of the annual monetary value of gross transfers to general services provided to agriculture collectively, arising from policy measures that support agriculture, regardless of their nature, objectives, and impacts on farm production, income, or consumption of farm products.

mechanism to support agriculture is Market Price Support (MPS[23]), namely, maintaining domestic prices at a level higher than reference border prices. MPS represents 90 percent of the Honduran PSE in 2003, the remaining corresponding to direct fiscal resources (provision of private goods). In other words, border protection for imported agricultural commodities provided most of the support to agriculture. However, this situation is going to change significantly as a result of DR-CAFTA, which has the potential of significantly lowering the effective border protection and, given the relevance of MPS in TSE, the total level of support to agriculture (Arias 2007).

Table 2.5. Total support estimate for Honduras, the DR-CAFTA region, and the OECD region, disaggregated by components (USD million)

INDICATOR	HONDURAS	DR-CAFTA REGION	OECD
Producer Support Estimate	96 (90%*)	1,856 (86%*)	257,285 (74%*)
Market Price Support	64 (67%**)	1,631 (88%**)	160,469 (62%**)
Fiscal Resources	32 (33%**)	225 (12%**)	96,816 (38%**)
General Service Support Estimate	11 (10%*)	174 (8%*)	61,979 (18%*)
Research and development	1.38 (12%***)	21.12 (24%***)	6049 (10%***)
Agricultural Schools	1.26 (11%***)	18.08 (20%***)	1781 (3%***)
Inspection Services	2.35 (21%***)	17.43 (19%***)	2291 (4%***)
Infrastructure	5.62 (50%***)	22.83 (25%***)	19943 (33%***)
Marketing and Promotion	0.42 (4%***)	6.86 (8%***)	24791 (41%***)
Public Stockholding	0.22 (2%***)	0.22 (0%***)	2223 (4%***)
Miscellaneous	---	3.43 (4%***)	3673 (6%***)
Consumer Support Estimate	-71	-1,828	-153,793
Total Support Estimate	107	2,149	349,808

* Percentage of TSE; ** Percentage of PSE; *** Percentage of GSSE
Source: Arias (2007).

[23] *Market Price Support* (*MPS*): An indicator of the annual monetary value of gross transfers from consumers and taxpayers to agricultural producers arising from policy measures creating a gap between domestic market prices and border prices of a specific agricultural commodity, measured at the farm gate level.

The total value of fiscal resources devoted to support agriculture equals the sum of GSSE and direct fiscal resources. An analysis of these resources highlight two main characteristics of the structure of agricultural support in Honduras: (1) the low level of fiscal resources (USD 43 million) allocated to agriculture support; and (2) the concentration on the provision of private rather than public goods (3 to 1 ratio), meaning that Honduras devotes three times more fiscal resources to support producers directly than to finance rural public goods. Furthermore, half of the resources devoted to the provision of public goods go into infrastructure, and another 21 percent goes into inspection services. In relative terms, Honduras invests roughly the same as other Central American nations in inspection services but significantly more than the group of OECD countries; regarding investment in infrastructure, Honduras is considerably above the average for the Central American region and OECD countries (25 percent and 33 percent, respectively), and is lagging far behind in marketing and development (Arias 2007). The differences in the allocation of these resources between Central America in general, and Honduras in particular, and the group of OECD countries reflects some of the different priorities these countries have, and point to the potential challenges that Honduras might face when liberalizing trade with OECD countries, particularly the U.S.

Data on PSE by crop reveals that rice, dairy, and hog farms receive the largest support, with a PSE%[24] of 68 percent, 54 percent, and 32 percent, respectively. Other crops that receive significant support are sugar (21 percent) and corn (10 percent). The large support received by the rice sector is striking, given that there are only some 2,000 producers and the sectoral output represented only 0.2 percent of agricultural GDP in 2003. On the other

[24] PSE% is estimated as the percentage of the PSE over total producer revenue.

hand, corn farms receive a much lower level of support, despite the fact that there is a much larger number of corn farmers and that the output value represented roughly 5 percent of agricultural GDP in 2003. Overall, rice farmers receive, on a per-hectare base, 21 times more support than corn farmers (Arias 2007).

The exogenous change in the structure of agricultural support mandated by trade liberalization increases the pressure on the already precarious public budget. Considering that, even with the level of market price protection offered to some crops such as rice and corn, numerous producers are struggling to make a profit, the future scenario of shrinking MPS as the implementation of DR-CAFTA advances raises serious concerns about the viability of farms, at least if the current production and market conditions prevail. It is then crucial to devote more resources, but particularly, make a more efficient use of the funds devoted to develop adjustment policies and programs to maximize the benefits (minimize the costs) from trade liberalization.

Another relevant source of information on domestic support to agriculture is the country's notifications to the WTO, which Honduras has reported yearly since 2001. All the domestic support to agriculture provided by Honduras qualifies as green payments[25]; over half of the these funds since 2001 have been allocated into training services, predominantly to the conservation and sustainable management of natural resources. These figures complement the total support estimate presented above, and highlight the insufficient support received by Honduran agriculture. It is also alarming to see the underfunding in areas such as sanitary and phytosanitary services, highlighted by analysts

[25] According to WTO's classification of domestic support, green-box payments are those that do not distort trade or, at most, cause minimal distortion (Agreement on Agriculture, Annex 2).

as a key area to enhance market access of Honduran products (Arias 2007, Todd, Winters and Arias 2004).

Table 2.6. Honduras: notification on domestic support to the World Trade Organization (USD 1,000)

Measure Type	Years				
	2001/02	2002/03	2003/04	2004/05	2005/06
General Services	1,636	3,178	11,613	31,492	271
1. Training services	1,355	1,355	1,877	25,515	46
2. Research services		111	79	2,054	7
3. Extension services			2,099	3,923	205
4. Sanitary and phytosanitary services	281	1,712	1,901		0
5. Infrastructure services			3,587		
6. Marketing and promotion services			2,070		13
Investment Subsidies Generally Available to Agriculture	1,634	1,042	2,192	2,023	31
Total Domestic Support	3,270	4,220	13,805	33,515	302

Source: own estimations based on Honduras's WTO notifications on domestic support to agriculture.

2.8 Conclusions

The evidence presented in this chapter suggests that achieving the rates of growth necessary to reduce poverty and improve the standard of living of the population is conditional on the performance of the agricultural and food sector. It is crucial to improve the productivity and competitiveness of many traditional agricultural sectors, by adopting modern production technologies, improving the efficiency of input and output markets, and facilitating the reallocation of resources into the production of commodities for which Honduras has shown to be competitive.

As acknowledged in the PESA, achieving these ambitious goals requires significant institutional reforms, coordination of efforts across private and public agents, and economic resources. The limited resources devoted to agriculture over the last several years, the recurrent budget deficits run by the government, and the limitations to serve the external debt cast doubts about the feasibility of many of the reforms proposed by PESA,

and highlight the need for increasing the efficiency in the use of the scarce resources available, and searching for new ways to finance agricultural public policy. External cooperation and increased foreign direct investment in agriculture are promising sources of funds that need to be expanded.

3. METHODOLOGY

3.1 INTRODUCTION

Analysts have an arsenal of research methods that can be employed for assessing the impact of trade policy reform on specific groups of agents and the economy as a whole. There are numerous classifications of research methods for policy analysis according to the particular specifications of the models and the specific areas of research. For instance, a classification of trade policy methods commonly used includes partial and computable general equilibrium (CGE) models as the two main branches, with further sub-classifications, such as micro or macro, single or multi-region, dynamic or static CGE models[26], and spatial or econometric partial equilibrium models[27]. Obviously, each approach has strengths and weaknesses, and the appropriateness of each depends on the nature of the problem the analyst is assessing, as well as the particular constraints of the research project, for instance, time, economic resources, analytical capability, and data availability (Francois and Reinert 1997).

By definition, partial equilibrium models do not take into consideration many of the variables included in a CGE model. As Francois and Hall (1997) state it,

> "While this is the root of the practical limitations of applied partial equilibrium modeling, it is also the source of its basic advantage (p. 122)."

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[26] An example of a micro-CGE models are the disaggregated rural economywide models (Taylor, Dyer and Yunez-Naude 2005); an example of a static, multi-region, macro CGE model is GTAP (Hertel 1997); an example of a static, single-region, macro CGE model is ORANI (Dixon, et al. 1982), and IFPRI (Lofgren, et al. 2001); an example of a dynamic, multi-region, macro CGE model is GTAP-DYN (Ianchovichina and McDougall 2000); and an example of a dynamic, single-region, macro CGE model is extended IFPRI model (Thurlow 2004).

[27] An example of a sectoral, spatial, partial equilibrium model is RICEFLOW (Durand-Morat and Wailes 2003); an example of a multi-sector, multi-region, partial equilibrium econometric model is IMPACT (Rosegrant, et al. 2005); an example of a sectoral, multi-region, partial equilibrium econometric model is the Arkansas Global Rice Model (Fuller, Wailes and Djunaidi 2003).

The main strengths of partial equilibrium models are that: (1) they are less demanding in terms of time, analytical capabilities (although in some applications they can be quite complex and very demanding), and data than CGE models; (2) in general, they allow for a more detailed specification of production, consumption, and market conditions than CGE models; and (3) partial equilibrium models allow for relatively rapid and transparent analysis of a range of commercial policy issues. On the down side, partial equilibrium models do not capture the impact of numerous variables that, in the real world, affect the behavior of economic agents (Francois and Hall 1997). Whether ignoring these effects is appropriate or not is a judgment call that analysts must make before deciding which methodology to use for a specific assessment.

The strength of CGE models is to actually enable researchers to assess the economy-wide impacts of a given policy change. This implies the specification of production, consumption, markets, and a series of macro constraints that define the economic environment in a given region. Such a simplification of the regional economy implies imposing numerous assumptions in order for the model to be manageable. On the down side, CGE models are generally more demanding in term of analytical skills, data, and time than partial equilibrium models, and for some applications, the results might be less transparent and, consequently, more difficult to understand (Hertel and Reimer 2004). Despite the fact that the models described above can be specified with a varying number of households, applications usually consider broad groups of representative households for which impacts can be assessed. Extension of results to individual households demands another, more detailed, analytical framework.

The interest of researchers to know more about the impact of trade reform on poverty has led to the proliferation of methods that link trade reform to the welfare of individual households. Hertel and Reimer (2004) classify these methods into 4 categories, namely:

1. *Partial equilibrium and/or cost-of-living approaches*: they are typically based on household expenditure data, and emphasize the impact of trade on households through consumption[28], usually ignoring the income effect through factor markets.
2. *CGE models*: based on disaggregated, economy-wide social accounting matrices, emphasize the impact of trade on households through changes in the markets for products and factors.
3. *Micro-macro synthesis*[29]: integrate the results from household survey data with those obtained from macro CGE models.
4. *Long-run economic growth models*: based on economy-wide social accounting matrices and other information describing the behavior of exogenous variables, emphasize the long-run effects of trade on economic growth and poverty. They abstract from income distribution effects, focusing only on aggregate income changes.

Numerous studies show that, when faced with changes in product and factor prices resulting from trade policy reform, households adjust both their consumption and income patterns, and that these adjustments can actually offset any impact estimated from a

[28] This feature gives the cost-of-living name to these models, since they tend to focus on the impact of commodity price changes on household expenditure and hence poverty.

[29] Maybe a more reasonable definition would be "general equilibrium simulation with post-simulation analysis of household impacts" (Hertel and Reimer, 2004).

model that does not account for them (World Bank 2005, Hertel and Reimer 2004). From this point of view, cost-of-living models have the limitations of ignoring the impact of trade reform on income as well as the adjustments made on consumption in light of changes in relative prices. CGE models do not suffer from these shortcomings; yet, most CGE models still have the limitation of working with regional representative households, thus constraining the extension of results to individual regional households.

Few studies have incorporated a large number of individual households into CGE models, thus enabling the extension of results to individual households[30] (Cogneau and Robilliard 2000, Rutherford, Tarr and Shepotylo 2003). However, these CGE models with a highly disaggregated set of institutions have the weakness of constraining the number of activities and sectors that could be defined in order for the model to remain manageable; moreover, the number of households that can be included is constrained by data availability.

The micro-macro synthesis allows for changes in products and factors prices to be translated into changes in the welfare of individual households. On the downside, and like the cost-of-living approach, micro-macro synthesis models abstract from the second-order impact that price changes might have on households' mix of consumption and earnings (Hertel and Reimer 2004).

Finally, long-run economic growth models have the strength of introducing long-run effects of trade on economic growth and poverty, thus offering a new perspective on the problem not emphasized by the previous models. On the downside, these models offer

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[30] For instance, the model used by Rutherford, Tarr, and Shepotylo (2003) includes more than 50,000 households.

only an aggregate view of poverty, and remain silent with regard to income distribution effects.

Despite the particular method used, ex-ante assessments of policy changes are limited by the broad set of assumptions required to make predictions before the changes occur (World Bank 2005).

The methods developed particularly for poverty analysis can be employed for the formulation of adjustment programs for specific sectors in light of trade liberalization, particularly with regard to defining the eligibility of recipients and the magnitude of the support to be granted. The norm among agricultural adjustment programs is to define eligibility based on some historical estimate, such as the production of a specific crop during the period chosen as the benchmark; programs that incorporate an updating procedure of the historical estimate and a redefinition of eligibility are less common. This study employs a dynamic, macro CGE model to assess the impact of DR-CAFTA on the Honduran economy, particularly on the welfare of basic grain producers. Unfortunately, data constraints do not allow for an analysis at the individual basic grain household level. Nevertheless, the methodology used in this study will shed light on the expected aggregate impact, results that can be used to (1) raise awareness about the potential impact of DR-CAFTA on the basic grain sector, and (2) influence the agricultural policy process in that regard.

3.2 Social Accounting Matrices

A social accounting matrix (SAM) is a squared matrix whose accounts register the economic transactions in an integrated framework (Pyatt 1988). A SAM is a means of representing the circular process of demand leading to production, leading to income, which in turn leads back to demand. On one hand, a SAM can be thought of as an

expanded input-output table[31], extended to capture income and expenditure flows between other institutions, such as households, government, and the rest of the world (Reinert and Rolland-Holst 1997). On the other hand, a SAM can be seen as a modification (in form) and expansion of national accounts. The modification in form comes from the fact the double entries recorded in the national accounts are recorded as one entry in the SAM. The expansion of the national accounts results from the use of other data sources to expand single entries recorded in national accounts into sub-matrices of transactions commonly recorded in SAMs.

The concept of a SAM evolved from pioneering works conducted over 60 years ago (Meade and Stone 1940, Hicks 1942, Stone 1949); since the late 1970s, SAMs have become the preferred national accounting format in most nations.

A SAM has two primary objectives: (1) organizing information in such a way that they present, concisely, a static image of the economic behavior of a unit, either a region, a country, or a state; and (2) providing the statistical basis for the creation of plausible simulation models (King 1985). The size of a SAM depends primarily on the availability of data for, and the purpose of, its construction.

Different methods have been proposed for the construction of a SAM. Arguably the most popular is the hierarchical or top-down approach (Stone 1977, Thorbecke 2003). According to this method, the construction advances from the most aggregated macroeconomic level to the desired micro level. The first step consists of creating the

[31] An input-output table traces the linkages of local industries with each other, with industries outside the region, and with final demand sectors. This table can be thought of as composed of four sub-matrices: (1) consumption patterns; (2) inter-industry structure; (3) income; and (4) non-market transfers (Schaffer 1999). Reinert and Roland-Holst (1997) provide a more restrictive definition of an input-output table.

macro SAM from the information contained in a country's macroeconomic account. The *macro SAM* provides control totals for each sub-matrix of the detailed *micro SAM*. According to Reinert and Rolland-Holst (1997), the most recent year for which the macroeconomic data are available sets a limit on the choice of a base year. The second step consists of building the *micro SAM*, which requires the use of input-output tables and a number of other sources, depending on the desired level of detail. Recent data are usually at a higher level of aggregation than less recent data; for instance, it is common that input-output tables lag national account data by 5 years or more. In order to make the SAM as timely as possible, given the available data, analysts usually employ the more aggregate data for control totals, and use the shares from less recent data to obtain the micro SAM (Reinert and Rolland-Holst 1997, Sanchez 2006).

The *micro SAM* thus obtained is commonly unbalanced; a number of balancing approaches can be employed at this stage, such as the RAS procedure (Stone 1962) or the cross entropy method (Robinson, Cattaneo and El-Said 2001). This balancing exercise constitutes the third step in the building process. The fourth step consists of further disaggregating parts of the SAM to obtain, for instance, a more detailed specification of households and sources of labor. The additional information at this stage usually comes from household surveys and other sources such as farmer organizations and non-governmental organizations.

3.2.1 PREVIOUS SAMS FOR HONDURAS

Two SAMs have been developed for Honduras in the past. The first was constructed by Lizardo, Navarro and Suazo (1999) for the year 1991; it divides labor into rural and urban categories, has one capital factor, four household categories based on their income level, ten economic sectors (five agricultural sectors), a government account, a capital account,

and five trading partners. The main sources of information were the Central Bank's National Accounts and Capital Accounts, while remaining parameters were estimated as part of the research project (Lizardo, Navarro and Suazo 1999).

Cuesta (2004) questions the 1991 SAM on the grounds of lack of reliable documentation of data sources, and develops a new SAM for the year 1997. The author clearly states the sources of data, namely, the National Accounts prepared by the Central Bank; capital flow information from the Ministry of Finance; data on labor, income and expenditure from the Permanent Household Survey (EPH for its initials in Spanish) and the Income and Expenditures National Household Survey (ENIGH for its initials in Spanish); and finally inter-industry structure from the Central Bank's pilot project that constitutes the first attempt to build an input-output table for the Honduran economy. The 1997 SAM contains ten categories of labor based on education and gender; a government account; a capital account including land; sixteen household categories defined by location, gender, occupation, and skill characteristics; one government account; twenty four activities and commodities categories; and a rest of the world account (Cuesta 2004).

While the disaggregation of the 1997 SAM could provide a good benchmark to which calibrate the CGE model developed for this study, it is desirable to have a more recent version of the Honduran SAM if possible, and also a different disaggregation of households to include, to the extent allowed by the data, those households depending on basic grains as a source of income. Analyzing the impact of DR-CAFTA on sensitive agricultural products using an outdated benchmark period adds another source of error that decreases the reliability of the results.

This chapter describes the process followed to generate a new SAM for Honduras, with emphasis on the basic grain sector, namely, rice, corn, and beans, the sensitive agricultural sectors believed to be the most vulnerable in the face of DR-CAFTA. The new SAM is estimated using the hierarchical or top-down approach. The next section describes the macroeconomic data employed and presents the macroeconomic SAM. Afterwards, the specification of the microeconomic SAM is introduced along with the data sources used for its estimation.

3.2.2 THE 2004 MACRO SAM FOR HONDURAS

As previously stated, the most recent year for which the macroeconomic data are available sets a limit on the choice of a base year. For Honduras, this corresponds to the year 2004[32] (Banco Central de Honduras 2007b)[33]. The description of the 2004 macro-SAM for Honduras is presented in Appendix Table 6; the numerical 2004 macro-SAM is shown in Appendix Table 7.

From the information contained in the macro-SAM, we can see that the *gross value of production* generated by the Honduran economy in 2004 is estimated at L 328,393 million (USD 18,550 million[34]), of which roughly 55 percent is used as input in the production process. The *gross domestic product* (GDP) for the same period is estimated at L 161,507 million (USD 9,125 million); manufactures and agriculture are the largest contributors, accounting for roughly 20 percent and 12 percent of GDP, respectively.

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[32] The following accounts provide all the information for the construction of a macro-SAM: (1) Production Account, (2) Generation of Income Account, (3) Distribution of Primary Income Account, (4) Distribution of Secondary Income Account, (5) Redistribution of in-kind Income Account, (6) Utilization of Income Account, (7) Capital Account, and (8) Financial Account.

[33] The Central Bank of Honduras released in November of 2007 the new series of macroeconomic statistics using the System of National Accounts 1993 (SNA93).

[34] Estimated using the average exchange rate of L 17.7/USD observed for the year 2004.

Value added represents around 90 percent of GDP, the remaining corresponding to *indirect taxes on production and imports*.

The distribution of income shows that *domestic returns to labor* and *domestic returns to capital* represent equal shares of value added, amounting to L 72,273 million (USD 4,083 million) and L 72,165 (USD 4,077 million), respectively. Adding the foreign returns to labor and capital (L 567 million and L 1,049 million, respectively), we obtain the *aggregate income of labor and capital*, which equal L 72,840 million (USD 4,115 million) and L 73,214 million (USD 4,136 million), respectively.

Factor income is in turn redistributed among institutions. Most of the labor income goes to households (99 percent), and the remaining is transferred to the rest of the world. Most of the capital income (roughly 87 percent) accrues to enterprises, which in turn (1) redistribute most of it among domestic institutions, namely households (62 percent) and foreign institutions, (2) pay income taxes (11 percent), and (3) save (27 percent). The remaining capital income accrues to the rest of the world (13 percent). The allocation of capital income into enterprises is a simplification commonly made in the construction of SAMs for modeling purposes, since it greatly simplifies the specification of institutional income. The *national product*, estimated from the GDP by adding (subtracting) factors of production's net payments from (to) the rest of the world, amounts to L 153,218 million (USD 8,656 million).

Information from the "Secondary Distribution of Income" account [35] shows that Honduran institutions received L 24,198 million (USD 1,367 million) in net current

[35] The secondary distribution of income contemplates transfers among all institutions, which for this macro SAM are (1) households, (2) government, (3) enterprises, and (4) the rest of the world.

transfers from the rest of the world in 2004, of which roughly 86 percent represent remittances to households originating primarily from the U.S.[36] Hence, the *gross disposable income* of Honduran institutions in 2004 amounted to L 177,416 million (USD 10,023 million), of which 81 percent was allocated into final consumption of both

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[36] The information contained in the "Secondary Distribution of Income" account allows us to disentangle most intra-institutional transfers. Items that can be clearly identified include:

- *Income taxes*: levied on domestic households and enterprises, and valued at L 1,452 million and L 7,377 million, respectively.
- *Social contributions*: provided from households to other households (L 17 million), to the government (L 2,318 million), and to enterprises (L 5,313 million).
- *Social contributions*: provided by the government, households, and enterprises to households (valued at L 734 million, L 17 million, and L 3,592 million, respectively).
- *Other current transfers*:
  - *Remittances*: reached L 20,717 million in 2004, received fully by households.
  - *International current transfers*: equal to L 18 million, accrued to enterprises.
  - *Current transfers within government*: equal to L 2,189.
  - *Premium of insurance* (excluding life insurance): equal to L 1,088 million, transferred within enterprises and from the government and households to enterprises.
  - *Insurance allowances* (excluding life insurance): equal to 1,088, transferred within enterprises and between these and households.
  - *Current international cooperation*: transfers from the rest of the world to the government and enterprises valued at L 1,430 million and L 2,377 million, respectively; transfers from the government to the rest of the world valued at L 5 million.
  - *Different current transfers with the rest of the world*: this item includes (1) transfers from Honduran enterprises to the rest of the world for L 5 million; and (2) transfers from the rest of the world to Honduran enterprises for L 18 million.
  - *Compensatory payments*: amounting to L 22 million, transferred from enterprises to households.

The following assumptions were made to disentangle the information contained in the following items:

- *Fines and economic sanctions*: valued at L 385 million paid by households (L 142 million), government (L 114 million), and enterprises (L 129 million), to the government (L 304 million) and enterprises (L 81 million). The assumption made here is that households and enterprises transfer their payments to the government, and the government transfers payments to enterprises. The remaining amount is assumed to represent transfers within the government.
- *Other current transfers*: valued at L 8,147 million paid by households (L 2,960 million), government (L 1,678 million), enterprises (L 3,504 million), and the rest of the world (L 5 million) to households (L 4,835 million), government (L 1,632 million), enterprises (L 1,339 million), and the rest of the world (L 341 million). The assumption made here is that (1) all transfers from the rest of the world go to the government; (2) the remaining government receipts come from households; (3) the remaining transfers from households go to enterprises (L 1,333 million); (4) all transfers to the rest of the world come from the government; (5) the remaining household receipts are paid by enterprises; and finally (6) all remaining receipts of enterprises are paid by enterprises.

domestic and imported goods and services, and the remaining 19 percent was saved, primarily by enterprises and households.

The Income in Kind Redistribution account considers all transfers in kind among institutions. For Honduras in 2004, this account provides all the information needed to disentangle all transfers in kind among institutions. Transfers in kind from the government (L 11,041 million) and enterprises (L 1,309 million) are received by households. The final consumption reported for enterprises is actually equivalent to the transfers in kind from enterprises to households; consequently, this flow is assumed to accrue directly to households, who decide to consume the type of goods they would have otherwise received from enterprises. The same assumption applies to the transfers in kind from the government to households.

The intra-institutional transfer sub-matrix shows net flows among domestic institutions; these net flows are exclusive of income taxes, which are entered separately into the income tax account.

3.2.2.1 Savings-Investment Account

Non-financial investment transactions and capital transfers among institutions need to be accounted for in the SAM. These transactions are recorded in the savings-investment (S-I) account(s) based on the information gathered from the Capital Account, generated as part of the System of National Accounts, revision 93 (SNA93). The S-I account(s) can be built for each institution separately, primarily if the SAM is going to be used for investment and savings analysis. Otherwise, a common simplification performed is the creation of only one S-I account for the whole economy, which records total savings and total investment performed in the economy; this is the approach followed in this study.

Furthermore, changes in stocks are also disaggregated into an account of its own, and merely report the transfers received from the S-I account and allocated into goods and services. Based on the information from the SNA93, total disposable savings in Honduras amounted to L 53,414 million in 2004, of which 63 percent are savings by domestic institutions and the remaining are capital transfers from the rest of the world. Savings are in turn exhausted in (1) gross fixed capital formation, (2) changes in stocks, and (3) capital transfers to the rest of the world.

3.2.2.2 Decomposition of Taxes

The Honduran tax system is based primarily on five taxes, namely, (1) sales tax; (2) income tax; (3) production and consumption tax; (4) oil derivatives tax; and (5) trade tax, each accounting for 35.5 percent, 25.1 percent, 4.6 percent, 20 percent, and 7.7 percent of total tax revenues in 2004, respectively. Other taxes include road services, airport fees, and selective automobile taxes, which account for the remaining of the tax revenue collected by the Honduran government.

The SAM organizes the different taxes above into five categories of taxes, namely (1) sales tax, (2) income tax, (3) production tax, (4) import tariff, and (5) export tariff. The information needed for the classification of taxes is provided by the Executive Directorate of Income (DEI for its initials in Spanish).

3.2.2.3 Comments on Diagonal Entries

A diagonal entry represents transfers made by institutions (identified with a SAM account) to themselves. As made clear in the presentation above, many single entries in the *macro-SAM* are disentangled into matrices in the *micro-SAM*, and what were diagonal flows in the former become off-diagonal entries, or flows between different institutions,

in the latter. Nevertheless, some flows might still remain diagonal. Diagonal entries in the target *micro-SAM* do not serve much purpose, since they simply represent the amount of duplication in production, income, or investment, depending on the account where the diagonal entry is reported. Thus, this study follows the common practice of reporting diagonal entries in the *macro-SAM*, but removing them in the final *micro-SAM*.

3.2.2.4 Further Comments

The supply and demand table generated by the Central Bank of Honduras as part of the System of National Accounts[37] shows that, for two commodity bundles, namely (1) alive plants and flowers, and (2) metallic debris, Honduras exported more than it produced, thus implying that there were re-exports of these products[38]. Of course, re-exports might have occurred in more sectors, but given the information available, namely aggregate import values with no data on the final use of these flows, it is not possible to discover their occurrence. Since the CGE model that would employ this SAM does not handle the possibility of re-exports, then the information contained in the supply and demand table has to be adjusted. This study follows the common practice of eliminating the export flow of those commodities where re-exports are observed, and adjusting the import level accordingly to maintain the account balance (Wobst 1998, Nielsen 2002). As a result of this modification, neither the resulting commodity export and import figures nor the aggregate trade figures in the SAM coincide any longer with those reported in the supply and demand table.

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[37] All tables conforming the Honduran System of National Accounts are available electronically at http://estadisticas.bch.hn/anexos_sector_real.php

[38] Together, these commodity bundles represent less than 0.5 percent of the gross value of production.

The supply and demand table also reports the distribution margins, namely transportation and commercialization margins, for each commodity that added to the basic price determine the purchaser's price. These commodity margins are actually an aggregation of the margins in domestic, import, and export markets. In other words, these margins include the margin incurred in (1) moving the domestic commodity from the production site to the domestic market; (2) moving exports from the production site to the border; and (3) moving imports from the border to the domestic market. The disaggregation of distribution margins among these three markets is done proportionally to their contribution to final use; domestic consumption of domestically-produced commodities is estimated as the difference between domestic production and exports.

3.2.3 THE 2004 MICRO SAM FOR HONDURAS

3.2.3.1 Disaggregation of the Basic Grain Sector

The basic grain sector is disaggregated into 6 activities according to the most relevant systems of production used in Honduras, and for which the Secretary of Agriculture generates production budgets. For corn, three activities are defined, namely (1) corn produced with high, (2) with medium, and (3) with low level of technology (traditional). For beans, two activities are specified, that is (1) valley, and (2) hillside production. Finally, rice is considered a single activity, given that the technology applied does not vary significantly among producers. Thus, the single basic grain activity defined in the original input-output table is disaggregated into six activities in the micro SAM.

3.2.3.2 Disaggregation of Labor

Four categories of labor are specified in the micro-SAM based on their geographic distribution and level of education. All the information needed to disaggregate labor, namely geographic location, years of schooling, employment by economic activity, and

transfer to households, comes from the Standard of Living Survey (ENCOVI for its initials in Spanish) administered twice a year by the National Institute of Statistics (INE for its initials in Spanish). The particular categories of labor considered in this study are:

1. Urban skilled labor: labor offered by the urban population with at least 7 years of schooling. This labor category accounts for roughly 25 percent of the total return to labor and 12.5 percent of total value added in 2004.
2. Urban unskilled labor: labor offered by the urban population with less than 7 years of schooling. This labor category accounts for 44 percent of the total return to labor and 21.5 percent of total value added in 2004.
3. Rural skilled labor: labor offered by people living in rural areas that have at least 7 years of schooling. This labor category accounts for 8 percent of the total return to labor and 4 percent of total value added in 2004.
4. Rural unskilled labor: labor offered by people living in rural areas that have less than 7 years of schooling. This labor category accounts for 23 percent of the total return to labor and 11 percent of total value added in 2004.

3.2.3.3 Disaggregation of Households

Representative households are specified according to their main economic activities. Since the main reason for the construction of this SAM is to calibrate a CGE model for the assessment of DR-CAFTA on the welfare of those households depending on basic grains for their economic survival, the categories of households must account, to the extent allowed by the available information, for households' agricultural and basic grain activities.

There is no survey in Honduras that would allow us to obtain representative information on income and expenditure at the agricultural activity level. Agricultural households are surveyed in the ENCOVI to obtain representative rural and national information on several aspects used to infer their standard of living. Moreover, basic grain producers are surveyed twice a year as a part of the Basic Agricultural Survey but only to obtain information on agricultural production and marketing.

This study disaggregates households into four categories, namely:

1. Basic Grain households: the approach followed in this study was to aggregate households surveyed in the ENCOVI whose reports indicate that at least 25 percent of their income comes from the production of basic grains. This representative household accounted for only 5 percent of total household income in 2004.
2. Livestock households: the approach followed in this study was to aggregate households surveyed in the ENCOVI whose reports indicate that at least 25 percent of their income comes from the livestock. This representative household accounted for only 3 percent of total household income in 2004.
3. Other agricultural households: the approach followed in this study was to aggregate households surveyed in the ENCOVI whose reports indicate that at least 25 percent of their income comes from agricultural activities other than basic grains and livestock. This representative household accounted for only 7 percent of total household income in 2004.
4. Other households: this representative household in made up primarily by urban households and some limited number of rural households whose income do not

depend on agriculture. This representative household accounts for roughly 85 percent of total household income in 2004. This shows the significant income inequality between urban and rural households, given that roughly half of the Honduran population lives in rural areas and depends primarily on agricultural activities for their survival.

The ENCOVI provides detailed information on income from which income shares were obtained. These shares are applied to the control total reported in the macro-SAM to obtain household-specific control totals. The ENCOVI is not designed to obtain detailed information on the expenditure of households. Consequently, another source of information is needed to obtain the shares of consumption by commodity and household. In this study, household expenditure shares are estimated from the ENIGH.

The final step in the construction of the household accounts is the determination of income taxes and savings. Unfortunately, the information available only allows for the estimation of control totals across all households. The approach taken in this study was to (1) disaggregate income taxes according to the level of income of each representative household, and (2) estimate savings for each representative household as a residual.

3.2.3.4 Disaggregation of Regions

The foreign sector in this SAM is represented by two accounts, namely, (1) the U.S., and (2) the rest of the world. Disaggregating the U.S. from all other regions that trade with Honduras is essential for an assessment of DR-CAFTA, since the agreement will alter bilateral U.S.-Honduras trade policies while keeping all other bilateral trade barriers unchanged.

The c.i.f. values of bilateral trade by commodity used to disaggregate the total value of trade were obtained from the National Institute of Statistics. The total values of import tariff revenues by commodity were disaggregated by region based on the estimated import tariffs applied to U.S. Import taxes on flows from the rest of the world are estimated as a residual.

3.3 Description of the CGE Model

The model developed for this study is written in linearized form, namely, all equations, most of which are non-linear, are transformed into their linearized form [39]. Consequently, all variables in the model are represented by their percentage change rather than absolute value. The linearization of non-linear equations has the main advantage of simplifying the model while yielding the same results as "levels" models (Hertel, Horridge and Pearson 1991).

Before proceeding with the description of the model, the sets defined in the model are introduced in Appendix Table 8. The definition of the values from the SAM used to calibrate the model is presented in Appendix Table 11, along with their formula (if estimated within the model) and the way in which they are updated during simulations.

3.3.1 Production Sector

From a modeling point of view, the production sector can be specified in two ways: (1) by activity and commodity so as to allow for the possibility of multiple outputs being produced by one production activity; and (2) by production sector, which integrates each activity and associated commodity into a single account. The first specification is used in

[39] Although most CGE models are written in non-linear form, the popular multi-region, multi-sector GTAP model is written in linearized form. For more information on the linearization of CES and other functions, see Hertel, Horridge, and Pearson (1991), and Hertel (1997).

the IFPRI model (Lofgren, et al. 2001) and the ORANI model (Dixon, et al. 1982); the second specification is used in the GTAP model (Hertel 1997). The model built for this study follows the first approach, since it better describes the scenario under consideration: a number of basic grain activities producing commodities that are treated as homogenous in the market.

For all activities, the structure of primary production is specified as two-level tree (Figure 3.1).

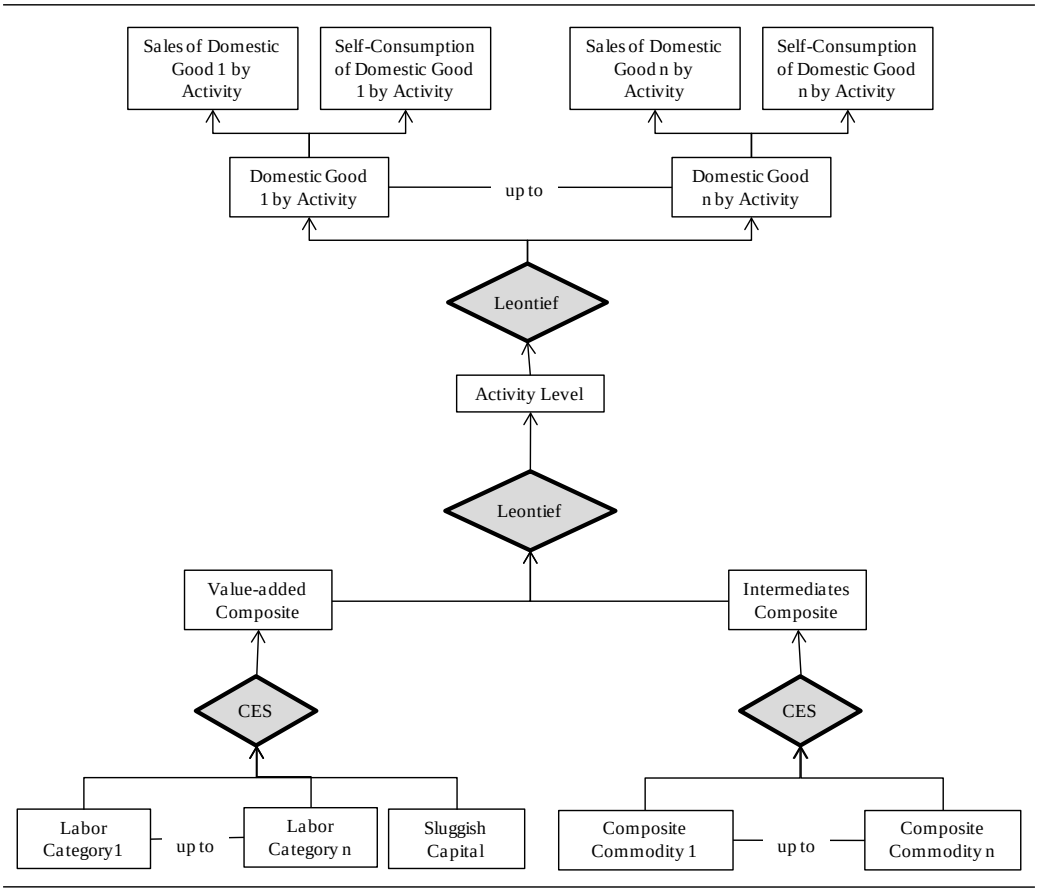
3.3.1.1 Activity Level Nest

At the top of the inverted tree in Figure 3.1 is the activity level nest. Following standard neoclassical economics, it is assumed that producers' goal is to maximize profits or, which is the same, minimize costs; this optimization process determines the activity level. The derived demands for intermediates and value-added composites, *qva(a)* and *qinta(a)*, are a function of the activity level and the technological characteristics of production. In this model, the activity level is specified as a Leontief technology, which implies no substitution effects between the factor composite and the intermediates composite (see equations 1 and 2 in Appendix Table 10).

The model includes a number of technology-related exogenous variables that can be shocked arbitrarily as part of an experiment. Variables *ava(a)* and *ain(a)* represent augmenting technical changes in the productivity of the value-added and intermediates composites by activity, respectively. A positive change in *ava(a)* has two main effects: (1) at constant prices, it uniformly reduces the demand for factors of production; and (2) it lowers the cost of value-added thus encouraging the expansion of production. A positive change in *ain(a)* works similarly to a change in *ava(a)* but on the intermediates

composite. The variable *ao(a)* stands for the output-augmenting technical change by activity; a shock to *ao(a)* is equivalent to a Hick-neutral technical change. An increase in *ao(a)* has two main effects: (1) at constant prices, it uniformly reduces the demand for both the value-added and intermediates composites; and (2) it lowers the cost of production thus encouraging expansion of production.

Figure 3.1. Structure of primary production



3.3.1.2 Value-Added and Intermediates Nests

At the bottom of the inverted tree in Figure 3.1 are the value-added nest and the intermediates nest, in which the derived demands for factors of production, *qf(f,a)*, and intermediate inputs, *qint(c,a)*, are determined (see equations 3, 4, and 5 in Appendix Table 10). These derived demands are obtained from a cost-minimization problem

assuming a constant elasticity of substitution (CES) production function. The functional form of these derived demand equations follows directly as a consequence of the assumption of constant returns to scale and cost functions of the CES type. The value-added composite price by activity, *pva(a)*, is estimated simply as a value-weighted average of the price of specific factors paid by this activity (Appendix Table 10, equation 6). Similarly, the intermediates composite price by activity, *pinta(a)*, is estimated simply as a value-weighted average of the price of specific inputs paid by this activity (Appendix Table 10, equation 7). For more details on the derivation of these equations, see Hertel, Horridge, and Pearson (1991), and Hertel (1997). The cost of production by activity is a function of the composite prices *pva(a)* and *pinta(a)* and the respective shares of value added and intermediates in the total cost of production of activity *a*[40].

The variable *afe(f,a)* represents the augmenting productivity change in factor *f* used by activity *a*. An increase in *afe(f,a)* has three effects: (1) at constant prices, it reduces the demand for the specific factor of production; (2) it reduces the effective price of the factor thus encouraging factor substitution; and (3) it lowers the cost of value-added thus encouraging expansion of production. Likewise, the variable *aie(c,a)* represents the percentage change in the productivity of specific intermediate inputs by activity, and its effects are similar to those described above for *afe(f,a)*.

The linearized form of these derived demand equations is simple, and facilitates the decomposition of the changes in derived demand. The first term in equations (3) through (5) corresponds to the partial effect of the augmenting technical change variable on the

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[40] By virtue of the zero profit condition imposed on production, the unit cost of production by activity (exclusive of activity taxes) equals the price received by producers, represented by *pap(a)*.

derived demand of factors and intermediates; since these variables are declared as exogenous in the standard model, they can be shocked at the discretion of the user. The second term corresponds to the expansionary effect, that is, how much the derived demand for any given factor of production or input changes as a result of an expansion in the output of the specific activity, relative changes in factor and input prices aside. Finally, the third term corresponds to the substitution effect, that is, to what extent the changes in intermediate demand for any given factor of production or intermediate input are explained by changes in their relative prices *vis-à-vis* the value-added composite price and the intermediates composite price, respectively.

3.3.1.3 Commodity Production by Activity

Despite the fact that most SAMs have highly sparse make tables, this model still allows for each activity to produce a mix of potentially all commodities. The quantity of commodity *c* produced by activity *a* is represented by *qac(c,a).* Revenue maximization under the assumption of a Leontief transformation function results in a production mix that does not vary with relative changes in commodity prices but only in fixed proportions to changes in activity levels (see equation 8 in Appendix Table 10). The average unit revenue or market price of activity *a*, *pam(a),* is estimated as a weighted average of commodity prices received by each activity, *ptoa(c,a)* (equation 9 in Appendix Table 10).

3.3.1.4 Aggregate Traded Output

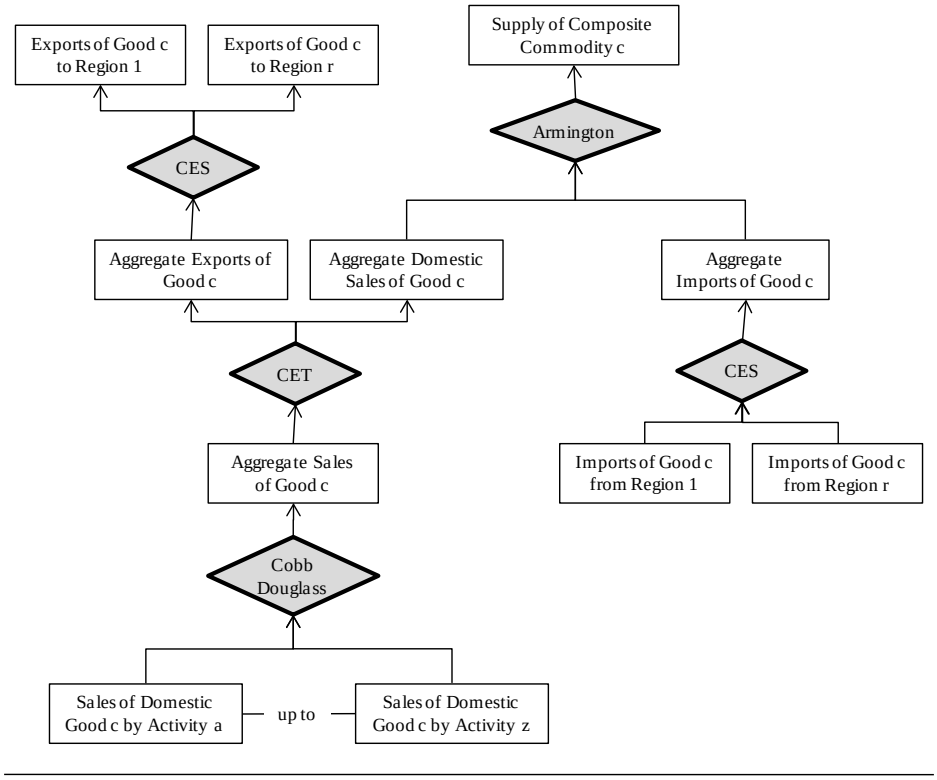
As shown in the upper part of Figure 3.1 above, the production of domestic goods by specific activities can be either traded in the market or kept for self-consumption by the relevant households. The demand for domestic goods for self-consumption is derived for

each household as part of a utility maximization process described later in this chapter. The quantity that each activity sales in the domestic market, *qtoa(c,a),* is derived from the aggregate demand for each domestic good *c*, identified here by *qto(c)* (Figure 3.2). The aggregation function is specified as Cobb-Douglas (Appendix Table 10, equation 10). At equilibrium, the aggregate demand for domestic good *c* must equal the aggregate supply or sales of the same good. In this model, instead of creating two different variables for the aggregate demand and the aggregate supply or sales of good *c* and equating them through a market clearing equation, the approach taken is simply to define both aggregate demand and supply by the same variable *qto(c).*

Note the similarity between equation 10 and equations 3 and 4. Beyond the augmenting technical variables in the production sector, the only difference between these equations is the magnitude of the elasticity of substitution. While a CES functional form allows for the use of different values of the elasticity of substitution, the Cobb-Douglas functional form implies an elasticity of substitution equal to one.

The model allows for the price of any given commodity *c* produced domestically to vary across activities. The wholesale price of domestic commodity *c*, *px(c),* is estimated as a weighted average price of activity-specific prices *ptoa(c,a)* (Appendix Table 10, equation 11).

Figure 3.2. Marketing of domestic goods, imports, and the production of a composite commodity



3.3.1.5 Allocation of Sales of Domestically-Produced Goods

Wholesalers have two options when it comes to selling their products: they can sell them either domestically or internationally. The allocation of output into either market is assumed to result from a revenue maximization problem. For all commodities, the production possibility function is defined as a constant elasticity of transformation (CET) function; consequently, revenue maximization given (1) the price of domestic output traded domestically, *pds(c)*, (2) the market price of exports, *pe(c)*, and (3) aggregate tradable output, *qto(c)*, determines the aggregate volume of exports and domestic sales, *qe(c)* and *qd(c)*, respectively (Appendix Table 10, equations 12 and 13, respectively). The zero profits condition at the wholesale level enforces that the revenue from selling a unit of commodity *c* actually equals its cost of production, which for the wholesaler is *px(c)*.

3.3.1.6 Export Supply

The allocation of exports by destination, *qed(c,r),* is specified as a CES function; commodities possess country-specific characteristics that make them imperfect substitutes among each other (Appendix Table 10, equation 14). Note the similarity between this equation and the derived demand for factors of production and intermediate inputs as well as the aggregation function. As discussed previously, the simple form of these equations enable users to easily decompose the expansionary and substitution effects driving the changes in the endogenous variables, in this case, the volume of exports by destination.

The composite export price for commodity *c*, *pe(c),* is estimated as a trade-weighted average of region-specific export prices, *pepd(c,r).*

3.3.1.7 Composite Commodity Production

Unlike some models such as GTAP that maintains different accounts for domestic and imported commodities, this model integrates imports and domestic sales of the same commodity into a composite commodity account. In fact, this approach is the most commonly used given that it is compatible with the standard design of the SAMs. Maintaining separate accounts for imported and domestic products is a desirable specification that would allow us to disentangle the potential differences in the demand for similar imports and domestic goods. On the downside, maintaining separate commodity accounts demands that data on final and intermediate consumption be disaggregated into consumption of imports and domestic products. Many nations, including Honduras, do not collect this type of data.

Domestic commodity *c* sold in the domestic market, *qd(c),* and imports of commodity *c*, *qm(c),* are assumed to be imperfect substitutes in the production of composite commodity

c, *qq(c)*. This specification is commonly known as the Armington model (Armington 1969). This step can be seen as a production process that generates a composite commodity *c* using two inputs, namely domestic and imported commodity *c*, that are imperfect substitutes and whose substitution is dictated by the Armington elasticity of substitution (see equations 16 and 17 in Appendix Table 10).

In turn, the composite commodity is later allocated into final and intermediate consumption, including the production of capital goods. Similar to the case of the wholesaler, it is assumed that the producer of the composite commodity incurs a cost of production per unit of output that is a function of input prices and their participation in the production process. Since the zero-profit assumption applies at this stage as well, this cost of production equals the supply price of composite commodity *c*, *pqs(c)*.

3.3.1.8 Sourcing of Imports

Imports of commodity *c* by source, *qms(c,r)*, are also assumed to be imperfect substitutes among each other. The sourcing of imports is specified as a CES function (Appendix Table 10, equation 18). The aggregate market price of imports, *pm(c)*, is estimated as the trade-weighted average of region-specific import prices, *pmms(c,r)* (Appendix Table 10, equation 19).

3.3.2 FACTOR SUPPLY

Factor supply in CGE models has been specified in three primary ways, namely (1) factors with fully flexible supply functions (the endowment of factors can be expanded infinitely at the ongoing price); (2) factors with perfectly inelastic supply functions (the endowment of factors is fixed regardless of the market incentives to expand or contract); and (3) factors with an upward-sloping supply function (endowments might expand or contract depending on market price signals; the extent of the change is dictated by a

factor supply elasticity). The first specification is commonly adopted for unskilled labor in developing countries in order to account for unemployment. Care must be taken when using this specification to ensure that the growth in the endowment is actually feasible. The second specification is commonly adopted for highly skilled workers in developed countries or land in general; this fix supply assumption on labor is appropriate only in short-run assessments where the short supply of highly skilled workers is more severe; in the medium and long term, the skills with high market demands can be acquired and the supply consequently expanded. Finally, the third specification attempts to capture the effect that price signal might have on factor endowments. This specification represents an intermediate situation, in which prices and quantities are allowed to vary to some degree (dictated by the factor supply elasticity), which in part addresses the unemployment or underemployment issues commonly seen in developing nations, but on the other hand accounts for some constraints in the availability of resources.

In this model, the aggregate supply for all factors included in subset FSUP is specified as an upward-sloping function of real factor prices (Appendix Table 10, equation 20). The total supply of capital is specified as fully inelastic within periods, but adjusted every year to account for net investment from the previous year (Appendix Table 10, equation 86).

The model also differentiates factors based on their mobility. Perfectly mobile factors of production can move freely among activities in the pursuit of higher returns; however, at equilibrium, the perfect mobility of factors determines a unique market price for the entire market. Hence, the activity-specific supply of mobile factors is a response to equalize mobile factor prices across activities. The situation is different for sluggish

factors, whose market prices vary across activities and, consequently, so does their supply. The allocation of sluggish factor supply across sectors, *qfsa(f,a)*, is specified as a CET function (Appendix Table 10, equation 21). This stylized specification of the workings of capital implies that without changes in relative prices, new capital will be allocated uniformly across activities (expansionary effect). With this specification there is no role for future expectations to affect the allocation of total investment across sectors. Changes in relative prices will yield a reallocation of investment across sectors according to the elasticity of capital transformation. The composite market price for sluggish factors, *pf(f)*, is estimated as a value-weighted average of activity-specific returns to sluggish factors, *pfa(f,a)* (Appendix Table 10, equation 22).

3.3.3 TRANSACTION SERVICES

Transaction services are used for moving (1) the domestic output from producers to consumers; (2) exports from domestic markets to the border; and (3) imports from the border to the domestic market. The demand for transaction services, *qt*, is estimated based on the assumption that the movement of goods demand fixed units of a single transaction service (Appendix Table 10, equation 23).

The unit price of transaction services is determined by the prices of the goods used as inputs in the marketing process. These commodities are identified in the SAM because they are demanded by the transaction service sector. The price of the single transaction service, *pt*, is defined as a value-weighted average price of the commodities demanded by the transaction service sector (Appendix Table 10, equation 24).

In order to provide its services, the transaction service sector demands composite commodities; in this model, the derived demand for composite commodity *c* by the

transaction service sector is specified simply as a fixed proportion of the output generated by the transaction service sector (Appendix Table 10, equation 25).

3.3.4 THE CONSUMER PRICE INDEX

The consumer price index, *cpi*, estimated as a consumption-weighted average of composite commodity prices, serves as the numéraire in the standard model, and is kept fixed at the baseline level (see equation 26 in Appendix Table 10). Consequently, all results are expressed as percentage changes *vis-à-vis* the *cpi*.

3.3.5 DETERMINATION OF FACTOR INCOME

Factor income, *fy(f)*, is defined simply as the sum of the revenue obtained from domestic activities that employ them as inputs, plus foreign transfers in return to the domestic factors of production used overseas. It is assumed that foreign transfers to factors in foreign currency by source, *rtff(f,r)*, remain fixed (unless shocked as part of an experiment) while foreign transfers to factors of production in domestic currency, *rtfd(f,r)*, adjust to changes in the exchange rate (Appendix Table 10, equation 27). Owners of mobile factors of production receive payments from activity *a* equal to [*pf(f) * qf(f,a)*]. Sluggish factors have activity-specific market prices, *pfa(f,a)*, which combined with the volume of inputs demanded, determine the gross factor income from specific activities, [*pfa(f,a) * qf(f,a)*] (see equations 28 and 29 in Appendix Table 10). Consequently, factor income is estimated as the sum of the returns obtained from activities plus the transfers received from overseas.

3.3.6 DISTRIBUTION OF FACTOR INCOME

Factor income can be either (1) transferred overseas, or (2) distributed among domestic non-government institutions. Transfers overseas by destination in foreign currency, *ftrf(f,r)*, are assumed to remain fixed at the baseline level, while foreign transfers in

domestic currency, *ftrd(f,r)*, are allowed to adjust to changes in the exchange rate. Aggregate factor transfers overseas in domestic currency, *fto(f)*, are simply the sum of region-specific transfers (Appendix Table 10, equation 31).

The share of factor income that flows to domestic institutions, *yfd(f)*, is estimated as the residual of factor income and total foreign transfers. Finally, it is assumed that factor income is distributed among domestic non-government institutions, *yfi(i,f)*, in fixed proportions.

3.3.7 INSTITUTIONS

There are four groups of institutions defined in this model, namely, households, enterprises, the government, and the rest of the world. Households collect income from two sources, namely, (1) returns to the factor endowments they own, and (2) transfers from other institutions. They in turn spend their income in (1) either current or future consumption (savings), (2) transfers to other households, (3) payment of income taxes, and (4) transfers to the rest of the world. By construction, households are not allowed to transfer income to enterprises.

Enterprises collect gross profits and government transfers and use them to pay taxes, save, and transfer surpluses to households and the rest of the world. Thus, enterprises differ from households in that they do not consume; apart from this distinction, both institutions perform the same economic activities.

The government collects its revenue from four taxes, namely, taxes on production, sales, income, and trade (exports and imports), as well as transfers from the rest of the world, and allocates total public funds into either final consumption or transfers to other institutions. The macroeconomic closure for the government in the standard model

implies that government savings are determined as a flexible residual (government total revenue minus total expenditures).

Finally, the rest of the world receives income (foreign currency spending) from sales of goods and services to the production sector and transfers from domestic institutions. On the other hand, the expenditure (foreign currency receipts) of the rest of the world includes the purchase of domestic goods and services (exports by the domestic economy), the payment for the use of domestic factors of production abroad, transfers to domestic institutions, and foreign direct investment. Foreign savings, or the current account deficit, is the difference between foreign currency spending and receipts.

3.3.7.1 Income of Domestic, Non-Government Institutions

Domestic non-government institutions include households and enterprises; as commented above, enterprises perform the same economic activities that households except consuming composite goods.

The gross income of domestic non-government institutions, *y(i)*, comes from four sources: (1) revenues from factors of production that they own; (2) transfers from other domestic, non-government institutions, *trii(j,i)*; (3) transfers from the government; and (4) transfers from the rest of the world (Appendix Table 10, equation 36). Constant government transfers, *govt(i)*, are assumed to be fixed in the standard model, while current government transfers, *gtdii(i)*, are allowed to adjust to changes in the *cpi* (see equation 34 in Appendix Table 10).

Similarly, overseas transfers to domestic, non-government institutions in foreign currency, *rtif(i,r)*, are assumed to remain fixed, while overseas transfers expressed in

domestic currency, *rtid(i,r)*, are allowed to adjust to changes in the exchange rate (see equation 35 in Appendix Table 10).

3.3.7.2 Expenditure of Domestic, Non-Government Institutions

Non-government institutions pay income taxes, whose power is represented by, *tinc(i)*. The power of the direct tax on income of institution *i* is estimated as *tinc(i) = (1 – ty(i)/100)*, where *ty(i)* represents the ad-valorem tax levied on the income of institution *i*. The percentage change in after-tax income, or net income, *yn(i)*, is estimated from gross income after subtracting income taxes (see equation 37 in Appendix Table 10).

Transfers from domestic non-government institution *i* to region *r* expressed in foreign currency, *itrf(i,r)*, are assumed to remain fixed while allowed to vary when expressed in domestic currency, *itrf(i,r)*, so as to account for changes in the exchange rate (see equation 38 in Appendix Table 10). Furthermore, transfers among domestic non-government institutions are assumed to vary proportionately to net income (Appendix Table 10, equation 39).

Enterprises savings, *esav(e)*, is specified as a constant share of their net income; that is, they have a fixed marginal propensity to save, *mps(e)* (see equation 40 in Appendix Table 10). In this model, the marginal propensity to save is specified as an exogenous variable and, consequently, subject to arbitrary manipulation by the user.

The net income of households that remains after transfers to other domestic institutions and the rest of the world are accounted for, *utilbud(h)*, is allocated into (1) current consumption of traded goods, (2) current consumption of non-traded goods, and (3) future consumption or savings, according to an aggregate utility of the Cobb-Douglas form.

3.3.7.3 Household Consumption Expenditures

It is assumed in this model that households allocate their budgets available for consumption among three upper-level commodities, namely, (1) a traded-good composite, (2) a non-traded-good composite, and (3) savings, according to a Cobb-Douglas aggregate utility function. Consequently, allocation of household total expenditure into each upper-level commodity is done at roughly constant shares[41]. The traded-good sub-utility is specified as a Constant Difference Elasticity (CDE) function, while the non-traded-good sub-utility is specified as Cobb-Douglas. Savings is a single commodity, defined as savings deflated by a savings price (see Figure 3.3 below).

The model is kept manageable by assuming weak separability in each sub-utility. Weak separability implies that the demand for the i^{th} tradable good, for instance, is only a function of the individual prices of the tradable goods and services that make up the tradable composite, and the total expenditure on the tradable composite; the shadow price of non-traded commodities and the price of savings are only relevant insofar as they determine the expenditure on the tradable composite.

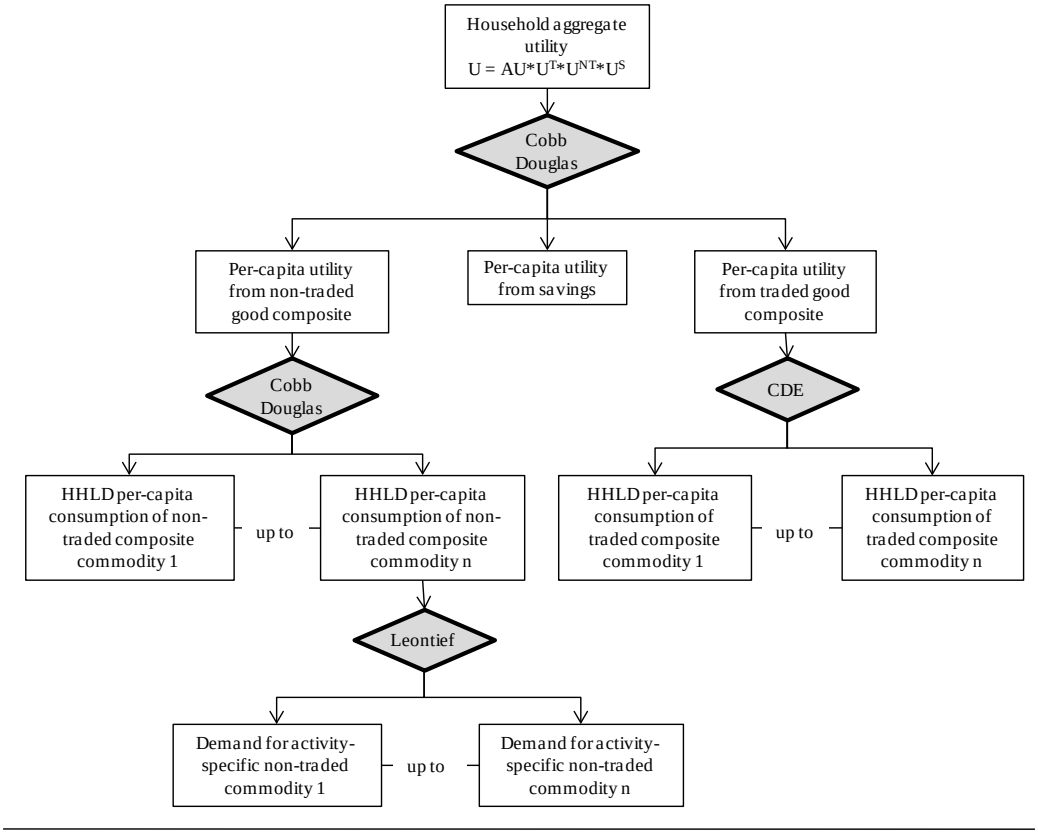
Therefore, we can think of consumption decisions as taking place in two stages: first, based on composite price indexes, consumers decide how much of the upper-level commodities to consume; second, consumers define their level of consumption of specific goods and services given their prices and the total expenditure on the respective composite.

[41] The reason for shares to adjust with changes in income, something we would not expect from a Cobb-Douglas demand system, is the presence of a non-homothetic sub-utility system for traded commodities.

Homothetic utility functions simplify the two-stage maximization problem by yielding linear budget constraints, that is, budget constraints whose terms are quantities times prices (Varian 1992). When sub-utilities are non-homothetic, as is the case of the CDE function used to represent the consumption of tradable goods and services in this model, then the budget constraints contain terms where the relationship between prices and quantities is nonlinear, which requires further development in order to obtain a suitable functional form.

While non-homothetic utility functions imply some extra work in the derivation of the relevant demand equations, the evidence suggests the effort is granted since, for the most part, demand follows nonlinear patterns as income increases (Deaton and Muellbauer 1980). The development of household demand system used in this model is based primarily on the work of McDougall (McDougall 2003), and readers interested in having a more in-depth description of the demand system and the derivation of the relevant equations presented in Appendix Table 10 (equations 42 to 61) are encouraged to review McDougall's study.

Figure 3.3. Specification of household consumption behavior



3.3.7.4 Government Revenue

In this model, government receipts consist of (1) receipts from the four categories of taxes, namely, taxes on production, sales, income, and trade, and (2) transfers from the rest of the world. Tax receipts are a function of the applied level of the tax and the relevant volumes and prices to which they apply (this applies for production, sales, and trade tax receipts) or the level of income of the domestic institutions (this applies to income tax receipts). Transfers from the rest of the world to the government are assumed to remain fixed in foreign currency and flexible in domestic currency to account for the changes in the exchange rate (Appendix Table 10, equation 62). Thus, total government revenue, *grev*, is determined as the sum of individual tax revenues and foreign transfers in domestic currency (see equation 63 in Appendix Table 10).

3.3.7.5 Government Expenditure

The government allocates revenues into either (1) current spending, or (2) future consumption (savings). Current government spending, *gexp*, consists of (a) transfers to domestic institutions, *gtdii(i)*, which are assumed to remain fixed in real terms; (b) transfers to the rest of the world, *govtrd(r)* and *govtrf(r)*, which are assumed to remain fixed in foreign currency; and (c) current government consumption, *qg(c)*, which is simply defined to equal the baseline level of consumption, which can be adjusted arbitrarily by shocking the uniform adjustment coefficient for government consumption, *ugovadj*, or the commodity-specific adjustment coefficient, *govadj(c)* . Treating the baseline level of consumption as a parameter, the percentage change in government consumption is defined solely by the percentage change in the adjustment coefficient (see equations 64 to 67 in Appendix Table 10).

3.3.8 PRICE LINKAGES

Nine equations define the price linkages in this model. The activity market price, *pam(a)*, is linked to the producer price, *pap(a)* through the power of the production tax, *to(a)*. The second price linkage equation defines the relationship between the supply and market price of domestic goods sold in the domestic market, *pds(c)* and *pdm(c)*, respectively. The prices are linked to each other through the domestic transaction cost, *pt*. The third equation specifies the linkage between the supply price and demand price of composite commodities, *pqs(c)* and *pq(c)*, respectively, which are linked to each other through the power of the sales tax, *ts(c)*.

The remaining six price linkage equations (see Appendix Table 10, equations 71 to 76) specify the relationship that exists between world, border, and domestic prices for both exports and imports. For the case of exports, the domestic (producer) price of exports of

good *c* to region *r*, *pepd(c,r)*, is linked to the border price of exports, *pebd(c,r)*, through the transaction cost of exports, *pt*. Moreover, these commodity and destination-specific border prices are linked to region-specific world prices, *pewd(c,r)*, through the power of bilateral export tax on commodity *c*, *ted(c,r)*. The world price pewd(c,r) is expressed in domestic currency, and transformed into a foreign-currency equivalent, *pewf(c,r)*, through the exchange rate.

The same specification applies to imports. The source-specific world price of imports of good *c* in foreign currency, *pmwf(c,r)*, is transformed into its domestic-currency equivalent, *pmws(c,r)*, which is in turn linked to the source-specific border price of imports of good *c*, *pmbs(c,r)*, through the power of the bilateral import tax on good *c*, *tms(c,r)*. This border price along with the unit transaction cost of moving imports from the border to the market, *pt*, determine the market price of imports of good *c* from region *r*, *pmms(c,r)*.

Given the trading position of Honduras in the world markets for most commodities, it seems reasonable to adopt a small-country assumption with respect to both imports and exports. This implies that Honduras takes the world price of exports, *pewf(c,r)*, and imports, *pmwf(c,r)*, as given, and adjusts its production and consumption patterns accordingly. In other words, world prices are exogenous variables not altered by changes in the Honduran economy. These world prices can be shocked and their impact on the Honduran economy assessed using this model.

3.3.9 ENDOGENOUS TAX RATES

In some instances, it might be of interest to change the government closure (discussed below), making government savings exogenous and letting government revenue to adjust to changes in government expenditures and savings in order to clear the government

budget. The traditional way in which governments adjust their revenues is through either an expansion of the base on which some particular taxes apply, or through an increase in the applied level of particular taxes.

This model includes three options when it comes to adjusting tax receipts to balance the public budget, namely, (1) a uniform increase in the sales tax; (2) a uniform increase in the income tax; and (3) a uniform increase in both the income and sales taxes. These alternative adjustment mechanisms can be activated one at a time by swapping any of the variables *tsadj*, *tincadj*, *tsincadj* for government savings, respectively.

3.3.10 SYSTEM CONSTRAINTS

3.3.10.1 Microeconomic Closures

Microeconomic closures include (1) market clearing conditions for factors of production, activity-specific goods, and composite commodities, and (2) zero pure-profits conditions for activities, wholesalers, and producers of composite commodities.

3.3.10.1.1 Clearing in Factor Markets

Equality of demand and supply must prevail at equilibrium. For mobile factors without sector-specific supply of factors, this is enforced by equating total factor supply *qfs(f)* with the sum of sector-specific demands *qf(f,a)* (see equation 79 in Appendix Table 10). For sluggish factors, the market clearing condition is factor and activity-specific in order for it to account for their limited mobility (see equation 80 in Appendix Table 10).

3.3.10.1.2 Clearing in Activity-Specific Commodity Markets

The commodity produced by any given activity can be either traded, *qtoa(c,a)*, or kept for self-consumption by households, *qntah(h,c,a)*. The equality between the supply of

commodity *c* by activity *a*, *qac(c,a)*, and the demand for activity-specific commodity *c* is maintained through a market clearing condition (Appendix Table 10, equation 81).

3.3.10.1.3 Clearing in Composite Commodity Markets

Composite commodities are produced from domestic goods and imports; they are consumed as final products by households, the government, and the rest of the world, and as intermediate inputs by the domestic production sectors, including the production of capital goods and transportation services. Equation 82 in Appendix Table 10 ensures that the total demand and total supply of composite commodity *c* are equal at equilibrium.

3.3.10.1.4 Zero Profits in Primary Production, Wholesale Activities, and Composite Commodity Production

Zero profit conditions are used to guarantee that no extra profits exist in any production activity; by forcing equality between costs and revenues, these conditions ensure that factors receive their normal rates of return (see equations 83 to 85 in Appendix Table 10). Zero profit conditions are reasonable assumptions for long-run assessments, since it is assumed that the limitations to adjust production techniques and resource allocation are less stringent in the long run, which would allow for factors of production to move across sectors in the pursuit of higher returns. This mobilization of resources would result in the elimination of extra profits in any particular sector. In the short run, however, the zero profit assumption might be misleading, particularly in developing economies where the barriers to entry and exist production are likely to be significant.

3.3.10.2 Macroeconomic Closures

3.3.10.2.1 Current Account Balance

As previously stated, the specification in this model assumes that the economy spends foreign currency in (1) purchasing imports to satisfy final and intermediate consumption,

(2) paying foreigners for the use of their factors of production, and (3) transferring public and private funds for payments of different kind, such as interest on debt or remittances. On the other hand, the domestic economy receives foreign currency from (a) exports of goods and services, (b) return to domestic factors of production used overseas, and (c) transfers to public and private institutions from the rest of the world. Foreign savings, or the current account deficit, represented by *fsav(r),* is the difference between foreign currency spending and receipts. Equation 86 in Appendix Table 10 guarantees the equality in the current account.

In the standard closure of the model, *fsav(r)* is exogenous, and the real exchange rate, *xr*, serves the role of equilibrating variable to the current-account balance. As Lofgren et al (2002) point out,

> "The fact that all items except imports and exports are fixed means that, in effect, the trade deficit is also fixed (p. 36)."

3.3.10.2.2 Government Account Balance

Equation 87 in Appendix Table 10 is introduced to ensure that the government budget always remains balanced. In the standard closure of the model, government savings, *gsav*, is the flexible variable that ensures the balance in the public budget; that is, that government revenue is fully exhausted into expenditures and savings. This specification seems to describe well the behavior of the Honduran government in this regard. Although it has run a deficit every year over the last several years on the order of 4.5 percent of its GDP for the period 1994-05 and 1.8 percent in 2006-07, the government clearly pursues a balanced budget as one of its main macroeconomic objectives (Secretaria de Finanzas de Honduras 2007, World Bank 2007a).

3.3.10.2.3 Savings-Investment Balance

In this model, savings are allowed by domestic non-government institutions (both households and enterprises), the government, and other regions. Hence, total savings in the economy, *totsav*, are estimated as the sum of these institutional savings. In the standard model, total investment, *totinv*, is defined as the value of the output of the capital good sector. The capital good sector is treated as any other production sector with the only exception that this sector does not demand factors of production. For simplicity, a new variable *qcgds* is created, and is set equal to the output of the capital good sector. Similarly, a new variable *pcgds* is introduced and set equal to the unit price received by the capital good activity.

Given that total savings and total investment are determined simultaneously and separately in any given run of the model, a market-clearing equation is needed to ensure that these two values are equal in equilibrium.

Walras' law enables us to check the economic consistency of the model. If the model satisfies Walras' law, then one equation is functionally dependent on the other and can be dropped. However, dropping one equation implies losing the possibility of easy consistency checking, one of the advantages of Walras's law-consistent models. Alternatively, instead of dropping an equation, a new variable can be added and set equal to the difference between the two sides of a macroeconomic balance equation. If the model is consistent with Walras' law, then its resulting value must be zero, thus offering a simple checking procedure. On the downside, this approach might lead to substantial loss of accuracy (so-called subtractive cancellation) when used in linearized models (Hertel, Horridge and Pearson 1991). Yet another approach, and the one chosen for this model, is to add a new variable, call it *walraslack*, and to add a new equation that would

estimate *walraslack* as the difference between total savings and total investment. If all equilibrium conditions are met, then the variable *walraslack* must equal zero at equilibrium. This approach reduces the potentially negative impact of subtractive cancellation and still provides a simple checking procedure. Consequently, and to make the link with Walras's law more evident, the variables *totsav* and *totinv* are renamed *walras1* and *walras2*, respectively (see equations 90 through 92 in Appendix Table 10).

3.3.11 Dynamic Extension of the Model

While the static model would allow us to assess the gains from trade due to increased efficiency of resource allocation, improved consumption possibilities, or increasing returns to scale in the case of imperfect competition, it would remain silent with regard to second-round gains steaming from capital accumulation effects (Thurlow 2004, Francois, McDonald and Nordstrom 1997). In order to account for the accumulation effects as well as other changes happening over time, the model is extended into a recursive dynamic model.

Capital stock at the end of the period (for instance, a year) is assumed to be a function of capital stock at the beginning of the period, and the investment and depreciation value during the period under consideration. Forward-looking expectations play no role in the saving-investment behavior of economic agents. New capital stock is allocated among production sectors according to sector-specific returns to capital.

3.3.12 Other Features of the CGE Model

A useful feature of the model is that it provides information on household welfare changes as a result of the experiment. The model includes a module that estimates the equivalent variation (EV) based on the conditions prevailing at the baseline and the end

of the simulation. The equations included in this module do not affect the results of a simulation; they are introduced just to simplify the analysis of the results.

The model also includes formulas that simplify the analysis of the results. Among the macroeconomic variables generated as part of the output are the gross domestic product, total volumes and values of trade, aggregate demand (absorption), and trade openness.

4. ASSESSING THE IMPACT OF DR-CAFTA

4.1 INTRODUCTION

DR-CAFTA was signed in 2004 and ratified by the Honduran Congress in 2006 (Law 2016-2006). This agreement represents another step towards economic integration, a process embraced by Honduras since the early 1990s and that has resulted in significant reduction of protection and increase in trade.

Trade liberalization impacts the welfare of households in different ways. Winters (2000) highlights 6 ways in which this relationship occurs, namely through changes in (1) the price and availability of goods; (2) factor prices, income, and employment; (3) government taxes and transfers influenced by changes in revenue from trade policy; (4) the incentives for investment and innovation, which affect long-run economic growth; (5) external shocks, in particular, changes in terms of trade; and (6) short-run risks and adjustment costs (Winters 2000).

DR-CAFTA is seen by many as a great opportunity for economic growth, as Honduran products would have preferential access to the largest market in the world. Many Honduran products already enjoyed preferential access through the Caribbean Basin Initiative and other later concessions made unilaterally and on an annual basis by the U.S. However, the fate of these concessions was conditional on the signing of DR-CAFTA, which came to institutionalize these concessions (making them permanent), and expanding them to many other products and services.

However, researchers are quick to point out that several domestic reforms are needed for Central American countries to reap the benefits of the agreement. The workings of the markets must be improved in many nations to allow for a more transparent transmission of the incentives generated by DR-CAFTA; factor markets must also be improved or in

many cases even created (e.g., land markets in Honduras); productive infrastructure must also be enhanced so as to lower transaction costs and achieve a better integration of domestic markets; the regulatory system in areas such as private property rights and sanitary and phytosanitary measures must be strengthened so as to encourage domestic and foreign investment and have access to the U.S. market. Without these adjustments, Central American nations might see the potential benefits of DR-CAFTA vanish (World Bank 2005, Serna 2007).

4.2 Previous Assessments of DR-CAFTA

Numerous studies have been conducted with the goal of assessing the impact of DR-CAFTA on different aspects of the economies involved. These previous analyses serve as a framework to which the results obtained in this study can be compared.

The World Bank (2005) conducted an exhaustive assessment of the potential impact of DR-CAFTA on the Central American economies. It reviewed numerous approaches used to assess this particular agreement, such as general and partial equilibrium models, highlighting that results are conditional on the economy's capacity to change its productive capacity. The study also reviews ex-post econometric assessments of the dynamic growth effects of regional trade agreements (RTAs) already implemented worldwide.

The results from partial equilibrium models suggest that gains for Central American economies will be concentrated primarily in the textile and apparel industry. The static general equilibrium model used for assessing the impact of this agreement on the Nicaraguan economy suggests a modest but positive impact on income per-capita but with only a very small positive effect on poverty. Previous econometric assessments of the dynamic effects of trade liberalization point primarily to the positive link between

trade and investment, and the negligible relationship between trade and corruption. The evidence from the studies surveyed finds no clear relationship between trade and technological innovation. Finally, previous studies analyzed in this study by the World Bank stress two more interesting findings: (1) the positive relationship between the growth rate of GDP per-capita and the participation of a country in RTAs; and (2) the lack of a strong relationship between economic growth and the type of partner in the RTA.

The study by the World Bank also acknowledges the particular importance of sensitive agricultural products, and presents evidence on the potential impact of trade liberalization on sensitive agricultural products using a *net-producer net-consumer model* (Deaton 1997, McCulloch 2002), in which the change in the economic welfare of households is assessed in response to external changes in prices. The model assumes that households do not adjust their production and consumption patterns; this is the reason why results from these models have been understood as the worst case scenario. The external changes in prices are estimated from baseline prices and effective import tariffs[42], under the assumption of perfect price transmission. The findings for Nicaragua, Guatemala, and El Salvador suggest that the vast majority of households will benefit from the liberalization of trade in sensitive products. However, and while DR-CAFTA grants considerable grace periods and extended phase-out schedules for the elimination of tariffs and expansion of quotas, it highlights the need for adjustment programs for households that are net-

[42] For sensitive products in Honduras, the effective tariff is estimated as a weighted average from import quantities and tariffs applied to different sources and under different import arrangements. Particularly for rice, yellow corn, white corn, and beans, the effective import tariffs are estimated at 1.4%, 1%, 1%, and 7.5%, respectively.

producers of sensitive crops and that stand to lose significantly from the agreement. Furthermore, the review by the World Bank presents evidence of programs adopted by other nations in Latin America and their impact. Finally, the study acknowledges the economic constraints that most government in Central America have, and the potential reduction in tax revenue resulting from the agreement. Governments must increase revenue (strengthening the tax revenue agencies and removing tax exonerations), make a more efficient use of the available fiscal resources, and promote a proper environment for private investment to prosper.

The World Bank alerts readers about the limitations of each of these approaches, some more severe than others, and the caution needed for the interpretation of the results; in this regard, the study concludes that ex-ante analyses of RTAs remains more an art than a science.

The Technical Support Unit (UNAT for its initials in Spanish), in charge of assisting the President on economic issues, conducted a study in 2005 with the goal of assessing the impact of DR-CAFTA on Honduran households. This study uses a *net-producer net-consumer model* based on data from the 2004 Standard of Living Survey (ENCOVI for its initials in Spanish). The study forecasts only a marginal increase in the aggregate welfare of the households as a result of DR-CAFTA, equivalent to 0.7 percent of per-capita consumption (1.1 percent and 0.3 percent for the representative urban and rural households, respectively). Furthermore, the results indicate that 88.8 percent of households will have a net gain out of DR-CAFTA, equivalent to roughly 1.5 percent of consumption, and only 7.7 percent are expected to experience a loss, equivalent on average to 4.5 percent of consumption. Disaggregating these results by geographic

location, the results suggest that most winners will be urban households (96 percent of urban households are expected to benefit), and most losers be rural households (14 percent of rural households are expected to lose). When arranged by income level, the results suggest that income will increase in all quintiles, with relative income gains being higher for the third and fourth quintiles (Unidad de Apoyo Tecnico 2005).

The UNAT acknowledges the importance of other factors that would affect the results obtained from DR-CAFTA and that were not accounted for in their study, such as less-than-perfect price transmission and the imperfect competition in some markets. The study shows evidence from the 1966-91 period that price transmission in Honduras is far from perfect (it takes 5 to 7 years for half the change in international prices get transmitted domestically). Significant progress towards economic integration has been made over the last several years to suggest that price transmission may have improved, but still perfect price transmission seems an implausible reality. The study also shows evidence of the poor price competitiveness of Honduras in the production of sensitive products.

Morley, Nakasone, and Piñeiro (2008) analyze the impact of DR-CAFTA on employment, production, and poverty in Honduras. They employ a dynamic CGE model[43] calibrated to the 1997 social accounting matrix of Honduras developed by Cuesta (2004). The authors analyze five different scenarios according to alternative definitions of exogenous shocks to import tariffs, import quotas, and the behavior of foreign direct investment. The assessment of DR-CAFTA on poverty is based on household survey information following a simulation method proposed by Vos, Taylor, and Paes de Barros (2002).

[43] For a description of the dynamic CGE model, see Thurlow (2004).

The findings of this study suggest modest increases in economic growth from the reduction of import tariffs and quotas according to the terms negotiated in DR-CAFTA, from a 3.06 percent average base growth to 3.16 percent. According to the authors,

> "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... This does not necessarily mean that the effect on particular sectors is not large." (p. 17).

DR-CAFTA makes permanent the rules of origin for the textile and apparel industry introduced by the Caribbean Trade Promotion Act of 2000, which would have otherwise expired in 2008. Maintaining these rules of origin for the textile and apparel sector is shown to have a large and positive impact on economic growth. The same can be said about the behavior of foreign direct investment when it is shocked exogenously according to its trend over the last few years.

Specifically for agriculture, the findings of the study by Morley, Nakasone, and Piñeiro indicate that while production and trade of traditional export products such as coffee and bananas will expand, the impact will be negligible for subsistence agriculture (that is, corn, rice, beans, and other commodities produced by the poor), and since it comprises over 80 percent of total agricultural production in Honduras, agriculture as a whole is insensitive to DR-CAFTA. Yet the authors acknowledge that, from a policy perspective, it is crucial that the long transition time to free trade negotiated for some commodities be used wisely to increase productivity, switch to more profitable crops, and take advantage of the new export opportunities opened up by DR-CAFTA.

Taylor et al (2006) analyze the impact that DR-CAFTA may have on the welfare of rural households. For this they employ a microeconomic, rural general equilibrium model, in which rural households represent the economic units linked to each other through the

market for goods and factors of production. Each rural household has its own production technology, source of income, and allocation of expenditures. The ability to specify each household separately is the main strength of this type of model. Small, subsistence households that produce almost entirely for self-consumption are decoupled from the relevant commodity markets, while commercial farms are linked to the relevant markets and therefore experience the changes in market prices directly through their impact on income and expenditures. Other wage households perceive the price change indirectly through income, since most of them are employed by commercial farms, and directly through their expenditure level. The social accounting matrices for each of the six representative rural households defined in this study[44] are built based primarily on information from a survey conducted by the International Food Policy Research Institute (IFPRI-WUR-PRONADERS) in 2001-02 that focus of hillside production.

The authors run a series of scenarios to assess (1) the short, medium, and long-term impact of DR-CAFTA, and (2) the impact of alternative compensatory policies. Their main findings are:

1. *DR-CAFTA would likely have an unequal impact across rural households*: a reduction in commodity prices is expected to have different impacts on the production decisions of households depending on their integration to the market. The impact on household income also depends on the relevance of the different sources of on-farm and off-farm income. For instance, a decrease in the market price of basic grains will not have a direct impact on the income of non-

[44] Rural households are disaggregated into the following groups: (1) producers without land; (2) non-commercial producers; (3) small-size commercial producers; (4) medium-size commercial producers; (5) large-size commercial producers; and (6) wage households.

commercial, subsistence households, since they do not participate actively in the market. However, their income will be negatively impacted through the labor market, since the derived demand for labor by commercial households will decrease along with commercial production of basic grains. The reduction in the opportunity cost of family labor encourages subsistence households to expand the production of basic grains. All households experience decreases in income in the long-run scenario. Household expenditures are also impacted differently depending on their consumption patterns. Overall, rural wage households, comprised primarily of rural workers, stand to lose the most from DR-CAFTA in the long-run, given that their reduction in income is so large that cannot be sufficiently compensated by the decrease in food prices. The results from the short and medium-run scenarios also stress the unequal impact of trade reform on the welfare of the different rural households. In conclusion, any compensatory policy that ignores these differences among rural households leading to different impacts will fail to achieve its goals efficiently.

2. *Technological innovation and reallocation of resources are viable options to increase the demand for labor and the income of rural households*: faced with decreasing market prices for traditional agricultural products, including basic grains, encouraging and facilitating the reallocation of resources toward non-traditional agricultural production is a promising option. This shift of resources requires investment in infrastructure (roads, electricity, processing facilities, laboratories, etc.) and human capital, as well as access to capital to finance private investment in agriculture. The results from this study suggest that technological

innovation could easily offset the negative impact of DR-CAFTA on income and production.

3. *Migration is an important strategy in the face of decreasing opportunities in rural areas*: migration to urban areas within Honduras or to other countries benefits rural households, providing sources of income not available in rural areas. Temporary migration programs could also help stabilize the income of rural households. Remittances to rural households are in many cases the only source of income and investment.
4. *DR-CAFTA will have marginal effects in the short-run and could have a positive impact on consumption*: the gradual liberalization of trade negotiated for many sensitive products lessens the negative income and production effects that the agreement might have on basic grain producers and workers; but different liberalization schedules will have different impacts. For instance, liberalization of trade for beans in the short-run without changes in the protection granted to corn exacerbates the negative impact on production and income of those households highly dependent on beans as a source of income. In the long run, when trade of sensitive products is fully liberalized, the negative impact of lower market prices will be offset through the reallocation of resources into the production of other crops or even other non-agricultural activities. Welfare increases for most rural households across the different scenarios analyzed; however, the findings point to the vulnerability of rural wage households, whose welfare in the long run is estimated to decrease significantly as a result of the new market conditions imposed by the agreement.

The authors highlight that importance of designing appropriate adjustment programs to ameliorate the negative effects of DR-CAFTA on income and production. To that end, they identify the main areas in which these programs should focus, namely (1) promoting the association among small farmers and the integration among agents in the supply chains; (2) promoting technological change and rural investment; (3) facilitating access to export markets; and finally (4) developing capital markets to finance agricultural production and rural investment.

The findings from the studies cited above, some of which apply specifically to Honduras, show different but, overall, small effects of trade policy liberalization as envisioned in DR-CAFTA on the economy, although highlight the vulnerability of certain sectors such as basic grains that might suffer significant losses from trade liberalization. The results obtained using a micro-CGE model actually disentangle the effect of the agreement on different households producing sensitive agricultural products, and find evidence of significant impacts particularly for rural wage households.

4.3 METHODOLOGY

As stated in the previous chapter, a CGE model is employed in this study for the assessment of DR-CAFTA. Two options are available when it comes to adjusting the model to the situation at hand; these options are (1) to modify a pre-existing model, overwriting existing behavioral equations, or to write a new model with the desired theoretical specifications, and (2) modifying the closures (namely, the split of endogenous and exogenous variables) so as to ensure the balance of all accounts while adopting a desirable specification of the markets. The second approach is the easiest, and should be employed to the extent possible since it is more efficient and less troublesome

than modifying or writing an entirely new model. However, in some instances overwriting the model is the only option available for obtaining the desired specification. The standard model described in the previous chapter is modified to better reflect the marketing arrangements in basic grains, more precisely, corn and rice, as follows:

- The derived demand of those production activities participating in the basic grain's purchase agreements is modified to account for the effects of such agreements. More specifically, it is assumed that the industries committed to purchase a negotiated volume of domestic corn and rice at a negotiated price still determine the demand for the corn and rice composites based on their objective of maximizing profits according to a Leontief production function. Once the derived demand for the corn and rice composites are determined, then producers decide on how much of these inputs to obtain from the market and how much to pay for them as a residual. Finally, the volume of corn and rice purchased from the market must be sourced from either the domestic production or imports based on changes in their relative prices according to a CES functional form. This specification will allow us to simulate the impact of removing these purchase agreements once DR-CAFTA is fully implemented, an aspect ignored by all previous studies reviewed.

The following closures are specified based on the belief that they appropriately reflect the conditions of the Honduran economy:

1. It is common for CGE applications for developing countries to assume a perfectly elastic supply of labor in order to account for unemployment; this approach is commonly implemented for categories of unskilled labor. However, care must be

taken in dynamic simulations to avoid an expansion of the stock of labor that goes beyond what is feasible in the real world. Preliminary runs for Honduras under the assumption of a perfectly elastic supply of unskilled urban workers (the largest category of labor included in the model) led to annual increases in the demand for this category of labor that are not sustainable in the long run. Consequently, I choose instead to specify the supply for urban unskilled workers as a slightly but upward-sloping supply function, reflecting the fact that new labor units might be available at little extra cost. The same closure is chosen for all other categories of labor, namely, urban skilled, and rural unskilled and skilled labor, although steeper supply functions are assumed for both categories of rural labor to reflect the fact that rural labor is in short supply in most rural areas in Honduras, as reflected by the low rural unemployment rate reported in the literature (Economic Commission for Latin American and The Caribbean n.d.).

2. The factor supply curves are shifted to the right at an annual rate equal to the growth in the economically active population for urban labor, and equal to the rural population growth for rural labor. I acknowledge the weaknesses of the specification above, primarily when it comes to assuming (1) that the pool of skilled and unskilled urban labor will grow at the same rate over the span of the simulation, this rate being the growth in the economically active urban population; and (2) that the pool of skilled and unskilled rural labor will grow also at the same rate, in this case equal to the rural population growth. The approach followed in this study also ignores the impact of international immigration flows, and assumes that the inflow of Hondurans from overseas (primarily deportees)

offsets the outflow of Hondurans. This assumption is likely to mislead, actually underestimate, the estimation of future trends in labor stocks, primarily unskilled labor, given the high number of Hondurans deported primarily from the U.S.[45] A good assessment of the growth in the different labor categories must at least consider past and future trends in education attainment, urban-rural migration, and international migration in order to generate more reliable estimates of labor stock changes. However, I consider that the alternative of ignoring any increase in labor supply seems less appropriate.

3. Coincident with the official goal of maintaining a balanced public budget (Secretaria de Finanzas de Honduras 2007), it is assumed here that the government actually achieves that goal every year for which simulations are run. Government savings is assumed to be the free variable that clears the public budget.
4. Honduras maintains a flexible exchange rate; in the standard model, this is the free variable that clears the balance of payments. Foreign savings are specified as exogenous.

The new 2004 Social Accounting Matrix for Honduras built for this study and presented in the previous chapter provides all the data needed to calibrate the model to the baseline. As commonly done in CGE modeling, behavioral parameters are gathered from exogenous sources. The following elasticity estimates are obtained from the Global Trade

[45] The number of Honduran deported from the U.S. increased significantly from around 10,000 in 2002 to more than 50,000 in 2005 (United Nations Development Program 2006). As of September, the number of deportees arriving into Honduras amounts to 44,000 in 2008 (El Heraldo 2008).

Analysis Project (GTAP) model[46] (Dimaranan, McDougall and Hertel 2006): (1) the elasticity of substitution among factors of production, among intermediate inputs, between domestic/imported products, and among different sources of imports; (2) the target uncompensated own-price elasticity of demand; and (3) the target income elasticity of demand[47]. Factor supply elasticities (for those factors of production with an upward-slopping supply function) are taken from Morley, Nakasone, and Piñeiro (2008). According to the literature review conducted for this study, there are no estimates for Honduras on the elasticity of transformation for sluggish factors as well as for allocation of commodity output among alternative uses. Given that an estimation of these parameters are well beyond the scope of this study, the approach taken here is to use estimates employed in previous studies or in well-known model frameworks. Consequently, the elasticity of transformation for the capital factor (considered sluggish in this model) is set at the same level employed in GTAP for the land factor. The elasticity of output transformation employed is the same as that used by Morley, Nakasone, and Piñeiro (2008).

Accounting for the dynamic impact of investment implies to have estimates on the initial stock of capital, depreciation rates, and annual gross capital formation. The estimation of the initial capital stock for this study is based on the GDP in the initial period using the

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[46] Since Honduras is not treated as a single region but rather as part of the Central American region, the assumption here is that the parameters estimated for the latter apply to the former. Correspondences between the list of commodities used in GTAP and that used in the Honduras SAM were also needed.

[47] GTAP assumes the presence of a single representative household in each region, and consequently regional demand elasticities are estimated at that level. Since the model employed in this study accounts for 5 different households, and given that no other exogenous estimates of own-price and income elasticities exist for each of these households in Honduras, I am forced to use GTAP's representative-household elasticity estimates for each of the households specified in this model.

formula estimated by Morley, Nakasone, and Piñeiro (2008)[48]. Likewise, this study assumes the same depreciation rate as that used by these authors (8 percent annually). Assessing the dynamic impact of DR-CAFTA on the Honduran economy entails running two sets of simulations:

1. *Counterfactual scenario*: exogenous variables not related to the agreement, e.g., population growth rate and world prices, are shocked to their forecasted levels to estimate what the future of the economy might look like without changes in economic policy resulting from DR-CAFTA. This becomes the benchmark or counterfactual scenario to which the impact of the agreement must be compared. It is important to keep in mind that benefits granted unilaterally by the U.S. through the Caribbean Basin Trade Partnership Act (CBTPA) were to expire on September 30th 2008, but the signing of DR-CAFTA made these concessions permanent and actually expanded the concessions to include other goods and services. Consequently, the counterfactual scenario must account for the elimination of the concessions granted to Honduras under CBTPA. Problems arise when specifying the elimination of CBTPA benefits. First, assuming that the U.S. would have removed CBTPA import tariff benefits to Honduran products but still applied a favorable treatment similar to that extended to other developing nations under the Generalized System of Preferences (GSP), then no significant changes in import tariffs would have occurred since most of the products heavily exported by Honduras into the U.S. enjoy a zero import tariff under GSP in 2008. Import tariff changes had been negligible even if the Most Favored Nation (MFN) import

[48] Initial capital stock = 2.26 * GDP

tariff would have been applied (MFN tariffs are the higher import tariffs the U.S. could have applied on Honduran products according to the regulations of the World Trade Organization). Analysts argue that the most important benefits of CBTPA accrued to the textile and apparel industry through more favorable rules of origin (ROO) than those granted by the U.S. previously, which significantly increased the competitiveness of the Central American textile and apparel industry in the U.S. market *vis-a-vis* the Mexican and Asian industries, and the economic activity of related economic sectors (Morley, Nakasone and Piñeiro 2008, World Bank 2005). Given the important benefits brought about by the changes in ROO introduced by CBTPA, it seems crucial to assess the likely effect of ROO removal as part of the counterfactual. Unfortunately, assessing the impact of the changes in ROO that would have occurred in the event DR-CAFTA had not been ratified is complicated in many ways. First, it requires a significant level of data disaggregation that is not yet available in Honduras; more precisely, (1) it implies having at least one specific activity account and product account for textiles and apparels activities and products, and preferably more to account for the differences in intermediate demand across different textile and apparel products; the latest information released by the Central Bank of Honduras and employed in the construction of the SAM for this study has the textile and apparel industry aggregated with several other manufactures; and (2) it demands having separate accounts for domestic and region-specific imports, which in turn implies having data on intermediate demand by industry disaggregated at that level, information not yet available in Honduras. Second and less worrisome is the

modification of the modeling framework to account for ROO specifically through their impact on the allocation of intermediate demand.

The limitations cited above, primarily those related to data availability, prohibit the assessment of ROO and undoubtedly become a significant limitation of this study. These limitations are unfortunately present even for countries with well-developed statistical services, and may explain why they have been somewhat overlooked in the empirical literature and, more specifically, in computable general equilibrium modeling analyses (Georges 2007).

Remittances have become an important source of income and economic growth in Honduras over the last several years. In 2006, remittances accounted for 25 percent of the GDP. However, the erratic nature of remittances makes forecasting difficult. Consequently, I opt for shocking this variable up to the year 2007 and based on information published by the Central Bank of Honduras. Thereafter, no shocks are performed to remittances, which mean that remittances are assumed to remain unchanged from the 2007 level.

2. *DR-CAFTA scenario*: both the exogenous variables shocked in the counterfactual scenario and the policy variables related to DR-CAFTA are shocked to assess the future of the economy given the forecasted trends in exogenous variables plus the negotiated schedules of liberalization implied by the agreement. Policy variables related to DR-CAFTA are basically bilateral (applying to trade with the U.S.) import and export taxes, which are expected to change according to the negotiated schedules. Annual changes in market access were negotiated for each product at the 8-digit level of the Harmonized System (HS). Consequently, annual changes

in market access for each of the products included in the SAM[49] are estimated as a trade-weighted average of the 8-digit HS products according to the correspondence between the HS and the Nomenclature of Products of Honduras (NPH for its initials in Spanish). The matrix of shocks actually defining the DR-CAFTA scenario is presented in Appendix Table 12.

There is no controversy about the importance of having good benchmark forecasts. Results of "what-if" assessments depend significantly on the future performance of the economy and, consequently, on the benchmark forecasts (Dixon and Rimmer 1998). However, obtaining good forecasts with CGE models is challenging; it implies gathering numerous exogenous data from experts in several economic fields, and specifying the model and closures in such a way as to better reflect the behavior of all agents involved. This is the main reason why good CGE forecasts are rare. Most researchers working with dynamic CGE models recommend that results be interpreted not in absolute but rather in relative terms to the benchmark. Despite this, it is important to keep in mind that even these relative impacts are affected by the poor calibration of the benchmark forecasts.

In this study, significant effort is made to obtain reliable forecasts to be used as shocks of relevant exogenous variables, but I acknowledge the limitations of using this model as a forecasting tool. This implies that readers must be aware that the results presented here might suffer from the errors introduced by not having good benchmark forecasts, and consequently readers should be cautious about the conclusions.

[49] These are basically the products listed in the NPH, with the only exception that seven of these products, all of them manufactures, are grouped into a single commodity.

CGE modeling has been criticized on several grounds, but arguably the most relevant is its lack of econometric foundations. The value of key parameters such as the elasticities cited above are taken as point estimates, ignoring the probability function associated with them. Furthermore, there is commonly no relationship between the theory employed in the econometric estimation and that used in CGE models. The most desirable approach to improve the confidence on CGE modeling is to engage in more and better parameter estimations. In the meantime, one approach to improve the confidence on CGE results is performing systematic sensitivity analysis of the results, that is, to check how robust the results are to changes in key parameters (Hertel, et al. 2003).

Following this suggestion, I perform a sensitivity analysis of the results with respect to the elasticity of substitution between domestic products and imports, most commonly known as the Armington elasticities. The main reason for choosing only this parameter for the sensitivity analysis is that, since we are interested in assessing the impact of a trade agreement particularly through its impact on the relative price of imports and domestic products, the results will be highly sensitive to its value.

Performing sensitivity analysis demands significant time and computing resources, more so when it is performed for many parameters and scenarios. For instance, conducting a sensitivity analysis on the Armington elasticity for all commodities included in this study and just one year of only one scenario entails running the model at least 78 times[50]. For both scenarios (20 years x 2 scenarios) and the 39 Armington elasticities, it demands at least 3,120 runs. To reduce the number of runs and still be able to make some inferences

[50] GEMPACK contains two approaches to run systematic sensitivity analyses, (1) Liu's quadrature, which runs the model two times for each parameter; and (2) Stroud's quadrature, which runs the model 4 times for each parameter.

about the confidence in the results, I selected (1) ten commodities based on their value of imports and import taxes applied on their flows during 2006[51], and (2) some particular years, namely the first, fifth, tenth, fifteenth, and twentieth year of the implementation of DR-CAFTA. This reduces the number of runs significantly and still helps us make inferences on whether or not the agreement generates significant results compared to the counterfactual.

4.4 Analysis of Results

CGE models usually involve a large number of variables describing the workings of the entire economy; consequently, care must be taken to manage the usually voluminous outcome in such a way as to highlight the main findings concisely. The approach followed here is: (1) to analyze the impact of the agreement at the macroeconomic level; (2) to assess the impact at the sectoral level, emphasizing the basic grain sector and related factor and input markets; and (3) analyze the impact of the agreement on households' welfare, with special emphasis on those depending primarily on basic grains as a source of income. In the discussion that follows, the terms counterfactual, benchmark, and baseline scenarios are all used interchangeably.

4.4.1 Macroeconomic Impact of DR-CAFTA

The findings of this study suggest a negligible, and actually negative, impact of DR-CAFTA on the growth of the Honduran economy in the long run. Results for both scenarios suggest that the Honduran economy will grow at a slow pace in the next twenty

[51] The ten selected commodities are: (1) machinery; (2) other goods; (3) textiles and apparels;(4) chemicals; (5) petroleum products; (6) food products; (7) beverages; (8) processed meats; (9) dairy products; and (10) other fruits and nuts.

years, but that DR-CAFTA could actually slow down economic growth in the medium and long term relative to the counterfactual.

Table 4.1. Rate of growth of selected macroeconomic variables under the two scenarios

	Average Annual Growth				
	2007-11	2012-16	2017-21	2022-26	Total
Counterfactual Scenario					
Gross domestic product	4.89%	4.37%	3.84%	3.40%	4.12%
Total value of exports	6.11%	5.58%	4.70%	4.04%	5.10%
Total value of imports	5.06%	4.43%	3.88%	3.43%	4.20%
Total value of trade	5.47%	4.89%	4.22%	3.69%	4.57%
Total quantity of exports	5.44%	4.87%	4.19%	3.65%	4.54%
Total quantity of imports	4.54%	3.83%	3.43%	3.09%	3.72%
Total quantity of trade	4.89%	4.25%	3.75%	3.33%	4.05%
Trade openness	0.56%	0.51%	0.37%	0.28%	0.43%
Absorption	4.49%	3.86%	3.44%	3.09%	3.72%
Gross investment	5.45%	4.47%	3.88%	3.40%	4.30%
Capital stock	6.41%	5.63%	4.92%	4.32%	5.32%
DR-CAFTA Scenario					
Gross domestic product	4.86%	4.25%	3.74%	3.32%	4.04%
Total value of exports	6.44%	5.51%	4.60%	3.93%	5.12%
Total value of imports	5.11%	4.35%	3.79%	3.34%	4.15%
Total value of trade	5.63%	4.82%	4.13%	3.59%	4.54%
Total quantity of exports	5.57%	4.76%	4.09%	3.57%	4.50%
Total quantity of imports	4.71%	3.76%	3.35%	3.01%	3.71%
Total quantity of trade	5.05%	4.17%	3.66%	3.25%	4.03%
Trade openness	0.73%	0.55%	0.37%	0.27%	0.48%
Absorption	4.36%	3.73%	3.34%	3.01%	3.61%
Gross investment	5.00%	4.29%	3.76%	3.33%	4.10%
Capital stock	6.24%	5.44%	4.76%	4.19%	5.16%

Source: own estimations based on model results.

The average annual rate of GDP growth for the 2007-2026 period is estimated at 4.12 percent [52] in the counterfactual scenario (see Table 4.1). When the annual changes in

[52] This is the geometric annual average over the implementation period. GEMPACK estimates the geometric average for percentage-change variables over *n* number of years as the n^{th} root of the geometric

GDP growth are decomposed [53] (see Table 4.2 below), we find that the annual change in the stock of capital [54] resulting from net investment in the previous year explains almost all the annual change. Annual changes in the price of goods and services have actually a marginal positive impact on economic growth of the order of only 0.1 percent.

Table 4.2. Decomposition of GDP growth by groups of shocks applied in each scenario

	AVERAGE ANNUAL GROWTH				
	2007-11	2012-16	2017-21	2022-26	TOTAL
COUNTERFACTUAL SCENARIO					
Total change GDP	**4.89%**	**4.37%**	**3.84%**	**3.40%**	**4.12%**
Price forecasts	0.03%	0.02%	-0.01%	-0.01%	0.01%
Population growth	0.00%	0.00%	0.00%	0.00%	0.00%
Shift in labor supply	0.87%	0.82%	0.72%	0.64%	0.76%
Change in capital stock	3.95%	3.53%	3.13%	2.77%	3.34%
DR-CAFTA SCENARIO					
Total change GDP	**4.86%**	**4.25%**	**3.74%**	**3.32%**	**4.04%**
Price forecasts	0.03%	0.02%	-0.01%	-0.01%	0.01%
Population growth	0.00%	0.00%	0.00%	0.00%	0.00%
Shift in labor supply	0.87%	0.82%	0.72%	0.65%	0.77%
Change in trade policies	0.07%	0.00%	0.01%	0.00%	0.02%
Change in capital stock	3.85%	3.42%	3.03%	2.68%	3.25%

Source: own estimations based on model results.

When tariff-reduction commitments under DR-CAFTA are introduced, the average annual GDP growth rate estimated for the 2007-2026 period is 4.04 percent, that is, 0.08 percent lower than that estimated in the benchmark scenario (Table 4.1 and Figure 4.1). Like in the counterfactual scenario, the decomposition of the results shows the still high

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product of year-on-year percentage changes. The geometric product results from compounding each annual percentage change over the number of years considered.

[53] GEMPACK allows for the decomposition of the effect of shocks in exogenous variables on the changes observed in endogenous variables. If the set of exogenous shocks is partitioned into several mutually exclusive and exhaustive subsets, then the total change or percentage change for endogenous variable is exactly equal to the sum of the contributions of these subsets of exogenous shocks.

[54] The binary variable *delunity* is shocked to 1 in the dynamic model to turn on the capital accumulation equation, or not shocked to deactivate it. Thus, estimating the subtotal for *delunity* is equivalent to estimating the subtotal for changes in the capital stock.

explanatory power of investment. Hence, the decomposition results from the two scenarios point to differences in net investment and, consequently, capital stocks as the main reason driving these results.

A closer look at the year-to-year results reveals that the agreement would actually increase economic growth relative to the counterfactual in the first year, but this relationship is reverted by the second year of the implementation and maintained throughout the implementation period. The agreement is expected to improve GDP slightly in the first year of the implementation by about 0.3 percent; recall that it is in the first year of the implementation when the most substantial removal of tariffs occurs. The gain that DR-CAFTA generates relative to the counterfactual in the first year amounts to USD 28 million. Although the rate of economic growth resulting from DR-CAFTA is lower than that estimated for the counterfactual starting as early as in the second year of the implementation, it is expected that in monetary terms the relative benefit of DR-CAFTA will last for few more years (see Figure 4.2 below). The accumulated economic impact of the agreement relative to the benchmark, measured in monetary terms, is estimated to amount to a gain of USD 36 million by 2011; significant losses from DR-CAFTA relative to the counterfactual are estimated in the medium and long term, generating a total relative loss of USD 2.14 billion by the year 2026[55].

[55] This monetary loss is not discounted. Using a 10-percent discount rate, the accumulated loss would amount to USD 9 billion.

Figure 4.1. Evolution of GDP (billion Lempiras) under each of the two scenarios considered

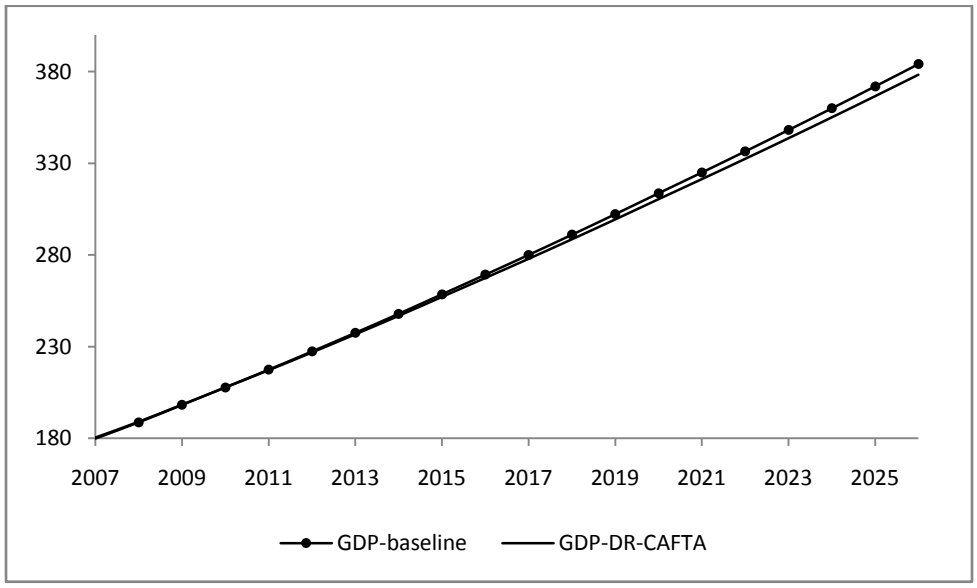
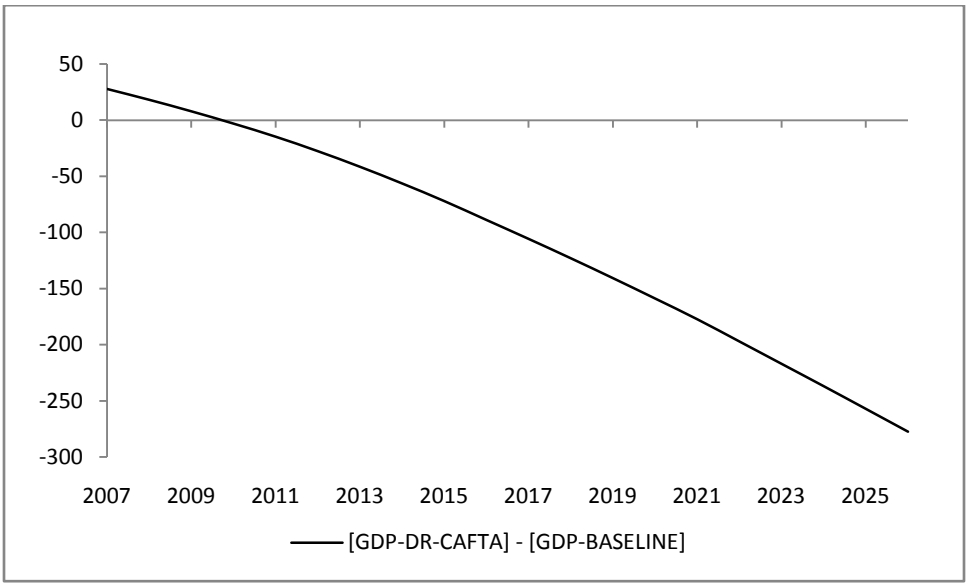


Figure 4.2. Difference in GDP generated in the DR-CAFTA scenario relative to that generated in the counterfactual scenario (USD million)



The findings suggest that the dynamic effects generated by DR-CAFTA through its impact on capital formation are to a large extent driving the aggregate results. In fact, findings from a static, all-at-once-impact simulation of DR-CAFTA show that in fact the

agreement would likely generate an increase in economic growth relative to the benchmark of roughly 1 percentage point[56].

The question of why DR-CAFTA would slow down investment relative to the counterfactual is puzzling, but a closer look at the results reveals that total savings (and thus, by the savings-investment market closure, total investment) would increase at a slower pace in the DR-CAFTA scenario as a consequence of the slower pace of government savings relative to that observed in the counterfactual. Let us analyze these results particularly for the year 2007, when most of the tariff reductions occurred (Table 4.3). Savings by firms and households, accounting for 36.8 percent and 24.2 percent of total savings, respectively, are actually expected to have increased as a result of the agreement by 1.3 percent and 1.2 percent, respectively, relative to the counterfactual. But government savings, which account for 13.7 percent of total savings in 2007, are estimated to have decreased by 19.7 percent as a result of DR-CAFTA in comparison to the benchmark. This significant decrease in government revenues is what actually slows down the growth of total savings, dominating the positive impact of the agreement on the incomes of households and firms and, consequently, on their savings.

The results show that the significant difference in the change in government savings between scenarios is driven primarily by differences in government revenues, more particularly, revenues from import tariffs. Table 4.4 below shows the initial composition of government revenue as well as the changes expected from each scenario. Hence, despite the fact that import tariffs accounted for less than 8 percent of government revenue in 2007, their significant decrease as a result of DR-CAFTA is expected to more

[56] Results from the static simulation are not shown, but are available from the author upon request.

than offset the increases in other more significant sources of government revenues, such as income and sales taxes.

Table 4.3. Percentage changes in the savings by the relevant institutions in each scenario, year 2007.

	INITIAL SHARE IN TOTAL SAVINGS *	COUNTERFACTUAL**	DR-CAFTA**	DIFFERENCE
Total Savings	**100.0%**	**6.3%**	**4.5%**	**-1.7%**
Enterprise savings	36.8%	5.7%	7.0%	1.3%
Household savings	24.2%	6.4%	7.6%	1.2%
Foreign savings	25.3%	-1.2%	-0.4%	0.8%
Government savings	13.7%	21.4%	1.6%	-19.7%

Source: own estimations based on model results.
* This is the share in total savings estimated for the beginning of 2007.
** Percentage change relative to initial values.

Briefly stated, then, decreases in government revenues as a result of the agreement, primarily during the first year where most of the reduction in import tariffs has occurred, result in significantly lower government savings, which actually slows down total savings (investment) relative to the counterfactual. Slower investment results in smaller increases in capital stock, which slow down annual economic growth relative to the counterfactual starting as early as in the second year of the implementation period.

Table 4.4. Composition of government revenues and estimated changes resulting from each of the two scenarios considered.

	INITIAL SHARE IN GOVERNMENT REVENUES *	COUNTERFACTUAL**	DR-CAFTA**	DIFFERENCE
Total Gov. Revenue	**100.0%**	**5.1%**	**0.6%**	**-4.5%**
Income tax	34.4%	4.7%	7.0%	2.3%
Sales tax	47.9%	5.3%	5.9%	0.6%
Production tax	9.6%	4.9%	5.8%	0.9%
Import tariffs	7.8%	5.5%	-67.1%	-72.7%
Foreign transfers	0.3%	0.0%	0.0%	0.0%

Source: own estimations based on model results.
* This is the share in total government revenue estimated for the year 2007.
** Percentage change relative to initial values.

While there is general agreement on the positive relationship between trade and economic growth, the relationship between trade policy reform and economic growth is ambiguous. Several studies conducted during the 1990s suggest a positive relationship between trade liberalization and economic growth (Dollar 1992, Sachs and Warner 1995). In fact, several multilateral organizations and governments have employed these findings to support trade liberalization. However, more recent econometric studies have questioned these findings primarily on the grounds of severe methodological shortcomings, and offered evidence on the still under-developed theoretical relationship between trade policy reform and economic growth (Rodriguez and Rodrik 1999). An econometric assessment by the World Bank (2005) finds a statistically significant and positive impact of free trade agreements on economic growth; the findings suggest a 0.8 percent increase in the rate of GDP growth as a result of the implementation of these agreement. However, these findings by the World Bank reflect the impact of free trade agreements inclusive of all effects they create beyond trade policy removal (e.g., induced changes in the quality of institutions and productivity of factors).

The behavior of total exports and total imports follows closely what happens with the total level of economic activity, which lets us infer that the expansionary effects are dominating the substitution effects. In other words, the expected future growth of the Honduran economy is likely to come primarily from the increase in factor stocks specified for each scenario (specified exogenously for labor and endogenously for capital) rather than from a more efficient allocation of production sparked by changes in

relative output prices[57] (allocative efficiency gains). The agreement is expected to have a positive impact on total volume of trade in the first year of the implementation, followed by minor negative impacts thereafter; when accumulated over the span of the implementation period, the final impact of DR-CAFTA relative to the counterfactual is expected to be marginally negative. In fact, imports and exports are both expected to increase in the short run as a result of the agreement relative to the counterfactual, coincident with the relatively higher level of economic activity sparked by DR-CAFTA in the first year of the implementation. The expansion in imports in 2007 follows primarily as a result of a higher aggregate demand, although the reduction in import tariffs explains around 10 percent of the change in aggregate imports.

Based on the above, we should expect a slight decrease in the total value of trade as a result of DR-CAFTA. At first sight, these findings seem to contradict the trade literature regarding the impact of trade policy reform on exports and imports. However, the minor reduction in trade resulting from the agreement is associated with the negative dynamic effect of DR-CAFTA on the capital accumulation as already explained above, which in turn is highly dependent on the government closure chosen for this study.

Trade openness, measured by the ratio of exports plus imports to GDP, is expected to increase slightly as a result of the agreement relative to the benchmark. This outcome results from the fact that, compared to the counterfactual scenario, the agreement will create a decrease in GDP relatively larger than that observed in exports and imports.

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[57] For instance, a decomposition of the change in total exports in 2007 shows that 99 percent of the change is explained by the expansion in domestic production, and only 1 percent by changes in relative prices (domestic vis-à-vis exports). For imports, the decomposition reveals that 89 percent of the change in aggregate (trade-weighted) total imports is explained by expansion in consumption, and only 11 percent is explained by changes in relative prices of domestic products and imports.

The agreement is expected to have a slightly negative impact on aggregate demand or, which is the same, absorption. In fact, DR-CAFTA is expected to yield an increase in aggregate demand 0.3 percent higher than the counterfactual in the first year of the implementation, 2007, but marginally smaller increases relative to the counterfactual thereafter.

The final macroeconomic indicator considered in this discussion is net investment. Its behavior has been already discussed indirectly when analyzing the future trend in savings and its relationship to gross domestic production. The first year of the implementation of DR-CAFTA is expected to generate a reduction in investment of roughly 1.7 percent relative to the counterfactual (see table 4.1 above). Thereafter, the annual rate of investment is expected to remain slightly lower (around 0.15 percent lower than the counterfactual); the accumulated reduction in investment created by the agreement relative to the benchmark is equivalent to an average of 0.2 percent a year.

It should be kept in mind that the DR-CAFTA scenario does not account for any exogenous change in investment, particularly foreign direct investment, which could materialize as a result of changes in the institutional environment derived from the agreement. The differences between scenarios presented above for a group of selected macroeconomic variables can be explained primarily by the changes in the savings behavior of the government resulting from the implementation of the agreement. From the analysis above we can make two important inferences: (1) that care must be taken when specifying the model to the particular scenario of interest, particularly in the specification of the different model closures; and (2) that changes in savings and therefore investment have the potential to significantly alter the results. While the first

observation is of particular interest for CGE modelers, the second is particularly important for policymakers, and highlights the potentially high returns that could be obtained from improvements in the economic environment that could lead to higher investment (see the results presented in section 5).

In conclusion, the findings of this study reveal that Honduras will experience a slight improvement in the most relevant macroeconomic indicators in the very early stages of the implementation of DR-CAFTA relative to the counterfactual. However, the agreement will likely generate a decrease in government savings early in the implementation process that could slowdown the economic activity marginally, leading to minor negative accumulated effects by the end of the implementation period relative to the benchmark.

4.4.2 SECTORAL IMPACT OF DR-CAFTA

Of the twenty-two economic activities included in the analysis[58], agricultural activities in general, and basic grain activities in particular, are of special interest in this study. However, in order to understand much of the changes reported in this study we need to analyze the impact of the agreement on the largest sectors of the economy. Manufactures[59] is by far the largest sector, accounting for roughly 21 percent of total value added and 56 percent of total intermediate demand in 2007; other sectors contributing greatly are communication services, agriculture, and construction, each

[58] There is a total of 23 activities, but one of them, identified as "a_cgds", represents the production of capital goods and does not count towards GDP.

[59] Manufactures actually encompasses numerous sectors that usually appear as different accounts in more disaggregated SAMs. Data limitations constrained the disaggregation of this sector, and consequently constrained the discussion of results, ignoring interesting cross-sectoral effects that might be happening among manufacturing sectors.

accounting for 15 percent, 13 percent, and 6 percent of total value added, and 5 percent, 7 percent, and 6 percent of total intermediate demand, respectively. Hence, the fate of these four sectors determines to a great extent what happens in the economy as a whole.

It is estimated that the agreement would have a minor impact on the level of production of the manufacture sector relative to the counterfactual for the period 2007-2026; however, the findings suggest that the agreement might change the dynamics of production slightly, yielding increases in production in the first year of roughly 1.7 percent, and slightly lower annual growth thereafter, always relative to the benchmark. This implies that, by 2008, the manufacturing sector already received the benefits of DR-CAFTA, and that the effect of the agreement in the medium and long term vis-à-vis the benchmark would rather be negative. The same findings can be extended to the other large sectors listed above, namely, a larger growth of production the first year of the implementation period sparked primarily by the expansion in aggregate demand relative to the benchmark, and slightly lower annual growth rates thereafter as a result of relatively lower investment generated by the agreement.

Regardless of the scenario, the findings suggest a slow growth of the Honduran economy. Sectoral output is expected to grow below a 5 percent annual average for the 2007-2026 period for all the sectors in the economy regardless of the scenario, with some sectors achieving annual growth rates below 3 percent. These rates of growth in total output are slightly higher than those estimated by Morley, Nakasone, and Piñeiro (2008). However,

when compared to the figures reported by the Central Bank of Honduras[60] for the period 2001-06 (Banco Central de Honduras 2007b), our estimates forecast a slower average growth of (1) the total economy, (2) the service sector, (3) the manufactures sector, and (4) the agricultural sector, in the coming twenty years, regardless of the scenario.

The agreement, as specified in the DR-CAFTA scenario, is expected to have a minor negative impact on total agricultural production relative to the counterfactual. An assessment of the changes in production of specific agricultural sectors shows the same patterns discussed above for manufactures and other large sectors. As can be seen in the Table 4.5 below, all agricultural sectors are expected to grow slightly more in the short run as a result of the agreement; however, in the medium and long term, the minor but still negative effect of the agreement on capital stocks yields smaller rates of sectoral growth relative to the counterfactual scenario.

[60] According to estimations based on the information reported by the Central Bank of Honduras, total output in Honduras grew at 5.7 percent annually in the 2001-06 period (5% arithmetic average), and at 6.5 percent annually (6.3% arithmetic average) in the period 2004-06.

Table 4.5. Activity level for selected sectors under the two scenarios considered

	Average				
	2007-11	2012-16	2017-21	2022-26	Total
Counterfactual Scenario					
Manufactures	5.35%	4.79%	4.14%	3.61%	4.47%
Communications	5.08%	4.52%	4.03%	3.59%	4.30%
Construction	4.76%	4.19%	3.75%	3.36%	4.02%
Agriculture	5.21%	4.58%	3.93%	3.39%	4.28%
Hillside beans	3.28%	2.65%	2.38%	2.14%	2.61%
Valley beans	3.92%	3.33%	2.96%	2.65%	3.21%
High-tech corn	4.00%	3.61%	3.20%	2.86%	3.42%
Medium-tech corn	3.77%	3.28%	2.94%	2.64%	3.15%
Traditional corn	3.58%	2.97%	2.69%	2.43%	2.92%
Rice	4.51%	4.49%	3.96%	3.47%	4.11%
Other agriculture	5.34%	4.69%	4.01%	3.45%	4.37%
DR-CAFTA Scenario					
Manufactures	5.46%	4.68%	4.03%	3.53%	4.43%
Communications	4.96%	4.39%	3.90%	3.49%	4.18%
Construction	4.82%	4.08%	3.64%	3.27%	3.95%
Agriculture	5.15%	4.47%	3.84%	3.31%	4.19%
Hillside beans	3.39%	2.62%	2.33%	2.09%	2.61%
Valley beans	4.02%	3.29%	2.90%	2.60%	3.20%
High-tech corn	4.08%	3.55%	3.27%	2.70%	3.40%
Medium-tech corn	3.87%	3.22%	2.97%	2.51%	3.14%
Traditional corn	3.71%	2.92%	2.70%	2.33%	2.92%
Rice	4.45%	4.38%	3.85%	3.57%	4.06%
Other agriculture	5.25%	4.57%	3.91%	3.37%	4.28%

Source: own estimations based on model results.

Of particular interest for basic grain producers is what would happen if, as a result of DR-CAFTA, the purchase agreements currently in place for corn and rice are eliminated by the end of the implementation period for these crops (namely, year 15 of the implementation for corn and year 18 for rice). This study finds that the expiration of these purchase agreements would have no significant effect on the level of production of corn and rice. The elimination of the 20-percent price premium above the market price of imports obtained by producers through these agreements will have a first-round effect of lowering the composite price (market price for market sales and negotiated price for sales

under the purchase agreements) of corn and rice by roughly 2 percent and 5 percent, respectively. However, the lower composite price for these basic grains encourages consumption, primarily intermediate consumption, which in turn generates an increase in the market price for domestic corn and rice that offsets the initial negative impact of removing the price premium. In conclusion, the purchase agreements will have almost no consequences on the performance of these production sectors as a whole; the only difference is that farmers would receive extra revenues from the market equivalent to the rent generated by these purchase agreements.

The sectoral findings presented here lead us to infer a minor negative impact of the agreement on average for the span of the implementation period. In fact, aside from the positive changes sparked by it in 2007, the agreement is expected to result in very marginal annual effects that deserve no particular explanation, only for the fact that when accumulated across the 20-year span analyzed here, these negligible annual differences end up revealing a minor negative net impact of DR-CAFTA.

The model results can be disaggregated up to the sectoral level. This obviously limits the power of the model to explain what happens at a lower level. One approach to circumvent this limitation is to disaggregate economic activities, at least those of particular interest to the study at hand, to the maximum level possible. To some extent, this is the approach taken in this study, in which the basic grain sector, initially a part of the agricultural sector, is disaggregated into 5 different subsectors. Another valid approach increasingly used by development economists interested in poverty and income distribution effects of trade policies is micro-simulation, that is, the combination of CGE modeling and a microeconomic module with very disaggregated, usually household-level data that takes

the CGE results and translates the effects into more detailed units of analysis. Micro-simulation extends the explanatory power of the analysis to one of the lowest levels of disaggregation possible, thus being arguably the most appropriate method for household-level impacts of economy-wide policy changes.

The comments above are intended to raise awareness about the limitation of the results shown here. The fact that no significant effects of DR-CAFTA on the basic grain sector have been found does not rule out the possibility that some particular production units would actually experience a loss as a result of the agreement. Farms selling a significant part of their output through purchase agreements would likely experience a significant reduction in the composite price they receive, and would likely be forced to relocate their resources into other more profitable activities and/or incur an extra cost searching for new marketing alternatives to sell their production of basic grains. Disentangling the effects of DR-CAFTA at the farm level or, for that matter, at the firm level in any other sector, imply obtaining detailed farm/firm data on production and marketing strategies currently not available in Honduras.

4.4.3 Impact of DR-CAFTA on Factor Markets

Economic growth can result from three primary sources: (1) a reallocation of existing resources into more productive uses; (2) an increase in factor endowments; or (3) an improvement in the technology of production. Most standard factor closures for developed countries tend to minimize the effect of expanding labor endowments. Furthermore, static models, by construction, ignore the potential for economic growth sparked by increases in capital stocks. By adopting (1) labor closures that account for the high levels of unemployment and underemployment in some labor categories, and (2) by capturing the impact of changes in capital stocks, this model tends to generate results that

could be considered too optimistic when compared with findings from static models with more neoclassical factor market closures.

Regardless of the scenario considered, demands for all categories of labor and capital are expected to increase at a significant rate over the next twenty years, which depicts a promising future for the fight against poverty. In fact, the rates of growth in rural and urban employment estimated for both scenarios are higher than the rural and urban population growth estimates and also higher than the rates of growth of the economically active population available for Honduras (Economic Commission for Latin American and The Caribbean 2008). The relatively large rate of growth in employment imply that the future economic conditions have the potential for significantly reducing the high unemployment and underemployment rates that have been observed in Honduras over the last two decades. A simple estimation assuming that (1) the stock of both categories of urban and rural labor would increase at the same rate that the urban and rural population respectively, (2) that unemployment and underemployment have the same incidence among labor groups, and (3) that underemployment amounts to 50 percent [61], reveals that unemployment among urban skilled labor might be halved by 2026, while unemployment among unskilled urban workers might decrease roughly 80 percent. The results regarding rural unemployment are shocking, revealing that in fact the future economic environment would actually increase both skilled and unskilled rural labor demand slightly above the stock of unemployed rural workers estimated following the simple approach above. This analysis of the future labor market conditions is highly simplistic, but is intended to highlight the importance of working towards improving the functioning of factor markets

[61] This means that all workers reporting to be underemployed are working half time on average.

to ensure a freer, less costly movement of labor resources not only among urban sectors but also between the urban and rural sector.

Focusing now on the relative impact of DR-CAFTA on the behavior of factor markets, the findings suggest very marginal changes in both the stocks and prices of factors and, consequently, very minor changes in factors' income between scenarios (see Table 4.6 below). The first year of the implementation period, that is, 2007, is when the most substantial but still minor changes are estimated. In fact, an analysis of the results for the first year would yield in general the same conclusions, although with different magnitudes, as those obtained from a static assessment of DR-CAFTA; that is, the agreement might spark economic growth which in turn increases the demand for all factors of production relative to the counterfactual. However, the negative impact of the agreement on investment leads to a relative slowdown in the demand for factors of production starting in the second year of the implementation period. The annual differences in factor demand between scenarios is very slight, less than 0.03 percent for all factors, but when accumulated over the 20 years of the implementation, they amount to some slightly negative impact of the DR-CAFTA.

Table 4.6. Estimated impact of DR-CAFTA on factor markets

	Average				
	2007-11	2012-16	2017-21	2022-26	Total
Counterfactual Scenario					
Factor endowments					
Unskilled urban labor	3.81%	3.52%	3.13%	2.81%	3.32%
Skilled urban labor	3.49%	3.25%	2.92%	2.65%	3.08%
Unskilled rural labor	3.05%	2.71%	2.34%	2.04%	2.53%
Skilled rural labor	1.99%	1.70%	1.41%	1.16%	1.57%
Capital	6.41%	5.63%	4.92%	4.32%	5.32%
Factor returns					
Unskilled urban labor	0.84%	0.68%	0.55%	0.45%	0.63%
Skilled urban labor	1.06%	0.84%	0.70%	0.58%	0.80%
Unskilled rural labor	2.13%	1.99%	1.85%	1.72%	1.92%
Skilled rural labor	2.16%	1.99%	1.84%	1.71%	1.93%
Capital	-1.29%	-1.11%	-0.98%	-0.85%	-1.06%
Factor income					
Unskilled urban labor	4.69%	4.22%	3.70%	3.28%	3.97%
Skilled urban labor	4.56%	4.10%	3.63%	3.23%	3.88%
Unskilled rural labor	5.24%	4.76%	4.24%	3.79%	4.51%
Skilled rural labor	4.19%	3.73%	3.28%	2.90%	3.52%
Capital	4.98%	4.42%	3.87%	3.41%	4.17%
DR-CAFTA Scenario					
Factor endowments					
Unskilled urban labor	3.95%	3.49%	3.09%	2.78%	3.33%
Skilled urban labor	3.56%	3.23%	2.90%	2.62%	3.08%
Unskilled rural labor	3.14%	2.67%	2.29%	1.98%	2.52%
Skilled rural labor	2.05%	1.68%	1.38%	1.14%	1.56%
Capital	6.24%	5.44%	4.76%	4.19%	5.16%
Factor returns					
Unskilled urban labor	0.98%	0.65%	0.52%	0.42%	0.64%
Skilled urban labor	1.18%	0.81%	0.65%	0.54%	0.80%
Unskilled rural labor	2.22%	1.95%	1.80%	1.67%	1.91%
Skilled rural labor	2.28%	1.95%	1.79%	1.66%	1.92%
Capital	-0.96%	-1.01%	-0.91%	-0.81%	-0.92%
Factor income					
Unskilled urban labor	4.97%	4.16%	3.63%	3.21%	3.99%
Skilled urban labor	4.75%	4.05%	3.56%	3.16%	3.88%
Unskilled rural labor	5.43%	4.67%	4.13%	3.69%	4.48%
Skilled rural labor	4.38%	3.67%	3.20%	2.82%	3.51%
Capital	5.17%	4.34%	3.78%	3.33%	4.15%

Source: own estimations based on model results.

Annual differences in factor prices are also very marginal. The most salient finding relates to the smaller decrease in the return to capital in the DR-CAFTA scenario relative to the counterfactual, which is related directly to the slightly lower supply of capital accumulated over the years.

All in all, then, we can expect only slight changes in factor incomes between scenarios. In fact, the largest average annual difference in factor returns is estimated to be in the order of 0.14 percent, a very minor effect.

4.4.4 Impact of DR-CAFTA on Households

The preceding discussion highlights the minor impact that we should expect from DR-CAFTA on the return to factors of production and the price of commodities. These minor impacts should then also translate into minor household's income, utility, and ultimately, welfare changes as a result of the agreement. These are the results that will be discussed in this section.

The initial dataset reveals that, in aggregate, households receive roughly 77 percent of their income from factors of production (that is, the return for their supply of labor and capital, the latter received through firms), followed by foreign transfers or remittances (17 percent), and public transfers (6 percent). It is important to recall here that firms' transfers to households is a function of firms' revenues, which is in turn primarily a function of capital income and, hence, endogenous in this model; foreign and government transfers to households are assumed to remain fixed in foreign currency and real terms (deflated by the consumer price index), respectively. Therefore, household income will change primarily as a result of changes in factors' incomes.

With factors' incomes increasing significantly over the next 20 years regardless of the scenario, we should expect a significant increase in household income as well.

Furthermore, the findings of this study suggest that the real composite consumption price paid by households will remain roughly unchanged during the next 20 years. A more than proportional increase in income relative to prices results in increases in the utility afforded by households. The change in welfare equivalent to the change in utility level can be translated into monetary terms. In fact, it is expected that household welfare as measured by the equivalent variation[62] (EV) would increase as a result of the changes implied by both the benchmark and DR-CAFTA scenarios. EV cannot be used to compare welfare changes between household groups; however, a common approach used to compare welfare changes between agents is to compare the ratio of EV to initial income. From the findings of this study we conclude that, given the forecasted trend in the relevant variables that describe the counterfactual scenario, all representative households will experience significant increases in their welfare equivalent to anywhere between 4 percent and 5 percent of their income in 2007.

However, when it comes to assessing the impact of the agreement on the income of households, the conclusion is that the agreement will have a very marginal effect on all household variables considered. The last column of Table 4.7 shows the negligible differences in income, consumption price, utility, and welfare between scenarios. These findings should not be surprising provided the slight changes forecasted from DR-CAFTA in the Honduran economy relative to the counterfactual.

[62] EV can be defined as the amount of money needed to be taken away from households before the price change to leave them as well off as they would be after the price change. EV is estimated for each of the representative households specified in the model. A positive EV value implies a welfare gain whereas a negative value implies a welfare loss.

Table 4.7. Estimated average annual impact of both scenarios on selected household variables

VARIABLES	BENCHMARK SCENARIO (1)	DR-CAFTA SCENARIO (2)	DIFFERENCE [(2) – (1)]
HOUSEHOLD INCOME			
Basic grains	3.35%	3.34%	-0.01%
Livestock	3.53%	3.52%	-0.01%
Other agriculture	3.46%	3.45%	-0.01%
Other urban & non-agricultural rural	3.60%	3.60%	0.00%
COMPOSITE CONSUMPTION PRICE			
Basic grains	0.07%	0.06%	-0.01%
Livestock	0.17%	0.17%	-0.01%
Other agriculture	0.12%	0.10%	-0.02%
Other urban & non-agricultural rural	0.01%	0.01%	0.00%
HOUSEHOLD UTILITY			
Basic grains	2.66%	2.66%	0.00%
Livestock	2.74%	2.73%	0.00%
Other agriculture	2.72%	2.73%	0.01%
Other urban & non-agricultural rural	0.88%	0.88%	0.00%
HOUSEHOLD WELFARE (MILLION LEMPIRAS)			
Basic grains	361	360	-1
Livestock	248	248	0
Other agriculture	558	559	1
Other urban & non-agricultural rural	6928	6928	0
Total welfare change	8095	8094	-1
EV / INITIAL INCOME			
Basic grains	4.56%	4.55%	-0.01%
Livestock	4.73%	4.72%	-0.01%
Other agriculture	4.69%	4.69%	0.00%
Other urban & non-agricultural rural	5.12%	5.12%	0.00%

Source: own estimates based on model results. Year-on-year results are not shown, but are available upon request.

These findings, primarily those regarding the welfare effect of the agreement on households depending to a large extent on sensitive, basic grains as a source of income, are somewhat unexpected. Although it is true that most previous assessments indicate a slight impact of DR-CAFTA on agriculture, they also point to the fact that some households, particularly those depending on sensitive products as a source of income, would likely stand to lose as a result of the agreement. It was expected that by

overcoming some of the limitations of previous studies, namely (1) defining a basic grain representative household, and (2) simulating the impact of the removal of the purchase agreements of basic grains, this study would find evidence on the potential negative impact of DR-CAFTA on the selected group of households. Instead, the findings of this study provide no support to reject (under the assumptions implied by this analysis) the null hypotheses presented in chapter 1, namely that DR-CAFTA would negatively impact the welfare of those households depending on basic grains as a source of income.

4.5 Assessing Other Dimensions of DR-CAFTA

The findings for the DR-CAFTA scenario presented above can be seen as a worse-case scenario in that no indirect effects of DR-CAFTA on variables such as foreign direct investment, productivity, and quality of public institutions are considered.

The goal of this section is to expand the analysis of DR-CAFTA beyond trade tariff removal, and assess the potential indirect effects of the agreement on selected areas highlighted by previous studies. This section is not intended to provide an in-depth discussion of the theories explaining the possible avenues through which regional trade agreements (RTAs) might spark domestic changes. It is only intended to provide a rough estimate of the potential returns that could be attained by investing resources in specific areas that could synergize the workings of DR-CAFTA.

Theories suggest numerous avenues in which a regional trade agreement (RTA) such as DR-CAFTA might spark changes in signatory nations, not only economic but also more general social and institutional changes. Previous ex-post assessments of the impact of free trade agreements (RTA) provide support for a positive relationship between RTAs and foreign direct investment (FDI) (World Bank 2005). However, it is extremely difficult to forecast how much FDI in Honduras might increase as a result of the

agreement, given the multiple factors, both domestic and international, that might be at play. The evidence is more ambiguous when it comes to the relationship between RTAs and changes in productivity growth. In fact, the evidence on a relationship between trade and productivity is blurry, let alone the relationship between free trade agreements (believed to yield positive trade effects) and productivity[63]. A review by the World Bank (2005) suggests that the relationship between RTAs and productivity growth is not significant, and stresses the need for improving national education and innovation policies in order to improve competitiveness and, consequently, maximize the benefits from DR-CAFTA. On the other hand, other researchers have found strong evidence on the positive relationship between free trade, growth, and technological spillovers (Deng, Falvey and Blake 2008, Lejour and Nahuis 2005). These studies differ from those reviewed by the World Bank in that they use primarily industry-level data by country rather than cross-country evidence. Finally, there is no clear evidence on the relationship between RTAs and the quality of public institutions. This implies that governments should encourage proactive policy changes to increase the transparency and lower the levels of public corruption. The World Bank (2005) acknowledges that RTAs such as DR-CAFTA, which call for transparency in some processes of government such as procurement and regulatory changes, might spark proactive public action in this regard. An assessment of the potential benefits that an increase in FDI and TFP resulting from DR-CAFTA might generate would shed light also on the potential returns that could be achieved from investments aimed at facilitating FDI and TFP improvements.

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[63] A discussion of the literature on trade and productivity is beyond the scope of this section, but interesting insights on this topic can be found in Alcala and Ciccone (2004), and Doyle and Martinez-Zarzoso (2006)

Specifying the increase in FDI that could be achieved as a result of DR-CAFTA is a challenge. Cuevas, Messmacher, and Werner (2002) find a positive impact of participating in RTAs on FDI; they estimate that the expectation of an imminent entry into a larger regional market increases FDI by 30 percent. Furthermore, the authors find that FDI growth will also vary with the size of the new regional market relative to the economic size of the country; they estimate an elasticity of FDI to relative economic size of between 0.10 and 0.07, which implies that if a country joins a regional market twice its economic size, then it should expect between a 14 percent and 20 percent increase in FDI. These findings say nothing about the annual behavior of FDI, they just express the impact of RTAs as a one-time shock to FDI (Cuevas, Messmacher and Werner 2002). Morley, Nakasone, and Piñeiro (2008) apply an arbitrary 6.25 percent annual increase in FDI as a result of DR-CAFTA. Given the uncertainty surrounding the increase in FDI, the scenario used in this section (called DR-CAFTA+FDI) adds to the specification of the original DR-CAFTA scenario a systematic sensitivity analysis (SSA) assuming that FDI would increase by 10 percent a year, but with a uniform probability distribution ranging from 5 to 15 percent.

Previous studies have shown the poor productivity of the Honduran economy in general (Baier, Dwyer and Tamura 2002), and Honduran agriculture in particular (Coelli and Prasada-Rao 2005). However, the literature shows ambiguous relationships between total factor productivity (TFP) and trade, let alone TFP and RTAs. However, there are numerous ways in which the government can influence TFP growth in the economy, so an assessment on the potential benefits of such an investment is granted. To the list of shocks specified in the DR-CAFTA scenario, I arbitrarily shock total factor productivity

across all sectors by 0.5 percent a year, which is equivalent to an accumulated 10.5 percent increase at the end of the DR-CAFTA implementation period (call the new scenario DR-CAFTA+TFP). No systematic sensitivity analysis is performed because of the large number of stochastic runs needed. However, the differences between scenarios are so large that it seems very unlikely that insignificant differences would be found between the two scenarios, that is, the DR-CAFTA+TFP and the counterfactual scenarios.

The results discussed are the annual average changes expected from each of the two new scenarios as well as the counterfactual over the full span of the implementation period, as well as the differences between the two new scenarios and the counterfactual [64].

4.5.1 Analysis of Results: Foreign Direct Investment Scenario

Table 4.8 below shows the average annual rates of growth of selected macroeconomic variables. As can be seen, a 10-percent annual increase in FDI has the potential for generating significant economic growth of 1.4 percent a year above that estimated in the counterfactual. Figure 4.3 shows the significant difference in GDP accumulated over the span of the implementation period as a result of the increase in FDI. The figure presents the upper and lower bounds for the 95-percent confidence interval estimated from the sensitivity analysis [65]; the narrow distribution around the mean gives us confidence in the potential impact of FDI on GDP relative to the benchmark.

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[64] An analysis of year-on-year results is not performed for the sake of brevity, but year-on-year results are available from the author upon request.

[65] Although we might know the probability distribution of the shocked variable, in this case FDI, it is impossible to know the distribution of each particular endogenous variable. However, there is a general result (Chebyshev's inequality) which assures us that, whatever the distribution of the endogenous variable,

The increase in FDI resulting from DR-CAFTA is estimated to improve all macroeconomic indicators. The total value and volume of trade are expected to increase slightly more than GDP, which leads to improvements in trade openness. Still, expansionary effects dominate substitution effects; exports and imports increase primarily as a result of changes in overall activity level and aggregate demand, respectively, rather than changes in relative prices. Recall that the model assumes perfectly elastic excess demand and excess supply functions, which implies that Honduras can export and import as much as it wants at the ongoing export and import prices. Investment is estimated to increase above 3 percentage points a year as a result of DR-CAFTA+FDI relative to the counterfactual; this significant increase leads to sizeable increases in capital stocks higher than the expected average rate of economic growth.

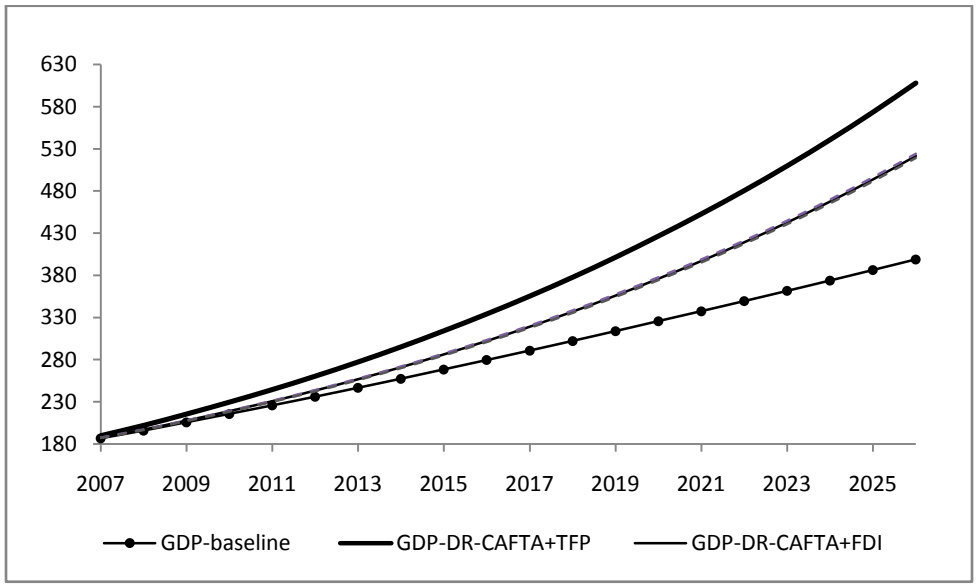
Table 4.8. Average annual rates of growth of selected macroeconomic variables for the two new scenarios and difference with respect to the counterfactual

	Average 2007-2026				
	Counterfactual	DR-CAFTA +FDI	Difference	DR-CAFTA +TFP	Difference
GDP	4.12%	5.53%	1.40%	6.34%	2.21%
Total value of exports	5.10%	6.12%	1.01%	7.09%	1.99%
Total value of imports	4.20%	6.05%	1.85%	5.88%	1.68%
Total value of trade	4.57%	6.08%	1.51%	6.38%	1.82%
Total quantity of exports	4.54%	5.66%	1.12%	6.62%	2.09%
Total quantity of imports	3.72%	5.75%	2.03%	5.55%	1.83%
Total quantity of trade	4.05%	5.71%	1.66%	6.00%	1.95%
Trade openness	0.43%	0.52%	0.09%	0.04%	-0.38%
Absorption	3.72%	5.62%	1.90%	5.69%	1.97%
Gross investment	4.30%	7.81%	3.51%	6.32%	2.02%
Capital stock	5.32%	7.41%	2.09%	6.47%	1.15%

Source: own estimations based on model results.

we can be 95% confident that its value will lie within 4.5 standard deviations each way. Alternatively you can be 89% confident that its value will lie within 3 standard deviations.

Figure 4.3. Evolution of GDP (billion Lempiras) under each of the two scenarios considered



The significant increase in the stock of capital resulting from the higher FDI (see Table 4.8 above) would likely spark expansion primarily among sectors employing a high proportion of the capital factor, namely, communication services, manufactures, and other agriculture sectors.

Table 4.9. Activity level for selected sectors under the two scenarios considered

	Average 2007-2026				
	Counterfactual	DR-CAFTA +FDI	Difference	DR-CAFTA +TFP	Difference
Manufactures	4.47%	5.56%	1.09%	6.69%	2.22%
Communications	4.30%	6.02%	1.72%	5.74%	1.44%
Construction	4.02%	5.69%	1.67%	5.81%	1.79%
Agriculture	4.28%	5.55%	1.27%	5.68%	1.40%
Hillside beans	2.61%	3.38%	0.76%	4.03%	1.42%
Valley beans	3.21%	4.12%	0.90%	4.56%	1.35%
High-tech corn	3.42%	4.42%	1.00%	4.83%	1.42%
Medium-tech corn	3.15%	4.15%	1.00%	4.68%	1.53%
Traditional corn	2.92%	3.89%	0.97%	4.60%	1.68%
Rice	4.11%	5.37%	1.26%	5.69%	1.59%
Other agriculture	4.37%	5.67%	1.30%	5.76%	1.39%

Source: own estimations based on model results.

The growth in these sectors would spread throughout the economy, generating significant increases in production in all sectors of the economy, and raising the demand for all categories of labor relative to the counterfactual. The increase in the demand for labor is expected to generate modest increases in real wages of less than 1 percent a year relative to the counterfactual, although these increases are not negligible when compared to the past trend in real wages particularly for unskilled labor. The return to capital is expected to decrease as a result of DR-CAFTA+FDI, which implies that the increase in the demand for capital is not large enough to offset the significant increase in capital stock, which leads to a decrease in price to achieve equilibrium in the capital market. DR-CAFTA+FDI is expected to increase the income of all factors of production by between 1.2 percent and 1.6 percent a year relative to the counterfactual, which would translate into slightly less than proportional increases in household incomes (Table 4.11). The increase in income along with the almost negligible increase in the real composite consumption price paid by households would lead to higher utility levels and, consequently, higher economic welfare for all representative households. The differences in welfare expected to be generated by DR-CAFTA+FDI vis-à-vis the counterfactual and expressed relative to households' incomes in 2007 are estimated in the range of 2.5 percent and 3 percent a year.

Table 4.10. Estimated impact of DR-CAFTA+FDI and DR-CAFTA+TFP on factor markets

	Average 2007-2026				
	Counterfactual	DR-CAFTA+FDI	Difference	DR-CAFTA+TFP	Difference
FACTOR ENDOWMENTS					
Unskilled urban labor	3.32%	3.9%	0.62%	4.59%	1.27%
Skilled urban labor	3.08%	3.5%	0.44%	3.79%	0.71%
Unskilled rural labor	2.53%	3.3%	0.77%	3.67%	1.14%
Skilled rural labor	1.57%	2.0%	0.45%	2.26%	0.69%
Capital	5.32%	7.4%	2.09%	6.47%	1.15%
FACTOR RETURNS					
Unskilled urban labor	0.63%	1.2%	0.61%	1.86%	1.24%
Skilled urban labor	0.80%	1.7%	0.85%	2.19%	1.39%
Unskilled rural labor	1.92%	2.7%	0.77%	3.05%	1.13%
Skilled rural labor	1.93%	2.8%	0.91%	3.33%	1.40%
Capital	-1.06%	-1.5%	-0.49%	0.10%	1.16%
FACTOR INCOME					
Unskilled urban labor	3.97%	5.2%	1.25%	6.54%	2.57%
Skilled urban labor	3.88%	5.2%	1.32%	6.04%	2.15%
Unskilled rural labor	4.51%	6.1%	1.58%	6.84%	2.33%
Skilled rural labor	3.52%	4.9%	1.39%	5.66%	2.14%
Capital	4.17%	5.7%	1.54%	6.53%	2.36%

Source: own estimations based on model results.

Table 4.11. Estimated average annual impact of DR-CAFTA+FDI and DR-CAFTA+TFP on selected household variables

	Average 2007-2026				
	Counterfactual	DR-CAFTA+FDI	Difference	DR-CAFTA+TFP	Difference
HOUSEHOLD INCOME					
Basic grains	3.35%	4.60%	1.24%	5.23%	1.88%
Livestock	3.53%	4.82%	1.29%	5.49%	1.97%
Other agriculture	3.46%	4.72%	1.26%	5.36%	1.90%
Other households	3.60%	4.87%	1.28%	5.71%	2.11%
CONSUMPTION PRICE					
Basic grains	0.07%	0.08%	0.01%	0.03%	-0.04%
Livestock	0.17%	0.17%	-0.01%	0.20%	0.03%
Other agriculture	0.12%	0.12%	0.00%	0.06%	-0.06%
Other households	0.01%	0.01%	0.00%	0.01%	0.00%
HOUSEHOLD UTILITY					
Basic grains	2.66%	3.88%	1.22%	4.56%	1.90%
Livestock	2.74%	4.02%	1.29%	4.65%	1.92%
Other agriculture	2.72%	3.97%	1.25%	4.66%	1.94%
Other households	0.88%	2.12%	1.24%	2.92%	2.04%
HOUSEHOLD WELFARE					
Basic grains	361	565	204	696	335
Livestock	248	395	147	482	234
Other agriculture	558	877	318	1082	523
Other households	6928	10737	3809	13729	6801
Total welfare change	8095	12574	4478	15989	7893
EV / INITIAL INCOME					
Basic grains	4.56%	7.14%	2.58%	8.80%	4.24%
Livestock	4.73%	7.52%	2.79%	9.19%	4.46%
Other agriculture	4.69%	7.37%	2.67%	9.09%	4.39%
Other households	5.12%	7.93%	2.81%	10.14%	5.02%

Source: own estimations based on model results.

4.5.2 ANALYSIS OF RESULTS: TOTAL FACTOR PRODUCTIVITY SCENARIO

Turning now to the analysis of the DR-CAFTA+TFP scenario, that is, trade tariff removal and a 0.5 percent annual increase in TFP over the span of the implementation period, the results suggest a remarkable impact of productivity growth on all the economic variables of interest. At the macroeconomic level, a 10 percent increase in productivity resulting from DR-CAFTA could generate a significant growth differential

with respect to the benchmark of the order of 2 percent a year. Figure 4.3 shows the significant increase in GDP generated by this scenario relative to the counterfactual as well as the DR-CAFTA+FDI scenario.

In a partial equilibrium setting, an increase in TFP at constant production levels and output prices would generate an imbalance in factor markets and extra profits in primary production. However, in general equilibrium neither output level nor output prices are fixed. As shown in Table 4.9 above, the increase in TFP leads to a significant expansion in production that actually pushes up the aggregate demand for all factors of production as well as their returns relative to the benchmark.

Aggregate exports increase significantly, primarily as a result of the expansion in domestic production. Aggregate demand is also expected to expand significantly, pushing up the demand for domestic as well as imported goods. As a result of the high economic growth relative to the growth of exports and imports, trade openness is expected to decrease slightly as a result of DR-CAFT+TFP. Finally, investment is expected to increase significantly vis-à-vis the counterfactual, primarily as a result of higher savings by domestic institutions, namely, households, firms, and the government, since in this scenario no changes in FDI are specified. In fact, the decrease in tariff revenues resulting from the removal of import tariffs would be more than offset by the increase in revenues from income and sales taxes, which leads to higher government revenues and savings relative to the counterfactual.

An accumulated ten-percent increase in TFP over the 20-year implementation period would lead to more than proportional increases in agricultural output. As shown in Table 4.9 above, on average we can expect a 1.4 percent increase in total agricultural output per

year, or which is the same, a 28 percent increase in total output over the next twenty years. This significant rate of growth is slightly smaller than that estimated for other large sectors such as manufactures, construction, and communication services.

Higher prices and aggregate demands for all factors of production relative to the benchmark lead to higher factor incomes, which in turn lead to increases in households' incomes. Basic grain households are expected to receive slightly lower relative increases in income compared to other households (see Table 4.11 above), but still their income gains from DR-CAFTA+TFP are expected to be significant and accumulate to a 45 percent differential by the end of the implementation period relative to the counterfactual. Higher incomes and relatively unchanged consumption prices lead to higher utility levels and improvements in economic welfare vis-à-vis the benchmark, which expressed relative to households' income in 2007, represent annual increases in income of between 4 percent and 5 percent.

The brief discussion on the potential impact of FDI and TFP growth on the performance of the Honduran economy and the welfare of representative households reveals that public investments aimed at creating the conditions believed to encourage FDI and TFP growth could be highly rewarding. While the results shown above might be good proxies for the gross revenue, the final rate of return of public investment in these areas will depend on the costs incurred to generate the desirable FDI and TFP outcomes.

4.6 CONCLUSION

Agricultural negotiators from the participating Central American nations were under significant pressure to obtain beneficial deals for their sensitive agricultural sectors during the DR-CAFTA negotiations. Measured by the negotiation outcome, agricultural lobbies representing sensitive sectors were successful, obtaining favorable, back-loaded

schemes and, in some instances, granting no further access to their domestic markets than that offered already under the most favored nation principle.

Nevertheless, there are still concerns about the impact of DR-CAFTA on sensitive agriculture, particularly on corn and, to a lesser extent, the rice and beans sectors. Regardless of the extended protection obtained for these products, free-trade competition with the U.S. will be a reality in the near future, and there is fear that the welfare of households depending to a large extent on these commodities as a source of income would be severely affected. This is even more worrisome if we consider the large number of poor households that rely on basic grains for their subsistence.

The findings of this study suggest a negligible impact of DR-CAFTA on the performance of the Honduran economy in general, and the agricultural sector in particular. This extends to the activities associated with the production of corn, beans, and rice, as well as the households depending to a large extent on these crops as a source of income. These results stand even assuming that the purchase agreements currently in place between the industry and producers of rice and corn would expire by the end of the implementation period for each product. The elimination of the price premium received by farmers under these purchase agreements would in aggregate be offset by an increase in the domestic market price for their products, leaving the trade-weighted composite price received by farmers roughly unchanged.

Based on previous ex-post assessments of the impact of free trade areas, it seems misleading to represent DR-CAFTA solely as a reduction in trade barriers. There is evidence that free trade agreements spark changes well beyond those resulting from tariff reduction. Changes in relative prices are but one of the ways in which free trade

agreements might impact the economic performance of a given region and the welfare of individuals. For instance, there is broad support to, and evidence suggesting a strong and positive impact of trade agreements on investment, a variable found to be an important source of economic growth.

Changing the specification of DR-CAFTA to account for the potential impact of the agreement on foreign direct investment and total factor productivity leads to significantly positive results and highlight areas where public efforts could prove highly rewarding. Although the findings from this study might be seen as a relief for some stakeholders with particular interest in the well-being of Honduran farmers, it is important to keep in mind the assumptions and limitations of this study, and consequently the generalization of these results.

First, as commented in the previous chapter, the data employed for the construction of the SAM is the best data currently available in Honduras. However, the statistical limitations, basically, representativeness, of the sample from which household income and expenditure data were obtained must be kept in mind as a potential source of error.

Second, as presented in the previous chapter, the CGE modeling framework has some associated limitations that must be kept in mind whenever results are analyzed. These limitations are associated primarily with the numerous assumptions that must be made in order for the model to be manageable. Perfect competition is assumed in all markets, which puts all weight on prices as a source of market adjustment. Modeling imperfect competition is a desirable extension of the model, provided that all the detailed data needed, usually detailed industry-level data, is actually available. Another modeling limitation relates to the technologies of production and consumer behavior. By definition,

each activity or institutional account is treated as a homogenous agent that produces according to one technology of production and consumes according to one system of demand. This limitation can only be overcome by defining more accounts, which is in turn limited primarily by data availability. Furthermore, there are a number of exogenous parameters needed for the calibration of CGE models whose origin and relevance to the study at hand might be questionable.

Finally, it must be kept in mind that the baseline scenario is specified considering that the benefits granted unilaterally by the U.S. through the Caribbean Basin Initiative (CBI) are maintained regardless of the fate of DR-CAFTA. Recall that the benefits granted under the CBI were conditional on the approval of DR-CAFTA or would have otherwise expired in 2008. This assumption greatly simplifies the analysis, since specifying the removal of these benefits is very difficult given the different rules included in the CBI.

5. ADJUSTMENT PROGRAM DESIGN

5.1 INTRODUCTION

Compared to its performance during the 1990s, the Honduran economy has done very well during the last seven years. Economic growth has increased significantly, from an annual average 3.3 percent during the 1990s, to a 5.6 percent in 2000-06 (Banco Central de Honduras 2007b). This change in growth has been led by changes in sectors such as textiles and apparels, tourism, and to a less extent, non-traditional agriculture. However, the growth of the Honduran economy just equals the average for the region and for a large group of developing nations, which suggests that the improvement in the economic activity has been more a consequence of a favorable external economic environment rather than structural changes in the domestic economy (World Bank 2007a). Furthermore, GDP per-capita has been highly volatile but in average remained stagnant during the 1990s, increased modestly but steadily in the early 2000s, and at a significant annual rate of 4 percent since 2004.

Economic growth is considered the most important means to improve the well-being of the population, particularly the poor. The evidence is clear in that economic growth contributes to the reduction of poverty (Fields 2001). Despite the promising economic growth observed lately, analysts agree that Honduras needs to accelerate its growth rate in order to achieve the World Bank/United Nations Millennium Development Goals (MDG) set for 2015, because growth and MDG achievements reinforce each other (Bussolo and Medvedev 2007). The signing of DR-CAFTA and, in general, the opening of the economy, is one of the economy-wide policy reforms undertaken with the goal of fostering economic growth; but many other reforms are needed not only to improve the

potential benefits from the agreement but also to take advantages of other growth opportunities.

The findings presented in chapter 4 suggest that the Honduran economy will grow only modestly over the next twenty years regardless of whether or not DR-CAFTA (understood only as reductions in import tariffs) is fully implemented. At the estimated rates of economic growth, Honduras would most likely not achieve any of the MDGs, and the good performance to date in particular areas such as poverty and education might prove insufficient. In fact, the findings of this study suggest a slightly negative impact of the agreement on economic growth, primarily because of the negative impact of the agreement on total investment. The findings for the DR-CAFTA scenario can be seen as a worse-case scenario in that no indirect effects of DR-CAFTA on variables such as foreign direct investment, productivity, and quality of public institutions are considered. Chapter 4 also shows the promising benefits that could potentially result from improvements in foreign direct investment and total factor productivity as a result of DR-CAFTA. Assuming that the higher rates of economic growth estimated in these two scenarios are sustainable, achieving the MDGs would still require additional adjustments at the public level. There is a need for a proactive role of the government primarily with regard to the management of public expenditure, basically (1) re-directing public investment into more productive areas, and (2) improving the cost-effectiveness of specific policies and programs (Bussolo and Medvedev 2007). Greater public disclosure and transparency of budget allocation and impact assessments are needed to mobilize political support for budgetary reforms (World Bank 2007a).

The DR-CAFTA agreement still raises significant concerns among those with a stake in traditional, basic grain agriculture. The schedules of trade liberalization negotiated for these sectors, although significantly back-loaded, still imply a potentially sizeable change in the long-term market conditions, bringing direct competition with the more efficient U.S. rice and corn sectors. The findings presented in chapter 4 indicate that the agreement might have negligible negative effects on the income of the representative household highly dependent on basic grains as a source of income relative to the business-as-usual, counterfactual scenario (see Table 4.7 in previous chapter). However, the limitations of the methodology are significant and should be kept in mind when analyzing the results. Perfect competition in factor and output markets, specifically for agriculture, is an overly simplistic assumption for the case of Honduras (Taylor et al. 2006). Furthermore, imposing optimality conditions in consumption for all households and in production for all activities is likely to be also a significant source of error. Even if these assumptions were to hold, and further assuming that in aggregate the findings for the representative basic-grain household are correct, still the impact on specific households cannot be estimated. Differences in the sourcing of income and allocation of expenditures would likely lead to significantly different outcomes for particular households compared to those estimated by the representative household. Consequently, although the findings might be seen as a sign of relief for some because the negative impacts are small, it should not deter stakeholders in the pursuit of appropriate programs to facilitate the transition to more competitive markets, and more importantly, the transition to improving the standard of living for basic grain farmers.

This chapter analyses the development of feasible adjustment programs for the basic grain sector. This exercise explores the limitations and strengths of applying particular policy tools to the Honduran case, as well as assesses to some extent the political economy surrounding agricultural policy. The following section focuses on the description of the context in which policymaking occurs, with particular emphasis on agriculture. The third section describes the desirable features of agricultural policy in developing countries, based primarily on evidence from around the world. The fourth engages more specifically in the process of formulating an adjustment program suitable for Honduras, providing stylized guidelines that can serve as a roadmap for a serious adjustment program formulation. Final conclusions of the study as a whole and recommendations are offered in section 5.

5.2 Towards a New Agenda for Honduran Agriculture: The Political and Economic Context

It is well known that formulating the agricultural agenda for both developed and developing countries has become more difficult over the last few decades. The multifunctional view of agriculture implies an increase in the scope of the products and services this sector provides and therefore the broader set of goals that agricultural policy must pursue. Today, agriculture is seen not only as a source of economic growth, but also as a way of living for the majority of the rural population, as a steward of the valuable endowment of natural resources, and as a key pathway out of poverty, particularly for the rural poor (World Bank 2007c).

Evidence from around the world shows the potential of agriculture as an engine for economic growth in the early development process. Countries once highly dependent on agriculture such as Thailand and Brazil have diversified away from agriculture and

achieved significant economic growth and reduction in rural and urban poverty rates. Still agriculture offers promising opportunities to foster economic growth in these countries, such as specialization in high-value agricultural products for the domestic and international markets. On the other hand, there is also evidence on the failures to achieve sustained agricultural growth. The productivity of agriculture in Sub-Saharan Africa has remained low and fairly stagnant for decades, and no progress has been made on the reduction of poverty, which still remains close to 50 percent (World Bank 2007c).

For most developing countries, achieving a sustainable growth of agriculture demands concerted action from different levels of government at the national and regional levels, the private sector, and from international donors and development organizations. For the particular case of Honduras, it will require numerous changes at the public level to increase accountability, make a more efficient use of public funds, and generate the political legitimacy needed to make tough decisions in the face of strong opposition from vested groups.

A precondition for agricultural and, for that matter, economic growth as a whole, is a stable macroeconomic environment. Like most Latin American nations, Honduras has historically struggled with increasing budget deficits, inflation, and unemployment rates. The Honduran government had make significant adjustments in its expenditures over the last few years to maintain a stable macroeconomic environment while at the same time satisfying the demands of powerful sectors of society in an attempt to control social unrest. According to experts from the World Bank and the Economic Commission for Latin America and The Caribbean (ECLAC), the upward pressure on public expenditures is primarily a consequence of three factors, namely, (1) the poor performance of state-

own enterprises, primarily the national electric and phone companies, which have run significant deficits over the last several years, (2) the increasing cost of the public labor force, primarily in the education and health sectors, and (3) the increasing cost of subsidies on services such as electricity and transportation, exacerbated by the latest upward trend in fuel prices. With limited latitude to increase taxes[66], and with donations being undermined by high levels of corruption, the only feasible alternative for Honduras to maintain a balanced budget is to improve the efficiency in the use of the scarce public resources (World Bank 2007a, Gomez-Sabaini 2003, 2006).

Foreign lenders such as the World Bank, the Central American Bank for Economic Integration, and several governments have written off the external debt that Honduras maintained with them conditional on those funds to be used on the fight against poverty (Secretaria de Finanzas 2007). Nevertheless, the government has cut expenditures in areas such as poverty reduction and public investment over the last few years in order to keep the deficit under control (World Bank 2007a).

Still, for the government to achieve the goals of (1) maintaining a high level of economic growth, (2) reducing income inequality, and (3) strengthening the fight against poverty, significant reform is needed to control the growth in expenses and, arguably more important, make more efficient use of public funds.

There is no doubt that investment in human capital is crucial for the future well-being of the society, and that is the reason why education and health have always accounted for a

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[66] For Honduras, Gomez-Sabaini (2006) estimates a steady increasing trend in the tax pressure (tax revenue / GDP) from 16.8 percent in 1995 up to 18.2 percent in 2004. These estimates might be biased upward due to the underestimation of the GDP. Re-estimating these figures using the new macroeconomic estimates generated by the Central Bank of Honduras, reveals that, on average, the tax pressure for the 2000-05 period was around 13.7 percent, still slightly higher than the average for Latin America.

significant share of the budget. However, there is also little doubt among analysts that more than just larger budgets are needed to get the payoff out of that investment. Honduras devotes much more resources (13 percent of its GDP in 2004) to salaries and wages than any other Latin American nation (regional average of 6.1 percent of GDP in 2004), most of which goes to pay the salaries of teachers and healthcare workers. Meanwhile, Honduras ranks 17th among 23 Latin American countries with regard to the efficiency in education, and just above the regional mean when it comes to the efficiency in the healthcare system[67] (Herrera and Pang 2004). Furthermore, public salaries in Honduras are estimated to be 88 percent larger than those paid by the private sector, which undermines the idea that public employees are underpaid relative to the rest of the society (World Bank 2007a). The poor performances in education and to a lesser extent healthcare are among the main reasons explaining the poor efficiency of public spending in Honduras.

Policy reform to improve the investment climate is crucial to stimulate domestic and foreign investment. Despite the recent success in attracting foreign direct investment[68], Honduras still has significant work ahead to encourage further expansion of investment,

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[67] The authors estimate the efficiency in education using a Production Possibility Frontier estimated using the data envelopment analysis approach. Both input and output-oriented efficiency in public education and health services are estimated. There are eight output indicator in education referring to primary and secondary enrollment, average years of schooling, first and second level completion rates, and literacy rates among youth. There are four output indicators for health referring to life expectancy at birth, DPT immunization, measles immunization and the disability-adjusted life expectancy index. For more information on these estimates, see Herrera and Pang (2004), and Annex A in World Bank (2007b).

[68] The Central Bank of Honduras estimates that FDI represented an average of 2 percent of the GDP during the 1990s, and increased to 3.5 percent during the 2000-02 period (Banco Central de Honduras 2004). According to the Economic Commission for Latin America and The Caribbean (2008b), FDI amounted to roughly 8 percent of the GDP during the 2005-07 period.

specifically when it comes to offering better protection to investors, enforcing contracts, and lowering the start-up costs of business [69].

The new administration of President Zelaya has also taken steps towards tackling the historical problem of corruption [70], but its actions so far have been ambiguous. After strong bargaining and significant compromises [71] between civil society and international organizations one the one hand and members of Congress on the other, Honduras passed the Transparency Law in 2006, aimed at increasing accountability in the management of public funds. The law is administered by the new Access to Public Information Institute (IAIP for its initials in Spanish). However, it is questionable whether this institute will administer the law fairly, primarily because the appointment procedure for the three commissioners in charge of administering the institution is subject to political favoritism. Furthermore, still too many funds are exempted from public disclosure with the approval of IAIP, which constitutes a violation of the Transparency Law as well as other international treaties on corruption to which Honduras is a signatory. All in all, the perception among the civil society is that despite the actions taken by the government, too much latitude still exists for corruption to continue unabated (Consejo Nacional Anticorrupcion 2007).

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[69] The World Bank "doing-business index" ranks Honduras 134 among 181 countries in 2008. Decomposing the index we find areas such as enforcing contracts, paying taxes, protecting investors, and employing workers, in which Honduras ranks among the 20 worst nations to do business. Honduras performs very well with regard to accessing credit (25th), and performs around the mean with regard to dealing with construction permits (70th) and registering property (85th). See http://www.doingbusiness.com.

[70] According to the corruption perception index estimated by Transparency International, Honduras ranks very low in terms of transparency (high in terms of corruption), actually in the 132nd place among 180 nations worldwide, and 26th among 32 Latin American nations in 2008. http://www.transparency.org.

[71] A strong source of disagreement between Congress and advocacy groups was the treatment of previous administrative acts. Finally, the new Transparency Law does not contemplate the investigation of previous administrations.

The government has also taken a proactive role to increase its legitimacy by approving the Civil Participation Law (Ley de Participacion Ciudadana) in 2006 with the goal of improving the participation of civil society in the policymaking process. Still, despite this effort, participation [72] remains extremely low, and constitutes a real threat to the democratic process (Coleman and Argueta 2008).

Despite the poor guarantees offered to political opponents and the limitations regarding freedom of speech, grassroots organizations are contributing to the fight against corruption mainly through monitoring of the policymaking process and engaging in the formulation of policy proposals. The participation of these grassroots groups is seen as one option to reform governance through higher participation of civil society in policymaking. Increasing the participation of civil society in policymaking can prove effective to diminish the capture of the government by strong interest groups, not only by countering the pressure of historically vested interest groups, but also by increasing the legitimacy of public institutions, currently so depreciated in Honduras (Coleman and Argueta 2008).

However, the public perception on corruption has not been altered much by the initiatives of the government cited above. Allegations of corruption in the Attorney General's Office in favor of powerful politicians and strong economic groups, the inaction of the government before these accusations, and the latter threats and acts of violence against some of the district attorneys involved in the strike are just contributing to the skepticism

[72] The America's Barometer survey measures civil society participation as the share of respondents that report (1) participation in local government meetings; (2) making demands before the local government; (3) participation in civil society organizations (e.g., church, parent's association at school, community development meeting) .

of the public about the willingness of seriously tackling corruption (Coleman and Argueta 2008).

5.2.1 Legislative Behavior and Implications for Agenda Setting

By design, the institutional framework in Honduras grants legislative power to the Executive Branch, the Legislative Branch, the Judicial Branch, and the National Electoral Tribunal. However, the evidence regarding legislative activity highlights the dominant role of the President in the policy making process[73]. The subordination of the Legislature to the will of the Executive has led some analysts to categorize the Honduran Congress as a marginal legislature, with modest policy-making power and little support from political elites. New evidence, however, call into question this categorization, for Legislatures have been found to play a larger part in policy making than previously expected (Taylor-Robinson and Diaz 1999). Furthermore, an analysis of the legislative-sponsored legislation highlights the dominant role of Congress leaders, that is, members of the Board of Directors, in the policy making process[74].

There has never been a divided government in the democratic history of Honduras. Analysts have proposed alternative explanations for this behavior. Calix (2001) argues that the electoral system has greatly contributed to this behavior, given that until 1997 presidential and legislative elections were fused, that is, voting for a presidential

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[73] Taylor-Robinson and Diaz (1999) found that no less than 66 percent of the bills passed into law annually during the period 1990-97 were initiated by the Executive Branch, and in 1992, a peak of 81 percent of the bills passed into law were initiated by the President. Ajenjo (2004) reports that 62 percent of the bills passed into law during the period 1997-2001 were sponsored by the President; furthermore, this author reports that roughly two thirds of the laws sponsored by the Executive branch were approved during the first half of the presidential period.

[74] Taylor-Robinson and Diaz (1999) found that 67 percent of the legislative-sponsored proposals enacted into law during the period 1990-97 were initiated by Congress leaders; on the other hand, only 23 percent of the legislative-sponsored proposals that died in commission were initiated by Congress leaders.

candidate implied voting also for his/her congressmen. Furthermore, the ballot did not include the names of the congressmen, whose designation was done ad-hoc by party authorities after the election (Taylor-Robinson 2006). This system led to similar electoral results at both the executive and legislative levels and to a great subordination of legislators to party authorities, which consequently resulted in the hegemony of one political force and one ideology in government. Another aspect of the electoral system blamed for the dominance of unified governments is the fact that presidential and legislative elections are both held the same day. This feature is believed to enhance the role of the president, spreading the intentions to vote at the presidential level to the legislative election.

Against the expectations derived from political science theories about the role of institutional design, the proportional representation system used in Honduras has not proven effective in promoting a multiple-party system (Calix 2001). Despite the growing importance of three minority political parties in the last two electoral cycles, the two leading parties, namely, the Liberal and National parties, continue to dominate the political arena[75]. According to Taylor-Robinson (2006), the two leading, conservative, pro-elite parties maintain their dominance through parochialism, primarily among poor, rural communities.

Since 2001, the party controlling the Executive Branch has no absolute majority in Congress. This composition of the Legislature has the potential to create a divided

[75] Argueta (2007) estimates that the number of effective political parties has remained close to 2 up to the 1997 election, and has increased to 2.4 in the latest 2005 election, which indicates only a slight move to a multi-party system. The author argues that changes in the electoral system introduced in 1997 might be the main reason behind the increase in the effective number of political parties.

government[76]. However, reality indicates that the ideological differences between the three minority parties and the main opposition party, that is, the National Party, make the conformation of an opposing coalition highly unlikely (Ajenjo 2007).

Another relevant feature of the Honduran legislative process is the relevance of priority relative to ordinary policy initiatives[77]. Priority initiatives call for more expedite legislative processes; according to analysts, priority initiatives are prone to be subject to less public exposure and hence can be used to the benefit of the proponent (Ajenjo, 2004).

All in all, the constitutional and procedural characteristics of the Honduran Legislative highlight the dominant role of the President and, to a lesser extent, Congress leaders, and the limited channels through which the preferences of the public can reach the relevant legislative agenda. Interests groups with enough lobbying power to affect the agenda of the President and Congress leaders are in a prime position to achieve their policy goals relative to other interest groups.

Some changes in electoral regulations implemented in 2005 might contribute to a more proactive role of Congress and new channels through which interest groups might permeate Congress. For instance, starting in 2005 voters cast their votes for particular legislators within a party of their choice, thus transferring the power of selecting

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[76] The current Legislature is composed as follows: 62 representatives from the Liberal Party (the same party that controls the Executive Branch); 55 representatives from the National Party; 5 representatives from the Democratic Unification Party; 4 representatives from the Christian Democratic Party of Honduras; and 2 representatives from the Innovation and Unity Party.

[77] Ninety four percent of the laws enacted in Honduras during the 1997-01 period were priority initiatives, and 62 percent of these priority initiatives were sponsored by the Executive Branch. This implies that the use of this categorization of policy proposals is not exclusive of the President, and that legislators also engage in the use of priority initiatives (Ajenjo, 2004).

particular legislators away from party authorities. This change in the institutional framework is expected to generate a stronger relationship between congressmen and society, and a more independent behavior of congressmen vis-à-vis party authorities (Taylor-Robinson, 2006). To date, however, there is no clear evidence on a change in legislative behavior.

Hence, reaching the Presidential agenda is still crucial for a proposal to have high chances of serious policy consideration. So the relevant question is who sets the Presidential agenda in Honduras. As previously said, the current administration sponsored the Civil Participation Law with the goal of improving the participation of civil society in the policy making process. This law creates new channels through which the organized civil society can place their demands to local and national authorities. However, these measures by themselves would likely be insufficient to enhance the participation of society in the policy making process; complementary measures are needed to develop the interest of civil society to participate in the policy making process (Coleman and Argueta, 2008).

5.3 Towards a New Agenda for Honduran Agriculture: Main Features

The World Bank and other development organizations are pushing for a new agricultural agenda for developing countries aimed at fostering economic growth and alleviating poverty. The guidelines provided by these initiatives, drawn primarily from the successes and failures of countries worldwide, emphasize the work in seven particular areas, namely, (1) improving price incentives, (2) enhancing the quantity and quality of public investment, (3) making product markets work better, (4) facilitating access to financial services and reduce the exposure to unsecured risks, (5) enhancing the performance of

producer organizations, (6) promoting innovation through science and technology, and (7) making agriculture more sustainable (World Bank 2007c).

Analysts agree on the importance that interest groups and institutions have when it comes to explaining certain policy outcomes. Economists and others alike have long realized the existence of political markets that distort policy outcomes away from those forecasted based on social welfare objectives (Schmitz, Furtan and Baylis, 2002, Baldwin 1989, Hillman 1982). Policymaking can be simply understood as a bargaining process engaged by politicians and interest groups and played within the rules set by the relevant political institutions. Politicians might pursue different goals, such as remaining in power, favoring their constituencies, or improving the overall welfare of the country; they can also employ alternative strategies or policies to achieve them. Interest groups might also pursue different economic and social goals, such as demanding public action to fight poverty or, more often, simply improving the welfare of group members. The exchange might involve votes, jobs, money, or other forms of political support. Institutions have a significant role in setting the rules that constrain the actions of the players; but the institutional framework has also the potential to affect the goals of the players (e.g., reelection, disclosure of information), the size of the prize at stake (e.g., total budget), and the number of players involved (e.g., cost of entry for new groups).

The political power of organizations is primarily a function of their ability to act collectively (overcoming the costs of organization and free-riding) and the resources at their disposal for political purposes (Olson 1965). The cost of organization is believed to vary inversely with the number of members in the group, their geographic dispersion, and constrained access to information. Collective action problems are usually exacerbated

also by the unequal distribution of endowments among group members, which might lead to intra-group differences in interests and magnitudes of the benefits/costs from a given policy outcome that yield differences in group member commitments to a given cause[78]. Some ways to improve the transmission of price incentives to farmers are the removal of policies biased against agriculture (e.g., taxation of agricultural exports and protection of imports), improvements in market infrastructure, institutions, and support services. For different reasons, developing countries have historically taxed agriculture. Despite the decreasing bias against agriculture observed worldwide, agriculture in developing countries can still perceive sizeable gains from the removal of trade barriers in developed and developing nations. In the particular case of Honduras, and as measured by the pattern of trade tariffs, there is no evidence of a bias against agriculture. The government applies no export tariffs on any product, including agricultural goods, and maintains low import tariffs on most products employed as inputs in agricultural production; furthermore, it maintains significant protection on few agricultural products. Information on the pervasiveness of non-tariff barriers (NTBs) in Honduras is scarce, but the evidence suggests that the schedule of NTBs maintained actually grant extra-protection to some Honduran agricultural sectors. It is a fact that Honduras maintains a number of sanitary and phytosanitary (SPS) measures in products such as poultry, potatoes, and dairy, whose rationale have been questioned in multilateral and, most intensively, in regional forums. Central American partners have raised several complaints over the last several years

[78] In some instances, heterogeneity among group members might actually help overcome the problems of collective action. Such might be the case of large farmers that, given the endowments of resources owned, are exposed to lose significantly from a given policy outcome, and are consequently willing to take a proactive role in organizing group action.

about the trade-distorting effects and poor scientific grounds of some of the measures maintained by Honduras (Tovar-Diaz 2006).

From a distributional point of view, Honduras has improved the quality of rural spending, moving from largely providing private goods to investing in rural infrastructure and social assistance. Public spending on rural infrastructure accounts for over half of total public spending in rural areas. However, the evidence is clear in that the Honduran government has for long time underfunded agriculture. This is not different to what has been observed across developing, agricultural-based countries worldwide. The information in Table 5.1 below indicates that while the Honduran government has devoted a normal share of its budget to rural areas relative to the Latin American region, it has vastly underfunded the rural sector relative to its economic importance compared to the regional standard. More recent information indicates a further deterioration in the agricultural budget; on average, funds for agriculture[79] as a share of total government spending decreased to an average 2.5 percent since 2006 (Secretaria de Finanzas 2008, Unidad de Apoyo Tecnico 2007b).

[79] This includes the public budget of the Secretary of Agriculture plus the budgets of the decentralized Agricultural Science and Technology Direction (DICTA), the National Direction of Sustainable Rural Development (DINADERS), and the National Fund for Sustainable Rural Development (FONADERS).

Table 5.1. Relative measures of agricultural support granted to agriculture in Honduras and Latin America

PERIOD	RURAL EXPENDITURE					IAO [2]	
	Honduras				Latina America	Honduras	Latin America
	PI [3]	RI [4]	SA [5]	Total[1]	Total[1]		
1985-90	58.1%	37.3%	4.6%	4.3%	7.7%	0.15	1.02
1991-95	27.2%	56.2%	16.6%	6.74	6.5%	0.12	0.82
1996-01	29.2%	57.9%	13.0%	9.2%	5.9%	0.19	0.71

Source: Soto-Baquero, Santos-Rocha and Ortega 2006.
1 Expressed as a percentage of total public expenditures. 2 Index of agricultural orientation. It is estimated as the ratio of the share of agricultural expenditures in total public expenditure to the share of agricultural GDP in total GDP. An index of 1 indicates that the government is giving the sector the same importance in the budget allocation that it has in the economy. 3 share of expenditure on programs that promote production relative to total rural expenditure. 4 share of expenditure on rural infrastructure relative to total rural expenditure. 5 share of expenditure on social assistance programs relative to total rural expenditure.

Improving investment in rural infrastructure entails (1) coordinated action among agricultural institutions as well as across other areas of government and civil society to improve the bargaining power of the sector and to expand the agricultural budget (e.g., achieving a larger allocation of the public budget, or expanding the inflow of funds from international donors), (2) the prioritization in the allocation of the agricultural budget in areas with high economic and social returns, and (3) improving the conditions for an expansion of private investment in rural infrastructure. The evidence worldwide shows that high rates of returns might be achievable from investing in agricultural research and development (Alston et al 2000); yet public investment in agricultural R&D proved insufficient to improve the productivity of agriculture, and plummeted since structural adjustments were made in the early 1990s (SICTA 2007). For instance, the budget of the Agricultural Science and Technology Direction (DICTA for its initials in Spanish), in charge of most of the agricultural R&D, accounted for only 6 percent and 3 percent of total agricultural expenditure in 2004 and 2005, respectively (Serna 2007). Estimations based on information from the Secretary of Finance indicate that this share remained low at 6.5 percent for the period 2006-2008 (Secretaria de Finanzas 2008). Most producers of

staples, primarily corn and beans, receive no technical assistance and continue to use very outdated production technologies that yield very low productivity levels and endanger the sustainability of the resources (e.g., deforestation and tilling on hillsides without enough use of fertilizer).

In an environment of shrinking public resources, it is imperative to ensure the participation of the private sector in the provision of certain services, and R&D and rural infrastructure (e.g., irrigation) can be areas of particular interest. The initiatives under the Central American Agricultural Policy[80] (PACA for its initials in Spanish) can prove fruitful by expanding the potential market for new technologies and allowing for economies of scale in R&D. It is also important to foster international cooperation in this area as well, and work closer with domestic research and education institutions such as the Pan-American Agricultural School (EAP for its initials in Spanish) and the Honduran Foundation for Agricultural Research (FHIA for its initials in Spanish). Delegating research and development activities to specialized independent organizations can prove cost-efficient, and can contribute to the transparency in the management of the agricultural budget. Extension is also crucial to improve the productivity of Honduran staple agriculture. The evidence suggests a significant gap between the technologies currently available in Honduras for the production of basic grains, and the technology

[80] Honduras, along with other six nations from the region, are cooperating within the framework of PACA towards creating more integrated agricultural markets that could spark sustainable agricultural development in the region by creating more favorable conditions for private and public investment in agriculture, particularly regarding research and development, encouraging the adoption of new management strategies to achieve economies of scale and gain competitiveness, and to increase the bargaining power of the region in agricultural forums. PACA is also envisioned to spark regional cooperation and action in other areas not directly under the umbrella of the ministries of agriculture but that are closely associated with the fate of agriculture, such as movement of factors of production and development of rural infrastructure (Consejo Agropecuario Centroamericano 2007).

employed (SICTA 2007). This points to the relevance of improving extension services and overcoming the financial constraints of farmers; new investment in R&D will be profitable only conditional on the innovation being adopted by producers.

The potential gains from improvements in the quality of institutions relate to the quality in the allocation of the budget and the potential expansion of the budget to be allocated. Corruption in Honduras has significant social, economic, and political costs. The Anticorruption Board estimates that the misallocation of public funds due to corruption has slowed economic growth lately by some 2 percentage points; even more important might be the direct costs of corruption, which are estimated to have reduced the public budget by an amount equivalent to 2.5 percent of GDP (Consejo Nacional Anticorrupcion 2007). These estimates do not account for the missed opportunities in investment and cooperation that corruption might have generated. All in all, it is imperative for Honduras to improve the transparency in the management of resources to achieve sustainable economic growth, better governance, and social stability.

Farmers have expressed their concerns about the lack of agricultural credit. Private banks have reduced the share of their agricultural portfolios significantly, and public banks have not allocated enough funds to finance agriculture for over a decade. The high risk of agricultural production, the lack of assets that could serve as collateral, and a culture of no repayment on loans are cited as the main reasons behind the lack of financial resources serving this sector (Villalobos, Deugd and Ochoa 2006). These characteristics are far more common among small farmers and, to a less extent, among medium size farmers, than among large commercial farmers. This explains why only a few large farms account for most of the agricultural credit received from formal private and public banks

(Instituto Nacional de Estadistica 2007). Small farmers have relied primarily on informal financial institutions such as input suppliers, wholesalers, and truckers. The lack of bargaining power of most small farmers leads to a high cost of credit; furthermore, this type of financing is always very short term, which constrains the use of these funds for intermediate and long-term productive investment. Cooperatives have devoted more funds to agriculture than private and public banks over the last several years. However, there is also a trend towards abandoning agriculture and moving to serve the urban population (Villalobos, Deugd and Ochoa 2006). The number of microfinance institutions has increased significantly after Hurricane Mitch hit Honduras in 1998; there are more than 3,000 microfinance institutions operating in Honduras, and these are usually the only source of financing in remote rural areas. The agricultural loans they offer are always short term, and are commonly used for purchasing inputs rather than investment. Many microfinance institutions have benefited from the Basic Grain National Plan (PNGB for its initials in Spanish) implemented in 2006. As part of the PNGB, the Technological Stamp program (BT for its initials in Spanish) contemplates the distribution of seeds and fertilizer for up to 0.7 hectares among some 80,000 eligible farmers conditional on repayment after harvest. Some 200 microfinance institutions are in charge of administering the BT program, and the funds collected from farmers are kept as new assets for future services.

The discussion in the paragraph above highlights the difficult task that lays ahead to improve financial services to agriculture, particularly to smallholder farming. It will require coordinated action among public and private institutions to articulate actions aimed at lowering the production and market risks, increasing the guarantees, and

creating the economic incentives for formal financial institutions to extend their services to agriculture. Some proposals include (1) lowering the reserve account for banks offering credit lines to agriculture, (2) lowering reserve requirements on unsecured credits, namely, those offered without assets as collateral, and (3) increasing the interest rate cap placed by the Central Bank to account for the higher cost of operation incurred in reaching out to the agricultural sector (Villalobos, Deugd and Ochoa 2006). It is also imperative to speed up the release of land titles but, more importantly, to advance in the implementation of the agrarian reform. In reference to solving the problem of unequal access to land, the World Bank (2007c) states that,

> "As long as such fundamental conflicts - often threatening people's lives – remain unresolved, using agriculture for development remains a distant goal." (p. 246).

Increasing the power and representativeness of farm organizations is essential to mobilize support for agriculture and contribute to the formulation of better policies. As commented above, substantial changes at all levels of government are needed to improve governance and participatory policymaking. But significant changes are needed within agriculture to (1) strengthen its lobbying position vis-à-vis other powerful sectors outside agriculture, and (2) increase the efficiency in the allocation of resources by overcoming the power of politically enfranchised agricultural groups. Previous experiences in other nations show some ways of improving the empowerment of disadvantaged rural groups such as smallholder farmers, so numerous in Honduras. One of the best practices to promote empowerment of small farmers is through the creation of sustainable cooperation. Cooperative association has the potential of raising the economic and political power of small farmers. It has proven to be one way for small farmers to reap the benefits of

globalization and the associated changes in the food supply system (e.g., increasing importance of supermarkets and differentiated products). Smallholders who have succeeded as suppliers for supermarkets have generally overcome these obstacles by forging cooperatives or enrolling in out-grower schemes, and previous experiences show that the government can play a significant role in fostering these arrangements[81] (Food and Agriculture Organization 2004). Furthermore, the changes in food markets in Honduras (e.g., rapid expansion of supermarkets) and its proximity to the largest market in the world (and consequently, relatively low cost of transportation) make the opportunity cost of non-cooperation even higher. Initiatives such as Honduras Compite, aimed at easing investment by providing technical assistance to prospective investors, are good steps to secure a higher level of investment, but more efforts will be needed to guarantee that benefits from these programs can spread to small farmers. Previous experiences also point to the importance of promoting these multi-sector enterprises while avoiding the capture of the government by private interests (World Bank 2007c). The formulation of agricultural policies and programs must be professionalized. Inputs from domestic and international think tanks must be considered when designing agricultural policies and programs. Too often programs are implemented based on inadequate scientific and empirical evidence about the linkages between the applied intervention and the goals to be achieved. It is also important to socialize the proposals in

[81] In Zambia, for instance, the government partnered with small farmers, agro-processors, input suppliers, and the largest supermarket chain to secure the supply of high-value vegetables at the required sanitary standard and in a timely manner. Similar examples are found in Mexico, where cooperation among small vegetable family farms led to product differentiation and significant penetration in the U.S. market, which has increased over 5 times the average income of the associated farm households (Food and Agriculture Organization 2004).

order to identify potential problems related to incomplete or erroneous understanding of a given situation, as well as to raise awareness and increase political support for the initiative. It is also crucial for policies to incorporate evaluation tools and a clear benchmark for accountability. This feature, commonly absent in agricultural programs worldwide, is key to being able to assess the appropriateness of the program for the problem at hand, and to correct the course of action (e.g., modifying the program or eliminating it altogether) in the event that predetermined outcomes are not being achieved.

The Secretary of Agriculture, as expressed in the 2004 Strategic Plan for the Agricultural Sector (PESA for its initials in Spanish) has decided to engage in significant institutional reform aimed at increasing the efficiency in the use of the resources and becoming more attentive to the demands of stakeholders. The plan also advocates for improvements in the design of programs that better serve the national policy goals, which would potentially provide a good opportunity for policy analysts to increase their contributions to the policy process. For the most part, the strategy provides broad guidelines in different areas of interest (e.g., competitiveness and quality and supply chain integration), but does not advance into the specific desirable characteristics of particular programs. This gives enormous flexibility for the proposal of adjustment programs, and increases the opportunity of selecting the alternative that best fits a specific scenario.

5.4 Policy Process: Designing Adjustment Programs for the Basic Grain Sector

The Honduran basic grain sector is one of the largest employers in rural areas; it is estimated that basic grains represent the main activity for roughly 350,000 farmers (Instituto Nacional de Estadistica 2007), and employ indirectly (counting indirect job

creation plus dependents) more than 1.5 million people out of a total population estimated at 7.2 million. Furthermore, the areas where basic grains are produced are among the poorest in the country (Secretaria de Industria y Comercio 2003).

The basic grain sector is characterized by the heterogeneity among farmers regarding access to land, technology, capital, and consequently, productivity and competitiveness. For instance, data from the last two production years 2006 and 2007 show that the average corn farm planted just 1 hectare and obtained only 2 mt per hectare; however, when corn farms are disaggregated, we find a large number of subsistence farms, primarily located on the hillsides, whose acreage and yields are well below the national average, and commercial farms, operating primarily in valleys and having more resources at their disposal (Instituto Nacional de Estadistica 2007). Among commercial farms, the differences in endowments and technologies are significant as well. While large commercial farms operate an average of 14 hectares and obtain yields roughly three times higher than the national average, small commercial farms operate on average 2 hectares and obtain an average yield of 1 mt per hectare, below the national average (Escuela Agricola Panamericana 2004). The same characteristics apply to the bean sector as well, since in fact most bean farms incorporate corn in their annual rotations. Rice farms, though not associated in production with corn and bean farms, are also characterized by high heterogeneity. Based on information for the year 2004, 30 percent of rice farms, those adopting better production management practices, operate an average of 16 hectares, and account for 88 percent of the total rice acreage and 93 percent of total rice output. The remaining 70 percent of rice farms operate on average only 1 hectare,

obtaining average-yields equal to a third of those obtained by large farms (Instituto Nacional de Estadistica 2004).

The removal of import barriers to staples coming from the U.S. negotiated in DR-CAFTA, along with the expiration of the purchase agreements between corn and rice farms and the processing industry[82], is likely to put downward pressure on domestic market prices. At the farm level, lower output prices would lower the profitability of those farms producing primarily basic grains, likely reducing the income of those operating at high costs to levels insufficient to afford the basic needs of the household. These high cost, primarily but not exclusively subsistence, farms, face severe on-farm constraints, such as insufficient access to credit, and poor human and social (networking) capital, as well as off-farm limitations, such as poor infrastructure and low human capital available in rural areas, that limit their chances of adapting to the new, more competitive market conditions. Without appropriate public intervention, DR-CAFTA, instead of becoming the source of new and better opportunities for basic grain farmers and the rural communities where these activities prevail, is likely to impose a burden that will lead to the collapse of numerous farm businesses, endangering the subsistence of rural communities, and increasing rural poverty and rural-urban migration.

Others share the same concerns regarding the fate of basic grain agriculture. According to the Food and Agriculture Organization, there is a high probability that commercial farms as well as a some segments of family farms, more precisely those more capitalized and connected to the markets, will be able to adjust and reap the benefits of free trade.

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[82] Every year since 1999, organized farmers and the food processing industry negotiate the reference prices and volumes that the latter will purchase from the former. Based on the volumes purchased domestically, import rights are granted to food processing industries properly register to import.

However, a large number of family farms, primarily those with severe resource constraints, will likely be forced out of agriculture, and either migrate to urban areas or even other countries, or be employed in the rural area (Soto-Baquero, Rogriguez-Fazzone and Falcioni 2007). Public policy should then create the conditions for these changes to be facilitated, namely, giving farmers with potential to compete the help necessary to reorganize their production process, and giving those farmers forced (by market forces) to abandon the agricultural production activity, the skills and information needed to relocate and secure a better source of income.

In what follows, I will discuss the design of adjustment programs for the basic grain sector of Honduras following to some extent the traditional linear policy development model[83] in that the analysis will start with the definition of the problem, followed by a discussion of the feasibility of previous programs employed worldwide to address similar problems, and discussing the agenda setting strategy and implementation variables that should be considered to improve the odds of the proposal in the Honduran policy arena.

5.4.1 PROBLEM DEFINITION

Clearly defining interconnected public problems is increasingly difficult; yet, problem definition is crucial in guiding and framing solutions. Carefully drafting and socializing the definition of a problem is the first step towards successful policy formulation. Political scientists have for long stressed the importance of this enterprise. According to Rochefort and Cobb (1994),

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[83] The traditional linear policy development model can be represented as follows: problem definition → agenda setting → policy formulation → policy implementation → policy evaluation.

> "as a political discourse, the function of problem definition is at once to explain, to describe, to recommend, and, above all, to persuade" (p.15).

The way in which an issue is defined into a problem may influence (1) the type of politicking that will develop around it; (2) its fate in the agenda of the relevant political institutions; and (3) the probability of achieving a desirable outcome. Furthermore, alternative definitions of the same problem have different probabilities of advancing in the agenda of particular institutions; put differently, institutions have selection principles that are satisfied to varying degrees by alternative problem definitions (Rochefort and Cobb 1994).

It is not the intent of this section to provide a broad discussion on problem definition theory; instead, the goal is primarily to advance but one definition considered appropriate that would shape the discussion that follows, that is: "*The increase in market competition resulting from the full-implementation of DR-CAFTA will put downward pressure on market prices for basic grains, benefiting those that are net consumers of these staples, but worsening the welfare of those households whose income depends greatly on these activities and that have severe limitations to adapt to the new market conditions. This new market condition would likely have a negative ripple effect on rural poverty in areas with already low social indicators*."

An important step after defining a problem is the proper definition of the desirable outcome/s or the vision of the policy. Interconnected public problems are rarely solved completely; it is important to have this in mind particularly when designing the evaluation procedure and defining the target outcome (Luke 1998). One desirable narrow outcome to pursue for the particular problem defined in the previous paragraph could be to achieve a certain degree of compensation (which can be specified explicitly in the

policy) in the income of basic grain farmers in the short to medium term, that is, throughout the life of the adjustment program. Another more comprehensive and preferable outcome, and actually the one chosen to guide the policy process in this study, is to *help all agents in the basic grain supply chain secure a higher level of income through the acquisition of technologies and human capital, the expansion of the market, and improvement in the workings of factor and output markets*.

The interconnected nature of public problems such as the one defined here implies that there are seldom, if ever, quick fixes. They usually require concerted action from different levels of government in close association with private and civil society organizations to tackle specific issues contributing to the overarching problem. Sometimes, issues are both a symptom and a cause of other problems, which expands the boundaries of the policy analysis to other areas never expected (Luke 1998).

5.4.2 Feasibility Analysis of Adjustment Programs

According to the World Bank (2007c), the feasibility of programs must be assessed on three grounds, namely, political, administrative, and financial or economic.

First, a program must be politically feasible for it to have an opportunity for serious consideration in the political agenda. Political feasibility in the political economy framework discussed in the previous section implies finding or maximizing the number of policymakers in each of the relevant policy arenas willing to champion the proposal, while at the same time avoiding (to the extent possible) confrontation with powerful, politically vested interest groups. The political feasibility of a proposal depends on several factors such as (1) the characteristics of the problem (e.g., causality, severity, proximity) (Rochefort and Cobb 1994); (2) the leadership of advocates (both in favor of and opposition to the proposal) (Luke 1998); (3) the size and social perception of the

supporting as well as opposing coalitions as well as the cultural strategy of agenda setting and denial (Cobb and Ross 1997); and (4) the institutional framework (e.g., accountability of policymakers, reelection, and seniority system).

Administrative feasibility relates to the capacity of the agencies in charge, either public, semi-public, or private, to implement the policy and programs effectively. The nature of the problem being addressed by any given policy defines to a large extent the urgency for action. Policies and programs designed to address problems that require urgent, short-term public intervention must be designed taking serious consideration of the installed administrative capabilities. Some expertise and resources can be acquired in the short term, but a policy formulated without properly addressing the administrative limitations is likely to generate poor outcomes. Less urgent problems allow more for time to overcome the administrative limitations; human and capital resources can be improved to achieve the level of expertise required to administer a given policy or program.

Finally, the fate of a policy proposal depends on its economic and financial feasibility, that is, whether or not it makes economic sense to invest in any given area, and whether or not the government would be able to finance such an enterprise. In a world of severely limited economic resources such as that of most governments in developing countries, it is crucial to use public resources wisely. However, many times programs that are superior from a social-welfare point of view are financially unfeasible (political feasibility aside). The goal of policy advocates should be to find financially feasible programs that provide the largest social-welfare improvements.

An important dimension apparently taken as granted by the World Bank can be called "technical" feasibility; that is, selecting specific policy tools that are appropriate to

address the specific problem at hand. Based on Luke (1998), I would argue that technical feasibility can be disaggregated into (1) the appropriateness of the causality model considered; and (2) the appropriateness of the policy tools selected to achieve the desired outcomes conditional on the causality model selected. The interconnected nature of public problems might lead to an overwhelming number of causality models to be considered. However, to the extent possible, policy analysts should assess the validity of these causality models and propose strategies accordingly. All in all, policies designed with these feasibility analyses in mind are likely to fare better in the policy arena.

5.4.3 REVIEW OF ADJUSTMENT PROGRAMS

Many countries worldwide have already faced the same dilemma when it comes to free trade: how to work towards improving social welfare while at the same time easing the transition of those agents standing to lose from the policy reform. Following is a brief discussion of some of the most common strategies employed.

5.4.3.1 Decoupled Payment Programs

Decoupled payment (DP) programs[84] have been used in general to compensate farmers for a decrease in income caused by changes in agricultural policies. For instance, the U.S. introduced the Production Flexibility Contract (PFC) program in 1996 in an attempt to increase the market-orientation of U.S. agriculture while still providing significant support to agriculture in compliance with the regulation of the newly-implemented World Trade Organization. The European Union also implemented the Single Farm Payment (SFP) program in 2003 as part of a significant reform of the Common Agricultural

[84] Decoupled payments are defined as lump-sum income transfers to farm operators that do not depend on current production, factor use, or commodity prices (Burfisher and Hopkins 2003)

Policy. Turkey and Mexico are examples of developing countries administering DP programs, and the challenges they encountered in the implementation and administration of these programs can prove very helpful for this analysis.

In all cases, the basis for program qualification has been historical land usage, in some cases conditional on the previous historical enrollment in other programs (U.S.'s PFC and European Union's SFP programs). While tenants are eligible to receive payments, the benefits commonly accrue directly or indirectly (through higher renting costs) to landlords.

The evidence shows that DP programs are good for protecting the income of recipients, but that employing them to promote the reallocation of resources is questionable. The latest evaluation of Mexico's DP program Procampo finds that the program accounts for 20 percent of the total expenditure of eligible farm households, thus serving to achieve the primary goal for which the program was implemented. The program has resulted in significantly higher levels of consumption among recipients relative to the control group (Yunez-Naude 2007). U.S.'s PFC program transfers amounted to an average of 9 percent of net farm income over 1996-2001, which also shows the efficiency of DP programs as an income-stabilization intervention (Burfisher and Hopkins 2003). A preliminary assessment of the DP program in Turkey suggests that it compensated the income of recipients for about half of the decrease in income resulting from agricultural reform (World Bank 2004). However, the evidence is clear in that Procampo has had no effects on resource reallocation (Yunez-Naude 2007). Furthermore, the low distorting feature of DP programs has been questioned on the grounds that they encourage resources to remain

in production in eligible sectors rather than moving according to market forces (Baffes and De Gorter 2005).

The evidence shows that the distribution of DP funds is skewed towards larger units since payments are based on historical production. For instance, in 2003 1.5 percent of the 5.2 million farm holdings participating in the SFP program received 27 percent of the transfers, while 76 percent of farm holdings, all characterized as small, received only 16 percent of total program transfers (Schmid, Sinabell and Hofreither 2006). In the U.S., commercial farms (those with more than $250,000 in annual sales) were fewer, around 10 percent of participant farms, but accounted for over half of the PFC payments in 2001 (Burfisher and Hopkins 2003). In Mexico, an evaluation of Procampo based on information from 2005 shows that the distribution of program benefits is highly unequal, with 3 percent of the largest farmers receiving over 30 percent of the transfers, and 60 percent of the transfers going to only 30 percent of the recipients[85] (Yunez-Naude 2007). Previous experiences suggest that administering decoupled payment programs demands a high level of administrative capabilities as well as financial resources (Baffes and De Gorter 2005). It entails having:

1. Good historical records on land ownership and use, which are required to determine program eligibility. This represented a problem in Turkey and Mexico, where no detailed statistics existed. Pilot projects had to be implemented to determine the best way of generating the records needed.

[85] The Gini coefficient estimated considering the transfers of the program is 0.6.

2. Institutional capabilities to deliver the services, which in the case of staple crops in developing countries usually imply reaching out eligible recipients in remote areas where agricultural agencies have no permanent presence;
3. Significant financial resources to transfer amounts that could have desirable multiplicative effects.

At first sight, it seems reasonable to consider DP programs as a viable option that could help compensate basic grain farmers in Honduras for the potential losses of income generated by DR-CAFTA. However, assessing the technical feasibility of DP programs, the conclusion is that too many requirements must be satisfied for the program to truly ameliorate the problem. Assuming a DP program will have a long-lasting positive income effect among recipients implies making many other implicit assumption such as that (1) the funds will be large enough so as to stimulate a level of investment that would have a significant impact in the productivity of the farm; (2) farmers will actually invest these funds and do not use them to improve current consumption profiles; and (3) recipients, well aware of what the future holds for them and the temporal nature of these payments, decide to invest these funds in human capital so as to increase their chances to secure a good income in other activities, either in or outside agriculture. These assumptions, to cite only some, do not stand before the evidence presented above, particularly the evidence coming from developing countries.

Besides the technical infeasibility, a DP program for the Honduran basic grain sector would likely not stand the financial feasibility. A simple exercise can serve as an example. Let us assume that the target income effect of a DP program to fully offset the decrease in income of basic grain households is set at 5 percent (that is, that income of

basic grain producers will decrease only 5 percent as a result of the changes brought about by DR-CAFTA relative to a counterfactual). Let us also assume that the administrative cost of a program like this will be roughly the same that the estimated for Mexico's Procampo, roughly 3 percent of the program transfers[86]. Based on the income of the representative basic grain household estimated in the Social Accounting Matrix developed for this study, the cost of the program would amount to 30 percent of the total public expenditure on agriculture or 48 percent of the total budget of the Secretary of Agriculture over the last three years. When the administrative cost of the program is assumed at 10 percent of the transfers, the total cost rises to 35 percent and 51 percent of the total budget allocated to agriculture and the total budget of the Secretary of Agriculture in 2006-08. Finally, if we set the target income effect of the program at 10 percent, and its administrative cost at 10 percent of total program transfers, then the cost of the program would be 75 percent of the annual total agricultural budget and 109 percent of the annual average budget of the Secretary of Agriculture over the last three years. Committing such a large share of the budget to provide a private good that has a questionable technical feasibility could actually worsen the situation for basic grain and other agricultural agents, by depriving the already low provision of other services.

A DP program also seems unfeasible from an administrative point of view. To cite just some of the problems readily observable, Honduras does not have a good record of land use, and as previously commented above, many farmers, primarily smallholders, have no property titles. The National Institute of Statistics (INE for its initials in Spanish)

[86] This administrative cost is actually considered low compared to the costs estimated in other countries (Yunez-Naude 2007)

conducts a survey among basic grain producers twice a year to collect basic information on production, but has no record on the entire population of basic grain producers. INE has the human resources and expertise to conduct a detailed census of the basic grain population, but creating an exhaustive record of production would entail investing significant resources.

Finally, assessing the political feasibility of DP programs is more ambiguous. It entails assessing the mobilization of interest groups that a proposal like this might generate. At first sight, it seems reasonable to expect that large basic grain farmers might have greater incentives to lobby for a DP program based on the large benefits they might obtain. How strong the opposition from other agricultural interests outside the basic grain sector might be is unknown, and would depend on the services that will be sacrificed to implement the DP program. In the extreme case that the program might actually dry out most of the budget allocated to agriculture, the political feasibility seems at best slim.

5.4.3.2 Conditional Cash Transfer Programs

Conditional cash transfer (CCT) programs have proliferated among Latin American nations lately. Brazil, Chile, Colombia, Nicaragua, and Honduras are but some of the countries using them for different purposes. CCT programs in the region have been used with the goal of reducing current poverty and breaking the inter-generational poverty cycle by improving human capital, primarily through improving access to education and health services for the youth, and training programs for the working-age population. These programs entail the transfer of certain amounts of money conditional on families achieving certain predetermined objectives (World Bank 2005). Eligibility to CCT

programs is usually related with the presence of children in poor households in the selected areas of influence.

In Latin America, CCTs are not administered by the Secretary of Agriculture, but usually fall under the umbrella of other ministries such as the Ministry of Planning in Chile, or other decentralized agencies such as the Family Allowances Program (PRAF for its initials in Spanish) in Honduras.

The fact that PRAF has evolved since its early stages to become a centerpiece in the fight against poverty in Honduras serves as evidence of its administrative, financial, and political feasibility. The experience of PRAF in Honduras indicates that many constraints that hindered the realization of the program objectives have been overcome. The institutional capabilities have improved since the early stages of PRAF, more particularly in areas such as targeting procedure (more transparent and better focused), transparency in the management of funds (transfers through the formal banking system), human and social capital of administrators, and information systems. Despite its shortcomings in achieving some specific goals, which resulted in strong political opposition during some periods, today the political power of PRAF is well established (Moore, 2008). PRAF itself is highly-politicized; the high employee turnover rates after elections are evidence of it[87]. This characteristic undermines the creation of administrative memory and the achievement of a more efficient administration of the program. Financially, the program has had a significant cost, and has been financed primarily through external loans. Spending of PRAF represented 20 percent of the total anti-poverty spending in Honduras

[87] All PRAF personnel were laid off after the 2002 elections. After the 2005 elections, all but 5 PRAF employees were laid off once again (Moore, 2008).

between 1992 and 1997. The Inter-American Development Bank reports the difficulties of the Secretary of Finance to fulfill the budgetary commitments towards PRAF-II in 2005, which resulted in delays in payments and hindered the achievement of the program objectives (Inter-American Development Bank, 2006). Nevertheless, given that the program is well established within the Honduran Poverty Reduction Strategy, and provided the importance that the program might have in achieving the Millennium Development Goals, international donors have maintained their financial support to the program, despite the fact that the outcomes of the PRAF program have been marginal so far (Moore, 2008).

The brief discussion in this section serves simply as an introduction to one of the most popular intervention tools employed to alleviate poverty in the Latin American region. The relevance for the case at hand is that poverty is highly predominant in the areas where basic grain production occurs, and actually affects many small basic grain farmers and wage workers. It is imperative that the government of Honduras and international donors continue allocating resources into the CCT programs currently administered by PRAF, and to take advantage of the expertise acquired by PRAF over the almost 20 years of existence. The Secretary of Agriculture must work closely with PRAF and other agencies to guarantee that their interventions complement each other and reach the target population, in this case farmers and wage workers in the basic grain sector, in a timely and sufficient manner.

5.4.3.3 Technical Assistance Programs

There is a large variety of technical assistance programs that an exhaustive discussion would require a study by itself. Thus, the discussion here briefly focuses on what has

been and is being done in Honduras regarding technical assistance, and what are some guidelines drawn from other experiences worldwide that could prove helpful to strengthen these programs in Honduras.

The Farmer Training and Development program (EDA for its initials in Spanish) has operated in Honduras since 2006. Financed by the Millennium Challenge Account and administered by a consortium conformed by a private agribusiness company (FINTRAC Incorporated), the Pan-American School of Agriculture and the Honduran Foundation for Agricultural Research (FHIA for its initials in Spanish), this program has the overarching goal of improving the income level and sustainability of some 8,000 target farmers (roughly 15,000 hectares, which indicates that participants are predominantly smallholders) by providing technical assistance in the production of high-value vegetables[88].

Regarding marketing, the program entails (1) facilitating the interaction between farmers and wholesalers or final retailers, (2) promoting production by contract, (3) coordinating production to guarantee a more stable supply throughout the year, and (4) improving access to marketing information. With regard to production, EDA contemplates the training of farmers in areas such as soil management, input use, pest control, as well as the introduction of types and improved varieties of vegetables. The program also promotes good management practices such as record keeping and management of pesticides and other chemicals. Finally, the other two areas of interest are post-harvest handling and financial management. EDA trains farmers and workers about good handling practices of the products so as to minimize quantity and quality losses.

[88] Information on the EDA program can be found at http://www.hondurasag.org

Regarding financial management, the program teaches farmers basic notions about how to prepare a budget or estimate potential profits, and assists them in the preparation of credit forms.

Twenty five agronomists work for EDA, and each serves some 25 leading farmers. In turn, these leading farmers are the link to some 10 to 15 beneficiary farmers. All in all, then, each agronomist has influence on 250 to 325 farmers. Leading farmers are in charge of mobilizing beneficiary farmers, transmitting program information, and facilitating their farms for demonstrative activities conducted weekly by the agronomists.

Eligibility to the program was conditional on the size of the farm (up to 50 hectares), the technological level employed (the requirement was to have a low technology), the access to reliable sources of water to implement irrigation, the participation in other technical assistance programs, and the willingness to provide farm-level information to the program managers as well as facilitating the use of the farms for demonstrative purposes (for leading farmers). Although no systematic evaluation of the benefits of the program has been conducted, a large number of success stories allow us to infer that the program is generating benefits for recipients (Farmer Training and Development Program 2008).

On the downside, the cost of the program is high. Some L. 565 million is being allocated to the EDA program in 2008, which represents roughly 63 percent of the total budget of the Secretary of Agriculture. This implies that carrying an EDA-type of program that could reach at least smallholder farming currently producing basic grains is financially unfeasible, at least with the level of public funds devoted to agriculture over the last several years. Alternative sources of financing must be secured in order for a program like EDA to be implemented at a larger scale.

Another important plan with some technical assistance component is the PNGB. This plan has been implemented in 2006 with the overarching goal of improving the productivity and competitiveness of the basic grain sector and reducing the dependency on imports, thus increasing food security (Food and Agriculture Organization 2008). The plan includes the Technological Stamp program (BT for its initials in Spanish), which contemplates the provision of inputs at subsidized prices, and the strengthening of several microfinance institutions serving small farmers and the poor. The Corn National Plan is another component of the PNGB, and contemplates the provision of technical assistance to corn producers, for which some 140 agronomists have been hired and some L 30 million allocated annually to that end.

To date there is no scientific evaluation of the PNGB. The national output data shows a significant increase in the production of basic grains over the last 4 years, but to what extent the increase was caused by the program remains unknown. Evaluation projects are currently being negotiated that could give some idea about the impact of the program on different outcome variables of interest. Some of the components of the PNGB, more precisely, the capitalization of microfinance institutions, the higher investment in infrastructure (primarily storage facilities), and the technical assistance granted to producers are desirable and likely to improve the economic sustainability of the sector. However, given the limited resources devoted to technical assistance (only 140 agronomists for the whole basic grain sector), it is highly questionable that the technical assistance would make a difference, and it is not clear how this assistance is being provided. The subsidy component of the program is questionable, though. Allocation of subsidies must be managed apolitically, and measures must be taken to avoid creating

dependency on them (World Bank 2007c). Furthermore, subsidies might deter private input suppliers from entering the market, thus making the sustainability in the use of inputs less likely. The government, rather than substituting for private entrepreneurship, must encourage it, concentrating its efforts on increasing the technical capabilities of farmers to realize the benefits of achieving higher technological levels.

5.5 Development of the Proposal

Good program formulation calls for the identification of the most relevant problems facing the target population. As expressed in the Agricultural National Roundtable (MAN for its initials in Spanish), there is significant heterogeneity among basic grain farmers with regard to what they perceive as the dominant problems. Table 2.3, re-introduced below, enumerates the most relevant problems identified by the agents of the basic grain supply chain.

The heterogeneity of the target group also requires flexibility in the programs to reach recipients with the right set of interventions. Different groups of farmers in different regions have particular needs that have to be addressed for a program to succeed, and programs must account for them and allow flexibility in the implementation so as to increase the odds of achieving the desired outcome.

Furthermore, the evidence suggests that the most effective solutions are those developed from the bottom-up, that is, from the needs of recipients, and not imposed by the government (Soto-Baquero, Rogriguez-Fazzone and Falcioni 2007). This approach is also desirable to improve the legitimacy of agricultural programs, an important aspect when it comes to assessing the political feasibility of a proposal.

Finally, it is important for the new proposal to benefit from the accumulated experiences in administering other related programs. Challenges and successes with the

administration of established programs must be taken into consideration when designing the new proposal to reduce the likelihood of a failure.

Table 5.2. Most relevant problems affecting the different agents throughout the agricultural supply chains.

Small farmers	• Outdated production and storage technology that limits both their productivity and quality of production. • Limited financial resources needed to adopt better production technologies. • Limited access to market information. • Poor infrastructure, such as roads, electricity, and irrigation. • High cost of services, such as electricity, and inputs.
Medium and large-size farmers	• Outdated production and post-harvest technology that limits primarily their productivity and, to some extent, the quality of production. • Poor infrastructure, such as roads, electricity, and irrigation. • High cost of services, such as electricity, and inputs.
Wholesaler	• Poor quality of product, which constrains the marketing opportunities for these products. • Poor infrastructure, primarily roads, which increases transaction costs.
Processor	• Poor quality of product and high price due to inefficiencies in previous stages of the supply chain, which lowers the competitiveness of the sector. • Limited financial resources needed to adopt better processing technologies. • High cost of inputs, such as electricity.
Final retailer	2) Poor quality of domestic products, which at similar prices cannot compete with higher-quality imports from other countries.

Source: Sanders, Ramirez, and Morazan (2006).

A severe limitation to program design in Honduras is the lack of information representative at the sectoral level, particularly regarding income strategies. The impact of a reduction in the market price of basic grains as a result of the full implementation of DR-CAFTA on the economic welfare of farm households will depend on the weight of basic grains both as a source of income and expenditures, as well as on the flexibility of households to adjust their production and consumption strategies in light of changes in the relative price of products. The lack of reliable information greatly undermines program design, primarily when it comes to defining program focalization (definition of inclusion/exclusion conditions) and the magnitude of the compensation.

The review of current public interventions reveals the limited emphasis on technical assistance in areas such as production technology and administration. Honduras has revealed comparative advantages in the production of numerous fruits and vegetables vis-à-vis its larger trading partners, that is, the U.S. (Monge-Gonzalez, 2004). At the same time, the U.S. corn and rice industries have shown to be more competitive than the Honduran corn and rice industries in the Honduran market (Secretaria de Industria y Comercio, 2003).

Based on the above, the proposed intervention, rather than encouraging factor fixity in basic grain production, must promote the diversification of production away from low-value basic grains into higher-value crops. An expansion of production in this direction will require significant efforts to create new markets or expand existing domestic and overseas markets.

Furthermore, the review also reveals the limited efforts made with regard to empowering farmers; promoting farmers' association is one way to improve their efficiency in production as well as their market leverage, more importantly in the presence of imperfect input and output markets.

The evidence gathered leads me to support a policy with three major components: (1) a *flexible* technical assistance program with a back-loaded cost-share scheme through which farmers will be responsible for the total cost of the service by the end of the program; and (2) two financing programs aimed at improving the supply of short-term and medium-term credit to basic grain agriculture.

The primary objectives of the proposed policy are:

1) With regard to economic welfare, the goal is to at least double the income derived from on-farm production through a combination of higher productivity of basic grains, and diversification of production to include high-value products such as fruits and vegetables. For basic grains specifically, the goal is to increase their productivity by at least 25 percent by the end of the first stage of the program (year 5) through the use of better quality of seeds and higher input levels, and the adoption of better production practices promoted by the program.
2) Regarding farm administration, the program pursues the goals of creating good record-keeping habits (e.g., production, finances), and training farmers in the preparation of simple cost-benefit analyses to evaluate production alternatives.
3) Regarding the sustainable use of natural resources, the goals of the program are to eliminate burning practices for weed control, promote the use of low tillage practices and levels, and employ good practices in the handling of inputs, particularly pesticides.
4) With regard to empowerment, the goal of the program is to encourage the association among producers as a way to improve their bargaining power in the relevant input and output markets as well as to lower production costs through the promotion of cost-sharing practices in the use of production assets.
5) Regarding the strengthening of agricultural financial markets, the goal of the program is twofold: (1) to improve the supply of short and medium-term agricultural loans, and (2) endowing local financial institutions in order to ensure a better provision of agricultural financing services in the long run.

In the three sections that follow, a description and a financial assessment of the specific programs is presented.

5.5.1 TECHNICAL ASSISTANCE PROGRAM

The program as envisioned follows to some extent the design used in the EDA program. It relies significantly on (1) the extension capabilities of agronomists to serve as the nexus between the information supplied by the research community (e.g., Secretary of Agriculture, Pan-American Agricultural School, FHIA, the National School of Agriculture, the Inter-American Institute for Cooperation on Agriculture) and the farmers, and (2) the leadership skills and willingness to participate of leading farmers. The program will have two stages. The first stage, envisioned to last 5 years, involves the full subsidization of technical assistance for all farm segments, that is, small, intermediate, and large farms. The second stage, also envisioned to last 5 years, introduces a cost-sharing scheme that would gradually transfer the cost of technical assistance to producers. This is the approach used, for instance, by the Rural Change program in Argentina, and has been proven successful to increase the technical level of small farmers with low dropout rates (Albanesi, et al. 2002).

The size of farm groups will to a great extent determine the cost of the program. It is clear that the more the resources that can be devoted to farmers the better the results that might accrue. However, fiscal constraints increase the unfeasibility of working with small groups of farmers. The financial assessment of the program presented in Table 5.3 below considers three alternatives sizes, namely, 10, 15, and 20 members.

The proposal calls for a minimum of 2 visits a month to each group of farmers. To the extent possible, agronomists will be hired full time (hiring in a part-time basis will be considered in the event that the geographical distribution of groups does not require full

time dedication) on an annual basis, with automatic extension of the contract conditional on the performance of the groups and the feedback from farmers. Agronomists will be required to visit two groups a day on average (this implies that agronomists must have at least 3 hours to interact with the group in every visit), distributing the visits to specific groups as evenly as possible through the month. Agronomists will meet with program administrators once a month, where they will receive training and transmit the concerns they identify as relevant based on the interaction with farmers. Thus, the program is flexible in that it allows for the technical service provided by the program to adjust to the demands expressed by stakeholders; this process will take place within certain guidelines defined at the outset by the program administrators.

Agronomists will transfer their knowledge to farmers primarily through on-farm demonstrations. Written technical material will be prepared by administrators using simple language for farmers to keep the relevant information for consultation. Agronomists must also fill out a form on a monthly basis aimed at assessing the progress of each group, and are encouraged to provide additional comments if necessary regarding member participation. The use of a harmonized form for all groups would ease the evaluation of the program, and also make an efficient use of the agronomists' time. Beside agronomists, an open line of communication between farmers and program administrators must be maintained to serve as a check point on the performance of the agronomists; some alternative ways of communication are microfinance institutions and local governments involved with the program, as well as direct contacts between leading farmers and top administrators.

The program is envisioned as flexible with regard to the production that should be carried out by members. Although eligibility to the program is conditional on the production of basic grains, the program is decoupled, meaning that farmers will have the freedom of reallocating their resources into other production activities without risking their benefits from the program. As previously shown, the evidence suggest that misinformation about the decouple nature of the Procampo program in Mexico has contributed to the low impact of this program on factor reallocation; consequently, agronomists must explain the features of this program carefully to avoid misinformation about the decoupled nature of it.

To the extent possible, the program must have a requirement regarding the homogeneity of group members with regard to the production being carried out and the technologies employed. The assumption here is that the more homogeneous the group is, the more likely farmers are affected by the same problems and would then have a relatively homogeneous demand for technical assistance. The experience with Cambio Rural in Argentina identifies the heterogeneity among members as the main cause of group failures (Albanesi, et al. 2002).

Following is a cost-benefit analysis of the technical assistance program for small as well as intermediate and large basic grain households. The assessment is performed for a sample of 56,000 (approximately 20 percent of the population of basic grain households) based on the following assumptions:

1) The technical assistance program extent 10 years. The cost of the service is fully absorbed by the government during the first five years. For small farms, the cost-sharing scheme (the percentage absorbed by farmers) from year 6 to year 10 is:

10%, 25%, 45%, 70%, and 100%; for intermediate and large farms the cost-sharing scheme is: 10%, 30%, 60%, 90%, and 100%.

2) Agronomists working full time advice 22 farm groups (estimation based on 22 working days a month). Their income is estimated to be 20 percent higher than the salary that the Secretary of Agriculture pays to agronomists working for the Basic Grains National Plan, plus a Christmas bonus equivalent to a full monthly income[89]. Additionally, agronomists can claim up to 25 percent of their income for expenses related to the program, such as fuel and vehicle maintenance. These benefits are believed to be good incentives to ensure agronomists' commitment to the program.
3) The administrative cost of the program has a triangular distribution with a mean value equivalent to 20 percent of the cost of agronomists, and a minimum and maximum value equivalent to 4 percent and 36 percent of the expenses on agronomists.
4) The program's benefits to farm households, expressed as a percentage of current on-farm income, have a triangular probability distribution with a minimum, mean, and maximum value of 75 percent, 100 percent, and 110 percent. Data on on-farm income by farm category (namely, small, intermediate, and large) comes from Jansen et al (2007).

[89] The Christmas bonus is provided to all workers, either in the private or public sector, and is usually equivalent to an extra monthly salary. Hence, it is included in the estimation of the program cost.

5) Benefits are assumed to be perceived fully starting on year 5 of the program, and to be sustained for 15 years, that is, 10 beyond the span of the program[90]. Other potential benefits of the program, such as improving the management of natural resources, and the potential creation of off-farm jobs related to the increase in commercial activities in rural areas, are not accounted for given the lack of reliable forecasts on expected outcomes.
6) The program is financed through concessional loans following the terms implied by the Fund for Special Operations (FSO) offered by the Inter-American Development Bank. The FSO implies a 10-year grace period, a 40-year maturity term, and a 0.25-percent annual interest rate.
7) The discount rate used to estimate the net present value of the program is the interest rate charged by the FSO, namely, 0.25 percent a year.

Table 5.3 below shows the financial results of the technical assistance program. The simulation entails 500 runs for each of the three group sizes, and accounts for the probability distribution of administrative costs as well as expected program benefits. The simulation results suggest that the cost of a program like the one proposed here will vary significantly depending on the group size adopted. Designing a program with small group sizes, namely 10 members, will cost an average of L 146 million a year for 10 years, with an estimated present value of program cost equal to L 1,446 million.

[90] This is a conservative estimation of benefits. Assuming that the increase in on-farm income can be sustained indefinitely would imply estimating the value of the program benefits as a perpetuity, which will yield a much lower cost/benefit ratio.

Doubling the size of the groups reduces the number of agronomists and the administrative cost by half[91].

The results also imply that the proposed technical assistance program will be a good public investment. Its estimated net present value averages L 5,270 million with a group size of 10 farmers, and increases up to L 5,993 million with a group size of 20 farmers. The annual net flows of the program (not shown here) indicate that expenses more than offset benefits during the first stage of the program (first 5 years), and that this relationship reverts thereafter. The internal rate of return of investing in the program varies from a low of 39 percent to a high of 62 percent, which also indicates the high returns that could be achieved by investing in technical assistance to basic grain farmers.

[91] In this exercise, the administrative cost is estimated as a percentage of, and consequently it changes proportionally to, the cost of hiring agronomists.

Table 5.3. Financial assessment of the technical assistance program (L million)

TECHNICAL ASSISTANCE PROGRAM: TOTAL			
	Mean (90% Confidence Interval)		
	Group Size: 10	Group Size: 15	Group Size: 20
Present value of program cost	1,446 (1,356 – 1,536)	964 (904 – 1,024)	723 (678 – 768)
Present value of program returns	6,716 (6,004 – 7,311)	6,716 (6,004 – 7,311)	6,716 (6,004 – 7,311)
Net Present Value of program	5,270 (4,528 – 5,880)	5,752 (5,035 – 6,360)	5,993 (5,277 – 6,593)
Internal Rate of Return	39% (36% - 43%)	52% (48% - 55%)	62% (57% - 65%)
Cost-Benefit ratio	0.22 (0.19 – 0.24)	0.14 (0.13 – 0.16)	0.11 (0.10 – 0.12)
TECHNICAL ASSISTANCE PROGRAM FOR SMALL BASIC GRAIN FARMERS			
	Mean (90% Confidence Interval)		
	Group Size: 10	Group Size: 15	Group Size: 20
Present value of program cost	723 (657 – 789)	482 (438 – 526)	362 (328 – 395)
Present value of program returns	1,997 (1,724 – 2,228)	1,997 (1,724 – 2,228)	1,997 (1,724 – 2,228)
Net Present Value of program	1,274 (1,000 – 1,496)	1,515 (1,241 – 1,735)	1,635 (1,362 – 1,857)
Internal Rate of Return	25% (21% - 29%)	36% (31% - 40%)	44% (39% - 49%)
Cost-Benefit ratio	0.36 (0.31 – 0.43)	0.24 (0.21 – 0.28)	0.18 (0.16 – 0.21)
TECHNICAL ASSISTANCE PROGRAM FOR INTERMEDIATE AND LARGE BASIC GRAIN FARMERS			
	Mean (90% Confidence Interval)		
	Group Size: 10	Group Size: 15	Group Size: 20
Present value of program cost	723 (657 – 789)	482 (438 – 526)	362 (328 – 395)
Present value of program returns	4,719 (4,074 – 5,266)	4,719 (4,074 – 5,266)	4,719 (4,074 – 5,266)
Net Present Value of program	3,996 (3,325 – 4,543)	4,237 (3,568 – 4,780)	4,358 (3,693 – 4,904)
Internal Rate of Return	50% (44% - 54%)	63% (58% - 69%)	74% (68% - 80%)
Cost-Benefit ratio	0.15 (0.13 – 0.18)	0.10 (0.09 – 0.12)	0.08 (0.07 – 0.09)

5.5.2 SHORT-TERM AGRICULTURAL FINANCING PROGRAM

Farm households have severe financial limitations to acquire the appropriate level of input, primarily fertilizers and high-quality seeds, so as to increase the productivity of

land devoted to basic grain production. Limitations are more stringent among small and intermediate farms vis-à-vis large farms.

Thus, the proposal must contemplate a mechanism to facilitate input access without becoming a full subsidy that could create farmers' dependency on the program and hinder the development of private input markets. In this regard, the recommendation of this proposal is to implement a financing program with the goals of facilitating short-term financing that could generate higher input usage rates, and endowing local financial institutions with sufficient amounts of capital that could ensure better access to credit for basic grain farmers beyond the span of the program.

As envisioned, the short-term agricultural financing program will channel resources through local financial institutions (e.g., microfinance institutions), which in turn will grant short-term (e.g., 6 months) loans to eligible farmers at a subsidized interest rate for the purchase of inputs. Unlike the Technological Stamp (BT for its initials in Spanish) program, the program being proposed here does not subsidize the price of inputs, but rather the interest rate on the short-term loans used to purchase inputs at ongoing market prices. Furthermore, the program advanced here does not restrict the supply of inputs to specific businesses, but rather leaves the decision to choose a supplier entirely up to farmers. The experience with the BT program implemented since 2006 indicates that input markets do not exist in many rural areas. To overcome this limitation, the program must consider the provision of basic inputs through selected local institutions, most likely the same microfinance institutions administering the program at the local level[92].

[92] This approach is prone to be permeated by corruption and political favoritism, and should be avoided to the extent possible without affecting farmers' decision about input use.

The interest rate on short-term loans will converge to the prevailing interest rates in the local market as the program advances. The provision of inputs at market prices and the partial subsidization of the interest rates with a convergence towards the prevailing interest rate in the local market are measures intended to avoid distortions in input markets that could obstruct the transition to competitive markets once the program is discontinued. Loans will be granted for the short term (e.g., microfinance institutions usually lend for up to 6 months), and must be paid at a certain, pre-determined period after harvest.

During the first year of the program, these loans will be granted to eligible farmers to purchase inputs for up to 50 percent of the land they operate. The amount of the loan will be estimated assuming a usage rate of up to 200 pounds of urea and 50 pounds of improved corn seed per hectare, although the funds can be used for the purchase of other inputs used to produce basic grains as well as other crops of interest such as fruits and vegetables. These usage rates are higher than those actually employed by the BT program, and are believed to be more appropriate, potentially allowing for significant improvements in the productivity of basic grains (conditional on improvements in other aspects of production such as timely planting, weed and pest control, and harvest and post-harvest handling of the production, on which the technical assistance must focus). Starting in the second year of the program, farmers' eligibility for these loans will be subject to presenting a stylized production plan developed by administrators and filled out by farmers and agronomists. This requirement is seen as a necessary condition for farmers to be interested and start applying the basic knowledge on farm administration they will acquire through the technical assistance program. Furthermore, the production

plan will serve financial institutions to guide their decision and assess the risks of granting these short-term loans to avoid excessive defaults of agricultural loans.

Table 5.4 below shows the results of a simulation of the short-term financing program for an initial phase encompassing 56,000 basic grain farmers. The two stochastic variables considered are:

1. The administrative cost of the program, which is assumed to have a triangular probability distribution with a minimum, mean, and maximum values of 5 percent, 7.5 percent, and 10 percent of the total available credit, respectively.
2. The lending time per year, which is also assumed to have a triangular probability distribution with a minimum, mean, and maximum values of 8 months, 10 months, and 12 months, respectively.

The simulation results indicate that the starting cost of implementing the program will average L 799 million (USD 42 million). However, in order to maintain the monetary value of the program constant throughout the implementation period, further annual investment in the program will be needed. The total revenue generated by the program will be large enough to cover the financial cost of the program (either to repay the trust in 10 instead of 25 years, or to free up these financial resources for an expansion of the program), and to generate significant extra earnings. However, the program will likely yield negative net cash flows during the first 4 years; the assumption made in this regard is that the extra capital needed during the first 4 years, estimated at L 32 million, is

accounted for in the initial external loan requested to finance the program (e.g., Petrocaribe[93]).

The short-term financing program represents a good investment option to be pursued. The net present value and the internal rate of return of the program are estimated at L 2,003 million and 77 percent, respectively. The program is also expected to yield a desirable cost-benefit ratio of 0.51, meaning that for each dollar invested the benefit almost double.

Such a large positive financial assessment of the program is the result of lending at the relatively high but yet subsidized interest rates, and paying a relatively low interest rate on trust funds.

Finally, Table 5.4 below shows that the net present value of the extra earnings generated by the program will average L 1,905 million. The proposal calls for these earnings to be retained by local financial institutions, thus increasing their capital endowments and improving access to credit beyond the span of the program.

[93] Petrocaribe is an Accord of Energy Cooperation signed in March 2008 between Honduras and Venezuela, and represents a new source of financing for Honduras. Briefly stated, the government of Honduras might retain up to 50 percent of the total oil purchases from Venezuela in a trust, which will be used primarily for investment projects in areas such as energy and agriculture.

Table 5.4. Financial assessment of the short-term agricultural financing program.

STYLIZED FEATURES OF THE PROGRAM	
Magnitude of the intervention	The monetary equivalent of 200 lb of urea and 50 lb of improved corn seed per hectare, up to 50 percent of the operated acreage or 15 hectares, whichever the lowest.
Cost Urea / 100 lb [a]	L 643
Cost improved corn seed / 50 lb [a]	L 609
Annual adjustment rate [b]	11.75%
Number of small farms in the program	28,000
Average area subject to financing [c]	2 ha
Number of intermediate and large farms in the program	28,000
Average area subject to financing [d]	12 ha
Program duration	10 years

PROGRAM FINANCING TERMS	
Reference interest rate on agricultural loans	25%
Proposed scheme of interest rate discount	Year 1 and 2: 40%; year 3 and 4: 30%; year 5 and 6: 20%; year 7, 8, and 9: 10%, year 10: 0%.

SOURCE OF PROGRAM FINANCING (reference: Petrocaribe)	
Grace period (years)	2
Annual interest rate	1%
Maturity term (years)	25

FINANCIAL ASSESSMENT OF THE PROGRAM [f]		
	Mean	90% Confidence Interval
Net Present Value of program (L million)	2,003	(1,779 – 2,227)
Internal Rate of Return	77%	(55% - 93%)
Cost – Benefit Ratio	0.51	(0.48 – 0.53)
Present value of extra earnings (L million)	1,905	(1,729 – 2,086)

a. Average wholesale price from November 2007 to October 2008. Source: Secretary of Agriculture.
b. Corresponds to the average annual inflation rate for the period 2000-2007. Source: Economic Commission for Latin American and The Caribbean 2008a.
c. Estimated from the weighted average acreage of basic grain farms operating less than 3.5 hectares. Source: National Institute of Statistics (see Appendix Table 1).
d. Estimated from the weighted average acreage of basic grain farms operating more than 3.5 hectares. Source: National Institute of Statistics (see Appendix Table 1).
e. This ratio accounts for inefficiencies in the use of capital available for lending, which are assumed to average 25 percent of the potential return to capital.
f. The discount rate equals the annual interest rate of levied on Petrocaribe funds, namely, 1 percent.

5.5.3 MEDIUM -TERM AGRICULTURAL FINANCING PROGRAM

The short-term agricultural financing program described above will have the potential for improving the input usage rate and, consequently, the productivity of basic grain farms.

However, short-term financing limits investment decisions to production inputs, having limited or no impact on other longer-term production investments such as leveling, irrigation, and purchase of equipment. Productive on-farm investment will likely interact positively with the technical assistance and short-term financing interventions, increasing the odds of achieving the goals set by the particular programs and, overall, the established goals of the entire intervention being proposed here.

Hence, it is important to facilitate access to credit that could be used for productive on-farm investment. The proposal calls for the provision of medium-term loans (up to 5 year) at competitive interest rates (e.g., 10 percent interest rate employed by the National Agricultural Development Bank on long-term agricultural loans). The proposal supports the involvement of commercial banks such as BANHCAFE in the administration of the program to the extent possible. Taking advantage of the installed capabilities of commercial banks with significant presence in rural areas will likely result in lower administration costs; furthermore, it will lower the initial investment needed to build up the administrative capabilities of alternative financial institutions (e.g., microfinance institutions). However, there are many regions that are not covered by the services of commercial banks, and it is there where microfinance institutions must play a relevant role in administering this program, and where program administrators must focus their efforts to transfer the administrative capabilities needed for the proper administration of the medium-term financing program.

Table 5.5 below presents a financial assessment of the program. The stochastic variables considered in this simulation are (1) capital turnover, and (2) administrative costs. The simulation is performed under the following highly stylized assumptions:

1. Capital turnover, or which is the same, the number of times that money is lent during the duration of the program, has a triangular probability distribution with minimum, mean, and maximum values of 1, 1.5, and 2. It is important to know that the maximum possible turnover given the duration of the program (15 years) and the maturity term of loans (5 years) is 3.
2. Administrative costs have a triangular probability distribution with a minimum, mean, and maximum values of 3 percent, 5 percent, and 7 percent of the value of the loans granted.
3. The program starts with an endowment of L 1,120 million, equivalent to L 20,000 per farmer.
4. The annual interest rate on these loans is at 10 percent (equivalent to that applied by the National Agricultural Development Bank on similar loans).
5. The program is financed through an external loan granted in similar terms to those implied by Petrocaribe (that is, a two-year grace period, a 1-percent annual interest rate, and a 25-year maturity term).
6. Since the flow of benefits depends on the unknown schedule of loans, the estimation performed here is conservative, assuming that the benefits of the program are received in three installments, two of them equivalent to 25 percent of total revenues and accrued in years 5 and 10, and the third installment equivalent to 50 percent of total program revenues and accrued in year 15.
7. The cost flow of the program is estimated following the terms of Petrocaribe, assuming the trust is fully paid by the end of the program. The administrative cost

is spread in equal annual installments throughout the entire duration of the program.

The simulation results show the good returns that could accrue from investing in a medium-term financing program. The simulation gives us high confidence that the investment will yield a positive and significant net present value and internal rate of return. The results also lead us to be highly confident that program benefits will exceed costs by at least 37 percent.

Since the estimation assumes that the trust will be fully paid by the end of the program, the trust funds, which have a maturity term of 25 years, can be employed to expand the program or be used for other public investment purposes.

This simulation, although highly stylized, shows the potential economic benefits that could accrue from investing in this type of program. It is important to notice that the assessment considers the financial benefits of the program from the point of view of the lender, and does not account for partial benefits that farmers might obtain from the program, such as higher productivity, lower production risk, or conservation of natural resources.

Table 5.5. Financial assessment of the medium-term agricultural financing program.

STYLIZED FEATURES OF THE PROGRAM		
Magnitude of the intervention	Total value of the trust sufficient to provide a L20,000 loan simultaneously to all participating farmers (56,000)	
Administration of the program	Commercial banks and microfinance institutions under the supervision of program administrators	
Initial investment (L million)	1,120	
Program duration	15 years	
PROGRAM FINANCING TERMS		
Reference interest rate on medium-term agricultural loans	10%	
SOURCE OF PROGRAM FINANCING (reference: Petrocaribe)		
Grace period (years)	2	
Annual interest rate	1%	
Maturity term (years)	25	
FINANCIAL ASSESSMENT OF THE PROGRAM [a]		
	Mean	90% Confidence Interval
Net Present Value of program (L million)	1,223	(432 – 2,025)
Internal Rate of Return	74%	(48% - 103%)
Cost – Benefit Ratio	0.55	(0.37 – 0.73)

a. Discount rate: 1%.

The analysis in the previous three sections provides a rough idea of the costs and benefits that a policy like the one being proposed here might imply. The inclusion of probability distributions on key variables is appropriate given the difficulty of assessing their magnitude with precision, and adds a valuable dimension to the assessment.

5.5.4 IMPORTANT ADDITIONAL FEATURES OF THE PROPOSAL

As explained above, the proposal calls for an initial stage encompassing 20 percent of the total population of basic grain households. Clear eligibility rules as to what constitutes a basic grain household and which households are to be included in the sample subject to the intervention and in the control group (not subject to the intervention, but subject to interview and consultation by evaluators) must be established and preferably agreed upon

among the relevant stakeholders, limiting to the extent possible the room for subjectivity in the determination of the eligibility.

Ideally, eligibility must be conditional exclusively on qualifying as a basic grain farmer over the period taken as reference. What constitutes a basic grain farmer and what will be the reference period are aspects that must be agreed upon among stakeholders participating in the formulation of the policy. Ideally there must be no other conditions for eligibility. Unfortunately, reality dictates that it is highly difficult and costly to reach out to the entire population of basic grain farmers. These are some of the reasons why interventions such as the BT program reach out only to those farmers that are organized locally. On way of improving the coverage of the program while at the same continue reaching out through local organization will be subsidizing the membership cost of joining a local institution such as a cooperative or a microfinance institution.

It is crucial to realize the importance of clearly defining the eligibility rules and to invest resources in reaching out to the eligible population. In the Honduran context, it is likely to require significant human and economic resources to maximize the inclusion of eligible recipients and at the same time minimize the leakages. The experiences of Turkey and Mexico in their implementation of DP programs shows the particular challenges that defining eligibility among staple producers in developing countries might represent (Baffes and De Gorter 2005).

The technical assistance program must allow for the participation of land-owners, tenants, and wage-workers, but with some restrictions. If for a given piece of land both the owner and the tenant are interested in participating, they will count as one group member so as to maximize the effective land upon which the program has influence.

Wage-workers will be allowed to participate in the technical assistance program so that they can acquire the training offered to farmers and thus increase their human capital and, presumably, their mobility. However wage-workers will not count as a member for the sake of defining the size of the group, and they must not exceed the number of basic grain farmers in any group, to ensure that the technical assistance program actually operates on a significant endowment of production resources. Only those qualifying as members in the group must share the cost of the technical assistance as groups mature.

Identification of farmers with characteristics that could make them leading farmers is crucial to the success of the policy, particularly the technical assistance program. For this, all the available sources of information and expertise must be consulted. As previously said, INE maintains an updated list of basic grain farmers with their general production characteristics (e.g., area planted, input use, and allocation of production), and surveys these farmers twice a year.

Furthermore, numerous medium and large-size basic grain farmers belong to certain farm organizations such as the Basic Grain Producer Association (PROGRANO for its initials in Spanish) and the Honduran Rice Producer Association. Beyond the relevant information these organizations can provide about basic grain farmers, their involvement in the formulation of the program would greatly help in the design and legitimization of the program, thus improving the technical and political feasibility of the proposal.

Eligible recipients should have the option of forming their groups, or otherwise letting administrators define the groups. The eligibility of a group would be based primarily on farmers' resources and proximity to the property of the leading farmer.

5.5.5 LIMITATIONS OF THE PROPOSAL

As can be inferred from the previous four sections, the interventions being proposed are aimed primarily at improving the human resources of farmers and farm workers, and strengthening the agricultural financial system directly in the short and medium term, and indirectly in the long run through the capitalization of local financial institutions. However, actions in many other areas are needed for the policy to achieve its intended goals. For instance, it will be necessary to improve the workings of output markets by encouraging the participation of and competition among wholesalers, processors, and retailers. In aggregate, they all stand to gain from a more prosperous agricultural sector. All these agents have complained about the quality of agricultural staples, and the policy being proposed here is expected to generate positive changes in that regard.

It would be desirable that retailers and processors could engage in contracts with farmers, particularly smallholders, for the purchase of their production; furthermore, granting incentives to encourage private entrepreneurship in rural areas must be considered. For instance, technical assistance to processors might help them overcome some limitations in their processing capacities. Moreover, tax breaks to wholesalers, retailers, and processors must also be considered and assessed. The feasibility of tax break concessions must be carefully analyzed with revenue authorities, since it might result in more than proportional administrative costs for the Income Executive Directorate. Furthermore, this goes against the recommendations by experts about the changes needed in the Honduran tax system (Gomez-Sabaini 2003, World Bank 2007a).

The stylized proposal advanced here is intended to serve as a road map for serious policy formulation. Several details of the policy must necessarily be settled with the participation of relevant stakeholders, which will increase the legitimacy and strengthen the political feasibility of the proposal. Furthermore, by accounting for the policy prescriptions being endorsed by important donors and agricultural organizations such as the World Bank and the Food and Agriculture Organization, we are increasing the odds of obtaining the transfers of fresh funds needed to start the program. Securing new resources for the program would raise less opposition among those groups that have captured the budget allocation process. However, this should not deter progress in terms of transparency, accountability and, overall, fighting corruption. Advances in this regard would likely free up resources that would enable the scale up of the services offered by the government.

The back-loaded nature of the concessions on basic grains under DR-CAFTA allows for some time to experiment before the full force of higher competition is felt. This does not mean that actions are not urgently needed; what it means is that the time should be used wisely to design and implement programs that effectively address the problem at hand conditional on the fiscal constraints in which policymaking in developing countries commonly occurs. Quick fixes applied at the national level would likely use up the budget, crowding out investment, and generating at best minor long-lasting effects.

The set of interventions being proposed here have the potential of generating long-lasting changes in the structure of production, the technical skills of farmers and wage workers involved in basic grain agriculture, and most importantly, in the welfare of basic grain households.

5.6 CONCLUSIONS

The Honduran economy has undergone significant changes over the last two decades. It opened itself to world trade significantly in the 1990s, going from having the largest level of protection in the region to the lowest level in just five years. Aggregate exports and imports have increased steadily since then; significant changes in the composition of trade flows evidence a large reallocation of resources to exploit the comparative advantages of this economy, primarily with respect to the two largest world markets, namely, the U.S. and the European Union.

The importance of agriculture as a generator of value added decreased significantly since the early 1990s, and that of other sectors such as textiles and apparels and tourism rose remarkably. The evidence also shows that Honduras has relocated resources within agriculture as well, primarily to reap the benefits of comparative advantages in some particular high-value sectors such as fruits and vegetables and palm oil.

Despite all of these positive changes, the economy grew slowly, and most social indicators worsened. Natural disasters such as Hurricane Mitch and high levels of corruption are but some of the factors related to the poor performance. The lack of opportunities in this economy has forced massive international immigration; jobs overseas were the way out of poverty and insecurity for hundreds of thousands of Hondurans.

Higher rates of economic growth have been achieved over the last four years relative to that observed during the 1990s and early 2000s. However, these rates are comparable to only the average regional performance. Social indicators have been resistant to improve, corruption continues at high levels, and the credibility of public institutions is among the lowest in the region and the world. After more than 25 years of experiencing continuous

democracy, the Honduran population maintains such low expectations about its political system that the nation is classified at high risk with regard to democratic values.

For Honduras to have a shot at achieving some of the Millennium Development Goals, economic growth rates should be at least sustained at the levels observed over the last three years, and inefficiencies in the use of public resources must be reduced significantly.

DR-CAFTA, signed in 2004 and passed into law in 2006, has been seen as a new opportunity for Honduras to continue its economic transformation, deepening the integration with its major trading partner and the largest market in the world. The agreement also raises expectations about its impact on institutional reforms, so much needed in Honduras. At the same time, DR-CAFTA is seen as a threat to some sectors, particularly traditional staple agriculture. Basic grains, namely, corn, beans, rice, and sorghum, are considered sensitive, and have received significant protection. The special treatment relates to the relevance of the basic grain sector as a major employer and as a contributor to the food security of the population.

Previous studies estimate a small but positive impact of the agreement on the economic activity in Honduras. However, these studies also suggest the potential negative impacts that the agreement might have on particular households depending to a large extent on basic grains as a source of income.

A new assessment was conducted in this study employing a dynamic computable general equilibrium, arguably the most sophisticated technique for the analysis of economy-wide changes in economic policies. The model was adjusted to the extent possible to better reflect the conditions prevailing in the Honduran economy. A new social accounting

matrix was constructed for this study that depicts the state of the Honduran economy as of 2004, and utilized to calibrate the model. The agreement was specified to reflect the impact of trade tariff removal done according to the schemes negotiated in the agreement; modeling limitations impeded the specification of the impact of the agreement on rules of origins, an issue particularly relevant for the textile and apparel sector, the most dynamic economic activity in the Honduran economy.

The findings of this study suggest a marginal negative impact of DR-CAFTA on the performance of the Honduran economy over the span of the implementation period, that is, 2007-2026. The same marginal impact is estimated for the activity of the basic grain sector and the income of the representative basic grain household. Hence, this study finds no support for the hypothesis that DR-CAFTA would benefit the Honduran economy as a whole while at the same time worsen significantly the situation of those depending to a large extent on basic grains for their subsistence.

The quantitative assessment performed in this study also assesses the potential spillover effects of DR-CAFTA on investment and technology, two areas where evidence suggests a positive relationship. These results from these highly stylized assessments actually show the potentially large benefits that might accrue from these spillovers, and stress the importance of directing efforts into these areas.

The fact that the evidence generated in this study is not sufficient to reject the null hypothesis driving the quantitative assessment should not deter us from generating the type of policies that could efficiently facilitate the transition of once highly protected economic sectors into more competitive markets. In this last chapter, I engage in an analysis of the political and economic conditions in which agriculture operates, the policy

guidelines driving agricultural policy in Honduras, and the guidelines being advocated by development institutions with a stake in agriculture.

With these variables in mind, I evaluated alternative approaches and propose a new policy that could better serve to address the overarching problem, that is, "*The increase in market competition resulting from the full-implementation of DR-CAFTA will put downward pressure on market prices for basic grains, benefiting those that are net consumers of these staples, but worsening the welfare of those households whose income depends greatly on these activities and that have severe limitations to adapt to the new market conditions. This new market conditions would likely have a negative ripple effect on rural poverty in areas with already low social indicators.*"

The desirable outcome from the intervention to be proposed is to "*help all agents in the basic grain supply chain secure a higher level of income through the acquisition of technologies and human capital, the expansion of the market, and improvement in the workings of factor and output markets.*"

The analysis of previous interventions and their feasibility for the Honduran context as well as the desirable guidelines promoted by development institutions and supported by the Secretary of Agriculture lead me to propose a policy with three main components, namely, a technical assistance program, and a short-term and a medium-term financing programs, as the best way to achieve the desired outcome. The proposal is highly stylized but highlights the main features to be introduced; many details on the formulation and implementation should be settled before taking the proposal for serious consideration. Nevertheless, the proposal presented in this chapter along with the information gathered for and generated by this study can serve as a good road map towards the design of a

formal policy proposal suitable for serious consideration. If these findings can serve to that end, the efforts of this study will be of value.

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Appendix Table 1. Number of producers by size of operation and their allocation of production, 2006-2007

FARM SIZE	PRODUCERS		TOTAL AREA		PRODUCTION	ALLOCATION			
	NO.	%	PLANTED	HARVESTED		CONSUMPTION	LOSSES	TRADE	TOTAL
TOTAL									
size < 1.5 ha	142,852	37.7%	19.7%	20.0%	12.7%	74.0%	0.5%	25.5%	100.0%
1.5 ha < size < 3.5 ha	116,266	30.7%	30.0%	29.4%	18.6%	59.4%	0.7%	39.8%	100.0%
3.5 ha < size < 7 ha	45,417	12.0%	14.2%	13.6%	9.6%	50.5%	0.3%	49.1%	100.0%
7 ha < size < 14 ha	30,360	8.0%	10.1%	10.1%	7.9%	45.0%	0.1%	54.9%	100.0%
14 ha < size < 35 ha	29,729	7.9%	13.9%	14.1%	11.7%	33.4%	0.1%	66.5%	100.0%
35 ha < size	13,896	3.7%	12.1%	12.7%	39.5%	12.4%	0.0%	87.6%	100.0%
	378,520	100.0%	100.0%	100.0%	100.0%				
MAIZE									
size < 1.5 ha	120,225	38.4%	19.7%	19.8%	13.5%	74.9%	0.5%	24.6%	100.0%
1.5 ha < size < 3.5 ha	95,974	30.7%	30.1%	29.6%	19.9%	59.3%	0.8%	39.9%	100.0%
3.5 ha < size < 7 ha	36,708	11.7%	13.9%	13.2%	10.0%	51.4%	0.3%	48.2%	100.0%
7 ha < size < 14 ha	24,947	8.0%	10.1%	10.2%	8.5%	45.3%	0.1%	54.6%	100.0%
14 ha < size < 35 ha	23,816	7.6%	14.2%	14.5%	12.4%	34.2%	0.1%	65.7%	100.0%
35 ha < size	11,120	3.6%	12.0%	12.6%	35.7%	15.0%	0.0%	85.0%	100.0%
	312,791	100.0%	100.0%	100.0%	100.0%				
BEANS									
size < 1.5 ha	13,676	33.8%	22.3%	24.2%	22.6%	53.3%	0.0%	46.7%	100.0%
1.5 ha < size < 3.5 ha	11,767	29.1%	27.0%	25.4%	22.1%	56.5%	0.0%	43.5%	100.0%
3.5 ha < size < 7 ha	5,116	12.7%	15.5%	16.6%	15.4%	45.9%	0.2%	53.9%	100.0%
7 ha < size < 14 ha	3,361	8.3%	8.6%	8.7%	7.8%	52.7%	0.0%	47.3%	100.0%
14 ha < size < 35 ha	4,305	10.7%	15.5%	13.7%	11.1%	41.5%	0.0%	58.5%	100.0%
35 ha < size	2,186	5.4%	11.1%	11.4%	21.0%	24.2%	0.0%	75.8%	100.0%
	40,411	100.0%	100.0%	100.0%	100.0%				

Appendix Table 1. Continued

Farm Size	Producers		Total Area		Production	Allocation			
	No.	%	Planted	Harvested		Consumption	Losses	Trade	Total
Rice									
size < 1.5 ha	456	23.0%	3.9%	3.6%	2.9%	25.7%	0.0%	74.3%	100.0%
1.5 ha < size < 3.5 ha	610	30.8%	10.7%	10.8%	9.9%	10.0%	0.0%	90.0%	100.0%
3.5 ha < size < 7 ha	357	18.0%	13.5%	13.4%	15.6%	3.7%	0.4%	95.9%	100.0%
7 ha < size < 14 ha	326	16.5%	11.7%	11.5%	10.5%	2.7%	0.0%	97.3%	100.0%
14 ha < size < 35 ha	158	8.0%	13.8%	13.8%	13.6%	2.4%	0.0%	97.6%	100.0%
35 ha < size	75	3.8%	46.5%	47.0%	47.5%	1.8%	0.0%	98.2%	100.0%
	1,983	100.0%	100.0%	100.0%	100.0%				
Sorghum									
size < 1.5 ha	8,496	36.4%	20.8%	21.7%	5.1%	80.6%	0.4%	19.0%	100.0%
1.5 ha < size < 3.5 ha	7,915	33.9%	35.3%	34.9%	7.5%	78.6%	0.0%	21.4%	100.0%
3.5 ha < size < 7 ha	3,235	13.9%	17.2%	16.2%	3.3%	79.4%	0.0%	20.6%	100.0%
7 ha < size < 14 ha	1,725	7.4%	10.6%	10.4%	1.9%	77.9%	0.0%	22.1%	100.0%
14 ha < size < 35 ha	1,449	6.2%	8.4%	8.6%	4.7%	27.9%	0.0%	72.1%	100.0%
35 ha < size	515	2.2%	7.8%	8.3%	77.6%	1.8%	0.0%	98.2%	100.0%
	23,335	100.0%	100.0%	100.0%	100.0%				

Source: own estimations based on information from INE (Instituto Nacional de Estadistica 2007, Instituto Nacional de Estadistica 2006).

Appendix Table 2. Main limitations cited by members of the basic grain supply chains

	Areas of Interest	Beans	Corn	Rice
Market and Business Development				
1.	Poor social capital of small farms, which among other things leads to their exclusion from sectoral purchase agreements	X	X	X
2.	Poor human capital of farmers and agricultural workers	X	X	X
3.	Asymmetries in output and input market information, and insufficient information on post-harvest and storage techniques	X	X	
4.	Limitations of farmers to add more value to their production, primarily because of insufficient options when it comes to selling their output	X	X	
5.	Insufficient on-farm infrastructure for post-harvest management		X	X
6.	Poor production technologies and high cost of loans		X	X
7.	The lack of drying facilities in many production areas, which decreases the quality and, consequently, the value of production.		X	
8.	The considerable distance from the production to processing areas, which increases the transaction costs			X
9.	No processing of sub-products that could add value to the supply chain	X		X
Institutional Development				
1.	Changing political environment that undermines the organization of agricultural business in the long run			X
2.	Inefficient bureaucracy that leads to high transaction costs and overlapping activities	X		
3.	Inadequate capacity of municipalities and local governments to identify the problems of local supply chains	X		
4.	Inadequate capacity of municipalities and local governments to administer agricultural development programs	X		
Financing				
1.	Hurricane Mitch in 1998 seriously damaged the financial profile of many farmers, and increased the cost of agricultural credit due to the rise in risk associated with agriculture	X	X	
2.	High level of indebtedness of farmers in general, and corn farmers in particular, which might result in the collapse of the sector if the government and private banks do not redefine the terms of these credits.		X	
3.	Insufficient funds available for financing agricultural production	X	X	X
4.	Lack of incentives to expand the services offered by non-traditional financial institutions	X		
5.	The assets eligible to be placed as collateral are undervalued by financial institutions, which consequently limits the access to credit	X	X	X
6.	Increased risk associated with trade liberalization, which further constraints the availability of funds			X
7.	Interest rates are too high relative to the returns of agriculture.	X	X	X
Rural Infrastructure				
1.	Insufficient coverage of irrigation systems	X	X	X
2.	Insufficient network of rural routes that constrain the ability of farmers to move their production to the markets. Truckers take advantage of this situation, thus gaining market power to the detriment of producers	X	X	
3.	Insufficient drying and storage facilities			X

Appendix Table 2. Continued

Areas of Interest	Beans	Corn	Rice
Rural Infrastructure, continued			
4. Insufficient coverage of basic services such as electricity and phone isolates producers, thus making them all the most dependent on truckers and other middlemen.	X	X	
5. The above also leads to the misinformation of farmers about public and private initiatives of interest.	X	X	
Promotion of Technological Innovation and Production Diversification			
1. Lack of professionals in rural areas to help farmers improve their economic results.	X	X	
2. Lack of investment in services such as soil labs, breeding programs, research in the management of agrochemicals, weed control, etc.	X	X	X
3. Insufficient supply of quality seeds with desirable agronomical and market characteristics that can expand the market for Honduran staples	X		
Sanitary and Phytosanitary Measures			
1. Lack of information regarding the use and certification of agrochemicals.	X	X	X
Sustainability of Natural Resources			
1. Inadequate management of soils in hillside production, which leads to the rapid loss of fertility.		X	
2. Advance of the agricultural frontier that endangers the sustainability of areas previously covered with forest.		X	
3. Inadequate management of water resources (which, among other things, leads to flooding, destruction of crops and infrastructure)		X	X
Education and Training			
1. Insufficient provision and poor quality of rural education	X	X	X
2. Lack of agricultural training	X	X	X

Source: National Agricultural Roundtable.

Appendix Table 3. Honduras: Competitiveness of agricultural and food exports to the U.S. (1990-2004)

Products	Change in Market Share	Change in Market Size	Product Classification
Agricultural Products			
Live animals	-0.106	-0.141	Retreat product
Fresh and frozen beef	-1.013	-0.117	Retreat product
Live fish	0.129	-0.302	Falling stars
Dairy and honey	-0.002	-0.004	Falling stars
Other animal products	0.012	0.004	Rising stars
Plants and flowers	-0.114	0.004	Missed opportunities
Beans and vegetables	0.127	0.003	Rising stars
Edible fruits	-3.791	-0.094	Retreat product
Coffee, tea, and spices	-0.575	-0.246	Retreat product
Cereals	na	-0.009	Undefined
Oil seeds	-0.058	-0.036	Retreat product
Food Products			
Milling products	na	0.013	Undefined
Sugar and sweeteners	-0.473	-0.124	Retreat product
Processed beans, fruits, and vegetables	0.173	-0.204	Falling stars
Alcoholic beverages	0.009	0.013	Rising stars
Cocoa and its derivatives	-0.088	-0.047	Retreat product
Tobacco	3.542	-0.078	Falling stars
Timber products	-0.142	0.517	Missed opportunities

Retreat products: losing competitiveness in stagnant sectors; **Missed opportunities**: losing competitiveness in growing sectors; **Rising stars**: gaining competitiveness in growing sectors; **Falling stars**: gaining competitiveness in stagnant sectors.

Source: Serna 2007.

Appendix Table 4. Honduras: short-list of agricultural and food export products with revealed comparative advantages in other foreign markets but the U.S.

Products	HS Code	Exports (USD 1,000)	
		World	U.S.
Whip cream	04022900	567	0
Muenster cheese	04069020	285	0
Fresh and frozen tomatoes	07020000	5,512	0
Beans	07082000	358	4
	07102200	459	435
	07133190	628	3
Almonds	08021200	265	0
Fresh plantains	08030011	111,956	97,041
Passion fruit	08109030	163	0
Coffee	09011120	262	0
	09011130	181,945	21,958
Cinnamon	09061000	51	0
Palm oil	15119090	13,851	0
Sweeteners	17021900	486	0
Cocoa and its derivatives	18031000	205	0
	18050000	905	0
Juices	20094900	1,050	218
Tomato juice	20095000	259	0
Ketchup	21032000	8,749	10
Tobacco	24012020	3,073	0
	24013010	520	0

Source: Monge-González 2004

Appendix Table 5. Measures to transform the agricultural and food sectors of Honduras

1. COMPETITIVENESS AND QUALITY
1.1. MARKET DEVELOPMENT
1.1.1. DOMESTIC MARKET
GOAL Create a more clear and stable regulatory framework as a first step towards improving the efficiency of production
LINES OF ACTION
3) Implementation of temporary price stabilization programs to protect the domestic market from a sudden rise in imports (safeguard measures) or unfair competition (anti-dumping measures).
4) Enhancing the efficiency of domestic markets by increasing its transparency; promoting the creation of wholesale markets at the municipal level; investing in infrastructure, primarily roads and storage facilities; improving the efficiency in the use of the public storage facilities; developing clear standards of weight and quality to make transactions more transparent, and improving the market information service.
5) Redefinition of food aid policies to avoid undesirable and unintended distortions in the domestic market.
6) Continuation of purchase agreements for basic grains between producers and the processing industry.
1.1.2. EXPORT MARKET
GOAL Create the conditions for the expansion of foreign markets for Honduran products
LINES OF ACTION
7) Continuing with the process of economic integration at the regional and multilateral levels.
8) Strengthening the negotiating skills of the Secretary of Agriculture (SAG) in regional and multilateral rounds.
9) Creation of agricultural *attachés* in relevant foreign markets in order to improve the knowledge about market opportunities and to promote Honduran agricultural products.
10) Creation of the Fund for the Promotion of Agricultural Products, financed by the SAG, with the goal of promoting Honduran products overseas.
11) Strengthening the market information system of the SAG through INFOAGRO.
12) Simplifying the application process for export rights.
1.2. SANITARY MEASURES AND FOOD SAFETY
GOAL Secure a better quality of products that would enable Honduran products to access world markets, as well as to offer high quality domestic products in the domestic market
LINES OF ACTION
13) Strengthening the enforcement of the Sanitary and Phytosanitary Law.
14) Improving the sanitary and phytosanitary (SPS) protocols throughout the supply chain.
15) Promoting the harmonization of SPS protocols in the Central American region.
16) Signing the new Seed Law to strengthen intellectual property rights, thus facilitating access to high-quality seeds and improving productivity.
17) Strengthening the procedures for inspection and authorization of food processing industries.

Appendix Table 5. Continued

2. PRODUCTION INCENTIVES AND SUPPLY CHAIN INTEGRATION
2.1. INCENTIVES TO TECHNOLOGICAL INNOVATION, DIVERSIFICATION OF PRODUCTION, AND GENERATION OF VALUE ADDED
GOAL Promote policies aimed at improving the investment in research and development as well as access to technology for a sustainable and more productive agriculture
LINES OF ACTION
18) Creation of the National System of Agricultural Innovation and Technology Transfer (SNITTA for its initials in Spanish) as a forum for interaction of public and private interests for the definition of research priorities and management of funds available for that purpose.
19) Creation of the National Center for Innovation in Food and Agriculture (CENITA for its initials in Spanish), dependent on the SAG, with the goal of developing the human skills and infrastructure necessary for public agricultural research.
20) Assessing the comparative advantages of the different regions and their limitations in order to allocate research and extension funds more efficiently.
2.2. EDUCATION, TRAINING, AND ENTREPRENEURSHIP
GOAL Improve the skills of the labor force available for the agriculture and food sector
LINES OF ACTION
21) Developing training programs for professionals and producers.
22) Adapting the curricula at all levels of education so that the contents are useful and reflect the needs in each region.
23) Creating the forums for the interaction of agents involved in rural education and training programs.
2.3. RURAL AND AGRICULTURAL FINANCING, PROMOTION OF PRIVATE INVESTMENT, AND RISK MANAGEMENT
GOAL Increase the supply of capital to finance agriculture and facilitate the access to these resources
LINES OF ACTION
24) Increasing the availability and efficiency in the allocation of public funds devoted to finance agricultural production.
25) Developing the proper regulatory system so as to encourage the participation of private financial institutions in agricultural capital markets.
26) Strengthening the risk management tools available so as to offer more guarantees to, and encourage the participation of, private financial institutions.
27) Increasing the funds for production activities of small farms granted through the Sustainable Rural Development National Project (PRONADERS for its initials in Spanish)
28) Subsidizing the cost of agricultural insurance to encourage their adoption and lower the risks of agricultural production.
29) Formulating mechanisms to reduce the interest rate on agricultural loans.
30) Designing a strategy to encourage foreign direct investment in agriculture.
31) Strengthening the National Bank of Agricultural Development (BANADESA for its initials in Spanish) and the National Fund for Production and Housing (FONAPROVI for its initials in Spanish), both institutionally and economically, to provide better public financial services to the agricultural sector.

Appendix Table 5. Continued

2.4.	RURAL INFRASTRUCTURE AND IRRIGATION
2.4.1.	IRRIGATION
GOAL	Expand the irrigation system to incorporate 40,000 hectares by 2005
LINES OF ACTION	
32)	Creation of the National Service of Rural Infrastructure and Irrigation (SENINFRA for its initials in Spanish), in charge of guiding and coordinating actions related to rural infrastructure and irrigation systems.
33)	Formulation of the Irrigation and Drainage National Plan, with the goal of developing feasible irrigation projects.
34)	Implementation of irrigation projects based on their social and economic returns.
35)	Encouraging private investment in irrigation through the granting of investment subsidies.
2.4.2.	RURAL INFRASTRUCTURE
GOAL	Accelerate public investment in rural infrastructure
LINES OF ACTION	
36)	Encouraging the use of SENINFRA as a forum where the different agencies in charge of public infrastructure could interact and coordinate their actions towards the development of proper conditions for agricultural production.
2.5.	NATURAL RESOURCE SUSTAINABILITY
GOAL	Manage natural resources, particularly forestry and water, in ways that provide economic benefits while ensuring their sustainability
LINES OF ACTION	
37)	The Secretary of Natural Resources and Environment (SERNA for its initials in Spanish) will initiate a review of the laws and regulations regarding natural resources to ensure their enforcement and compatibility with the new production processes and environmental standards.
38)	Designing the National Strategy for Sustainable Management of Water Basins, in charge of evaluating the current conditions of numerous basins, and taking the steps towards recovering the productive capacity, primarily of those that present a high level of degradation.
39)	Creating mechanisms that promote a sustainable management of resources.
40)	Strengthening the enforcement of laws and regulations against illegal management of the rainforest.
41)	Reviewing the allocation of public land titles to landless farmers, avoiding the allocation of land in protected areas.
2.6.	ACCESS TO LAND, PRIVATE PROPERTY RIGHTS, AND SOCIAL EQUITY
GOAL	Solve the problem of private property rights and unequal access t land
LINES OF ACTION	
42)	Strengthening the regulatory framework by formulating the National Land Policy.
43)	Improving the conditions for the development of land markets.
44)	Facilitating access to land for small farmers through guarantees and/or subsidies provided by the government.
45)	Encouraging the development of new agricultural land through the concession of tax incentives to private investors.

Source: Government of Honduras 2004.

Appendix Table 6. Description of the macro-SAM of Honduras for the year 2004

	PRODUCTION				DOMESTIC INSTITUTIONS			TAXES	
	ACT	PROD	LAB	CAP	HOU	GOV	ENTR	PR-TX	S-TX
Activities		*Production*							
Products	*Intermediate consumption*				*Final consumption*	*Final consumption*			
Labor	*Value added*								
Capital	*Value added*								
Households			*Domestic transfers*			*Net transfers*	*Operating surplus*		
Government								*Tax revenue*	*Tax revenue*
Enterprises				*Domestic Transfers*		*Net Transfers*			
Production tax	*Production tax*								
Sales tax		*Sales tax*							
Import tariff		*Import tariff*							
Export tariff		*Export tariff*							
Income tax					*Income tax*		*Income tax*		
Dis. Margins domestic		*Margins*							
Dis. Margins exports		*Margins*							
Dis. Margins imports		*Margins*							
S-I					*Savings*	*Savings*	*Savings*		
Rest of the World		*Imports (c.i.f)*	*Transfer to ROW*	*Transfer to ROW*		*Transfer to ROW*	*Transfer to ROW*		
Total	*Gross output*	*Domestic absorption*	*Labor cost*	*Capital cost*	*Household expenditure*	*Government expenditure*	*Enterprise expenditure*	*Tax revenue*	*Tax revenue*

Appendix Table 6. Continued.

	TAXES			DISTRIBUTION MARGINS					
	M-TR	**X-TR**	**I-TX**	**DM-D**	**DM-X**	**DM-M**	**S-I**	**ROW**	**TOTAL**
Activities									*Production value*
Products				*Margins Demand*	*Margins Demand*	*Margins Demand*	*Gross capital formation*	*Exports (f.o.b.)*	*Aggregate demand*
Labor								*Compensation from ROW*	*Aggregate labor income*
Capital								*Compensation from ROW*	*Aggregate capital income*
Households								*Transfers from ROW*	*Household income*
Government	*Tax revenue*	*Tax revenue*	*Tax revenue*					*Transfers from ROW*	*Government revenue*
Enterprises								*Transfers from ROW*	*Enterprise income*
Production tax									*Production tax revenue*
Sales tax									*Sales tax revenue*
Import tariff									*Import tariff revenue*
Export tariff									*Export tariff revenue*
Income tax									*Income tax revenue*
Dis. Margins domestic									*Distribution margins*
Dis. Margins exports									*Distribution margins*
Dis. Margins imports									*Distribution margins*
S-I								*Capital inflow*	*Total savings*
Rest of the World							*Capital outflow*		*Payments to ROW*
Total	*Tax revenue*	*Tax revenue*	*Tax revenue*	*Margins demand*	*Margins demand*	*Margins demand*	*Total investment*	*Payments from ROW*	

Appendix Table 7. The 2004 Macro-SAM for Honduras (million Lempiras)

			FACTORS		DOMESTIC INSTITUTIONS			TAXES					DISTRIB. MARGINS				
	ACT	PROD	LAB	CAP	HOU	GOV	ENTR	PR-TX	S-TX	M-TR	X-TR	I-TX	DM-D	DM-X	DM-M	S-I	ROW
ACT		328,393															
PROD	181,283				130,459	13,202							20,233	7,299	6,889	47,912	94,357
LAB	72,273																567
CAP	72,165																1,049
HOU			72,534		33	9,025	41,161										20,717
GOV						2,222	0	2,672	12,448	1,801	148	8,829					1,436
ENTR				63,616		265	27,404										2,395
PR-TX	2,672																
S-TX		12,448															
M-TR		1,801															
X-TR		148															
I-TX					1,452	0	7,377										
DM-D		20,233															
DM-X		7,299															
DM-M		6,889															
S-I					11,526	4,495	17,733									9,403	14,431
ROW		124,423	306	9,598	0	346	5									273	
TOTAL	328,393	501,634	72,840	73,214	143,470	29,555	93,680	2,672	12,448	1,801	148	8,829	20,233	7,299	6,889	57,588	134,953

Appendix Table 8. Sets defined in the CGE model

ACT: activities	**CAPACT**: activities producing capital goods	
	CONACT: activities producing consumption goods	
COM: commodities	**CT**: commodities used as inputs by transaction service sector	
FAC: factors of production	**FM**: mobile factors of production	**FSUP**: factors with supply function
		FNSUP: factors with fixed supply
	FS: sluggish factors of production	**FSUP**: factors with supply function
		FNSUP: factors with fixed supply
ID : domestic institutions	**IDNG**: domestic non-government institutions	**HOU**: households
		ENT: enterprises
	GOV: government	
REG : other regions		

Appendix Table 9. Parameters in the CGE model

PARAMETERS	DESCRIPTION
	EXOGENOUS
σ_{va}	Elasticity of substitution among factors of production in the value-added nest
σ_{int}	Elasticity of substitution among intermediate inputs in intermediates nest
σ_{out}^{cet}	Elasticity of transformation between domestic and export markets
σ_{ARM}	Armington elasticity of substitution between domestic and imported goods
σ_{exp}^{ces}	Elasticity of substitution among destinations of exports
σ_{imp}^{ces}	Elasticity of substitution among sources of imports
σ_{fac}^{cet}	Elasticity of transformation for sluggish factors of production
ε_{fs}	Own-price elasticity of factor supply
$INCPAR(c,h)$	CDE income parameter
$SUBPAR(c,h)$	CDE substitution parameter
$UTILTRADE(h)$	Utility from the consumption of traded composite (set to 1 at the baseline)
$UTILNOTR(h)$	Utility from the consumption of non-traded composite (set to 1 at the baseline)
$UTILSAVE(h)$	Utility from savings (set to 1 at the baseline)
	ENDOGENOUS
$APE(c,g,h)$	Allen partial elasticity of substitution by household
$EY(h,c)$	Income elasticity of demand for commodity c by household
$EP(c,g,h)$	Uncompensated own-price elasticity of demand by household
$UELASTRADE(h)$	Elasticity of expenditure on traded composite with respect to utility by household
$UTILELAS(h)$	Elasticity of total expenditure with respect to utility by household

Appendix Table 10. List of equations included in the CGE model

ACTIVITY LEVEL NEST		
1)	$qva(a) = qa(a) - ava(a) - ao(a)$	$\forall\ a \in ACT$
2)	$qinta(a) = qa(a) - ain(a) - ao(a)$	$\forall\ a \in ACT$
VALUE-ADDED AND INTERMEDIATES NESTS		
3)	$qf(f,a) = -afe(f,a) + qva(a) + \sigma_{va} * \{pva(a) - [pfa(f,a) - afe(f,a)]\}$	$\forall\ f \in FS$ and $a \in ACT$
4)	$qf(f,a) = -afe(f,a) + qva(a) + \sigma_{va} * \{pva(a) - [pf(f) - afe(f,a)]\}$	$\forall\ f \in FM$ and $a \in ACT$
5)	$qint(c,a) = -aie(c,a) + qinta(a) + \sigma_{int} * \{pinta(a) - [pq(c) - aie(c,a)]\}$	$\forall\ c \in COM$ and $a \in ACT$
6)	$VFA(a) * pva(a) = \sum_{f\ \epsilon\ FS}\{VFAA(f,a) * [pfa(f,a) - afe(f,c)]\} + \sum_{f\ \epsilon\ FM}\{VFAA(f,a) * [pf(f) - afe(f,c)]\}$	$\forall\ a \in ACT$
7)	$VIA(a) * pinta(a) = \sum_{c\ \epsilon\ COM} VIAA(c,a) * [pq(c) - aie(c,a)]$	$\forall\ a \in ACT$
COMMODITY PRODUCTION BY ACTIVITY		
8)	$qac(c,a) = qa(a)$	$\forall\ c \in COM\ and\ a \in CONACT$
9)	$VAM(a) * pam(a) = \sum_{c\ \epsilon\ COM}\{VCAM(c,a) * ptoa(c,a)\}$	$\forall\ a \in CONACT$
AGGREGATION FUNCTION FOR TRADED COMMODITIES		
10)	$qtoa(c,a) = qto(c) + [px(c) - ptoa(c,a)]$	$\forall\ c \in COM\ and\ a \in CONACT$
11)	$VTOM(c) * px(c) = \sum_{a\ \epsilon\ CONACT}\{VCAM(c,a) * ptoa(c,a)\}$	$\forall\ c \in COM\ and\ a \in CONACT$
ALLOCATION OF DOMESTIC COMMODITIES		
12)	$qe(c) = qto(c) - \sigma_{out}^{cet} * [px(c) - pe(c)]$	$\forall\ c \in COM$
13)	$qd(c) = qto(c) - \sigma_{out}^{cet} * [px(c) - pds(c)]$	$\forall\ c \in COM$

Appendix Table 10. Continued

EXPORT SUPPLY		
14)	$qed(c,r) = qe(c) + \sigma_{exp}^{ces} * [pepd(c,r) - pe(c)]$	$\forall\ c \in COM, and\ r \in REG$
15)	$VEM(c) * pe(c) = \sum_{r\ \epsilon\ REG}\{VEMD(c,r) * pepd(c,r)\}$	$\forall\ c \in COM$
COMPOSITE COMMODITY PRODUCTION		
16)	$qd(c) = qq(c) + \sigma_{ARM} * [pqs(c) - pdm(c)]$	$\forall\ c \in COM$
17)	$qm(c) = qq(c) + \sigma_{ARM} * [pqs(c) - pm(c)]$	$\forall\ c \in COM$
SOURCING OF IMPORTS		
18)	$qms(c,r) = qm(c) + \sigma_{imp}^{ARM} * [pm(c) - pmms(c,r)]$	$\forall\ c \in COM, and\ r \in REG$
19)	$VMM(c) * pm(c) = \sum_{r\ \epsilon\ REG}\{VMMS(c,r) * pmms(c,r)\}$	$\forall\ c \in COM, and\ r \in REG$
FACTOR SUPPLY		
20)	$qfs(f) = qfsint(f) + \varepsilon_{fs} * [pf(f) - cpi]$	$\forall\ f \in FSUP$
21)	$qfsa(f,a) = qfs(f) + \sigma_{fac}^{cet} * [pf(f) - pfa(f,a)]$	$\forall\ f \in FS\ and\ a \in ACT$
22)	$VFS(f) * pf(f) = \sum_{a\ \epsilon\ ACT}\{VFAA(f,a) * pfa(f,a)\}$	$\forall\ f \in FS$
TRANSACTION SERVICES		
23)	$VDTS * qt = \sum_{c\ \epsilon\ COM}\{[VDM(c) - VDS(c)] * qd(c) + \{\sum_{r\ \epsilon\ REG}[VEBD(c,r) - VEMD(c,r)] * qed(c,r) + [VMMS(c,r) - VMBS(c,r)] * qms(c,r)\}\}$	
24)	$VDTS * pt = \sum_{c\ \epsilon\ CT}\{VDTRP(c) * pq(c)\}$	
25)	$qtd(c) = qt$	$\forall\ c \in CT$

Appendix Table 10. Continued

CONSUMER PRICE INDEX EQUATION		
26)	$VTFDH * cpi = \sum_{c \in COM}\{VTFDCH(c) * pq(c)\}$	
DETERMINATION OF FACTOR INCOME		
27)	$rtfd(f,r) = rtff(f,r) + xr$	$\forall f \in FAC, and\ r \in REG$
28)	$FACINC(f) * fy(f) = \sum_{a \in ACT}\{VFAA(f,a) * (pf(f) + qf(f,a))\} + \sum_{r \in REG}\{VRTFS(f,r) * rtfd(f,r)\}$	$\forall f \in FM$
29)	$FACINC(f) * fy(f) = \sum_{a \in ACT}\{VFAA(f,a) * (pfa(f,a) + qf(f,a))\} + \sum_{r \in REG}\{VRTFS(f,r) * rtfd(f,r)\}$	$\forall f \in FS$
DISTRIBUTION OF FACTOR INCOME		
30)	$ftrd(f,r) = xr + ftrd(r,f)$	$\forall f \in FAC, and\ r \in REG$
31)	$VFTR(f) * fyo(f) = \sum_{r}\{VFTRD(f,r) * ftrd(f,r)\}$	$\forall f \in FAC$
32)	$VFTD(f) * fyd(f) = FACINC(f) * fy(f) - VFTR(f) * fyo(f)$	$\forall f \in FAC$
33)	$fyi(i,f) = fyd(f)$	$\forall f \in FAC\ and\ i \in IDNG$
INCOME OF DOMESTIC, NON-GOVERNMENT INSTITUTIONS		
34)	$gtdii(i) = govt(i) + cpi$	$\forall i \in IDNG$
35)	$rtid(i,r) = rtif(i,r) + xr$	$\forall i \in IDNG, and\ r \in REG$
36)	$GYIDNG(i) * y(i) = \sum_{f \in FAC}\{VFTDI(i,f) * fyi(i,f)\} + \sum_{j \in IDNG}\{VTII(i,j) * trii(i,j)\} + \sum_{r \in R}\{VRTDI(i,r) * rtid(i,r)\} + VTGI(i) * gtdii(i)$	$\forall i \in IDNG$
37)	$yn(i) = y(i) - tinc(i)$	$\forall i \in IDNG$

Appendix Table 10. Continued

EXPENDITURE OF DOMESTIC, NON-GOVERNMENT INSTITUTIONS		
38)	$itrd(i,r) = itrf(i,r) + xr$	$\forall\ i \in IDNG \text{ and } r \in REG$
39)	$trii(j,i) = yn(i)$	$\forall\ i,j \in IDNG$
40)	$esav(e) = yn(e) + mps(e)$	$\forall\ e \in ENT$
41)	$UTILBUD(h) * utilbud\_p(h) = NYIDNG(i) * yn(i) - \sum_{i \in IDNG}\{VTII(i,r) * trii(i,h)\} - \sum_{r \in REG}\{VDITR(i,r) * itrd(i,r)\}$	$\forall\ h \in HOU$
HOUSEHOLD DEMAND SYSTEM		
SUB-UTILITY FROM SELF-CONSUMPTION		
42)	$qntah(h,c,a) = qnth(h,c)$	$\forall\ a \in CONACT, h \in HOU, \text{and } c \in COM$
43)	$qnth(c,h) - pop(h) = unt(h) - [px(c) - pnth(h)]$	$\forall\ h \in HOU \text{ and } c \in COM$
44)	$VNTH(h) * pnth(h) = \sum_{\substack{c \in COM \\ a \in CONACT}} VHCAHM(a,c,h) * px(c)$	$\forall\ h \in HOU$
45)	$unt(h) = vnth(h) - pnth(h) - pop(h)$	$\forall\ h \in HOU$
SUB-UTILITY FROM TRADED COMMODITIES		
46)	$qqh(c,h) = \sum_{c' \in COM}\{EP(c,c',h) * pq(c')\} + EY(h,c) * [vth(h) - pop(h)] + pop(h)$	$\forall\ h \in HOU \text{ and } c \in COM$
47)	$uelast(h) = \sum_{c \in COM} XWCONSHR(c,h) * [pq(c) + qqh(h,c) - vth(h)]$	$\forall\ h \in HOU$
48)	$pth(h) = \sum_{c \in COM}[CONSHRT(c,h) * pq(c)]$	$\forall\ h \in HOU$
49)	$UELASTRADE(h) * ut(h) = vth(h) - pop(h) - pth(h)$	$\forall\ h \in HOU$

Appendix Table 10. Continued

REPRESENTATIVE HOUSEHOLD		
Budget Allocation		
50)	$dptrade(h) = dpsftrade(h) + dpshift(h)$	$\forall\, h \in HOU$
51)	$dpnotr(h) = dpsfnotr(h) + dpshift(h)$	$\forall\, h \in HOU$
52)	$dpsave(h) = dpsfsave(h) + dpshift(h)$	$\forall\, h \in HOU$
53)	$dpav(h) = XSHRTRADE(h) * dptrade(h) + XSHRNOTR(h) * dpnotr(h) + XSHRSAVE(h) * dpsave(h)$	$\forall\, h \in HOU$
54)	$uelas(h) = XSHRTRADE(h) * uelast(h) - dpav(h)$	$\forall\, h \in HOU$
55)	$vth(h) = utilbud(h) - [uelast(h) - uelas(h)] + dptrade(h)$	$\forall\, h \in HOU$
56)	$vnth(h) = utilbud(h) + uelas(h) + dpnotr(h)$	$\forall\, h \in HOU$
57)	$housav(h) = utilbud(h) + uelas(h) + dpsave(h)$	$\forall\, h \in HOU$
58)	$qsave(h) = housav(h) - psave(h)$	$\forall\, h \in HOU$
REPRESENTATIVE HOUSEHOLD		
Aggregate Utility		
59)	$pi(h) = XSHRTRADE(h) * pth(h) + XSHRNOTR(h) * pnth(h) + XSHRSAVE(h) * psave(h)$	$\forall\, h \in HOU$
60)	$u(h) = au(h) + DPARTRADE(h) * log[UTILTRADE(h) * dptrade(h)] + DPARNOTR(h) * log[UTILNOTR(h) * dpnotr(h)] + DPARSAVE(h) * log[UTILSAVE(h) * dpsave(h)] + [1/UTILELAS(h)] * [utilbud(h) - pop(h) - pi(h)]$	$\forall\, h \in HOU$
61)	$DPARSUM(h) * dpsum(h) = DPARTRADE(h) * dptrade(h) + DPARNOTR(h) * dpnotr(h) + DPARSAVE(h) * dpsave(h)$	$\forall\, h \in HOU$

Appendix Table 10. Continued

GOVERNMENT REVENUES		
62)	$rtgovd(r) = rtgovf(r) + xr$	$\forall\, r \in REG$
63)	$GOVREV * grev = \sum_{a\,\epsilon\,CONACT}\{VAM(a) * [qa(a) + pam(a)] - VAP(a) * [qa(a) + pap(a)]\} +$ $\sum_{c\,\epsilon\,COM}\{VQD(c) * [pq(c) + qq(c)] - VQS(c) * [pqs(c) + qq(c)]\} +$ $\sum_{\substack{c\,\epsilon\,COM \\ r\,\epsilon\,REG}}\{VEWD(c,r) * [pewd(c,r) + qed(c,r) + xr] - VEBD(c,r) * [pebd(c,r) + qed(c,r)]\} +$ $\sum_{\substack{c\,\epsilon\,COM \\ r\,\epsilon\,REG}}\{VMBS(c,r) * [pmbs(c,r) + qms(c,r) + xr] - VMWS(c,r) * [pmws(c,r) + qms(c,r)]\} +$ $\sum_{i\,\epsilon\,IDNG}\{GYIDNG(i) * y(i) - NYIDNG(i) * yn(i)\} + \sum_{r\,\epsilon\,REG}\{VRTDI("gov", r) * rtgovd(r)\}$	
GOVERNMENT EXPENDITURE		
64)	$qg(c) = ugovadj + govadj(c)$	$\forall\, c \in COM$
65)	$gtdii(i) = govt(i) + cpi$	$\forall\, i \in IDNG$
66)	$govtrd(r) = govtrf(r) + xr$	$\forall\, r \in REG$
67)	$GOVEXP * gexp = \sum_{c\,\epsilon\,COM}\{VDGOV(c) * [pq(c) + qg(c)]\} + \sum_{i\,\epsilon\,IDNG}\{VTGI(i) * gtdii(i)\} + \sum_{r\,\epsilon\,REG}\{VDITR("\text{gov}", r) * govtrd(r)\}$	
PRICE LINKAGES		
68)	$pam(a) = pap(a) + to(a)$	$\forall\, a \in ACT$
69)	$VDM(c) * pdm(c) = VDS(c) * pds(c) + [VDM(c) - VDS(c)] * pt$	$\forall\, c \in COM$
70)	$pq(c) = pqs(c) + ts(c)$	$\forall\, c \in COM$
71)	$VEBD(c,r) * pebd(c,r) = VEMD(c,r) * pepd(c,r) + [VEBD(c,r) - VEMD(c,r)] * pt$	$\forall\, c \in COM, and\ r \in REG$
72)	$pebd(c,r) = pewd(c,r) - ted(c,r)$	$\forall\, c \in COM, and\ r \in REG$
73)	$pewd(c,r) = pewf(c,r) + xr$	$\forall\, c \in COM, and\ r \in REG$

Appendix Table 10. Continued

PRICE LINKAGES. CONTINUED		
74)	$VMMS(c,r) * pmms(c,r) = VMBS(c,r) * pmbs(c,r) + [VMMS(c,r) - VMBS(c,r)] * pt$	$\forall\ c \in COM, and\ r \in REG$
75)	$pmbs(c,r) = pmws(c,r) + tms(c,r)$	$\forall\ c \in COM, and\ r \in REG$
76)	$pmws(c,r) = pmwf(c,r) + xr$	$\forall\ c \in COM, and\ r \in REG$
ENDOGENOUS TAX RATES		
77)	$ts(c) = tsadj + tsincadj$	$\forall\ c \in COM$
78)	$tinc(i) = tincadj + tsincadj$	$\forall\ i \in IDNG$
MICROECONOMIC CLOSURES		
79)	$VFS(f) * qfs(f) = \sum_{a \in ACT}\{VFMA(f,a) * qf(f,a)\}$	$\forall\ f \in FM$
80)	$qfsa(f,a) = qf(a,f)$	$\forall\ f \in FS$ and $a \in ACT$
81)	$VCAM(c,a) * qac(c,a) = VTCAM(c,a) * qtoa(c,a) + \sum_{h \in HOU}\{VHCAHM(a,c,h) * qntah(h,c,a)\}$	$\forall\ a \in CONACT\ and\ c \in COM$
82)	$VQD(c) * qq(c) = \sum_{a \in ACT}\{VIAA(c,a) * qint(c,a)\} + \sum_{h \in HOU}\{VDH(h,c) * qqh(h,c)\} + VDGOV(c) * qg(c) + VDTRP(c) * qtd(c)$	$\forall\ c \in COM$
83)	$VAP(a) * [pap(\ \ ) + ao(a)] = \sum_{f \in FS}\{VFAA(f,a) * [pfa(f,a) - afe(f,a) - ava(a)]\} + \sum_{f \in FM}\{VFAA(f,a) * [pf(f) - afe(f,a) - ava(a)]\} + \sum_{c \in COM}\{VIAA(c,a) * [pq(c) - aie(c,a) - ain(a)]\}$	$\forall\ a \in ACT$
84)	$VTOM(c) * px(c) = VEM(c) * pe(c) + VDS(c) * pds(c)$	$\forall\ c \in COM$
85)	$VQS(c) * pqs(c) = VMM(c) * pm(c) + VDM(c) * pdm(c)$	$\forall\ c \in COM$

Appendix Table 10. Continued

MACROECONOMIC CLOSURES	
86)	$\sum_{\substack{c \in COM \\ r \in REG}}\{VMWS(c,r) * [pmws(c,r) + qms(c,r)]\} + \sum_{\substack{f \in FAC \\ r \in REG}}\{VFTRD(f,r) * ftrf(f)\} + \sum_{\substack{i \in IDNG \\ r \in REG}}\{VDITR(i,r) * itrf(i,r)\} +$ $\sum_{\substack{i \in GOV \\ r \in REG}}\{VDITR(i,r) * govtrf(i,r)\} = \sum_{\substack{c \in COM \\ r \in REG}}\{VEWD(c,r) * [pewd(c,r) + qed(c,r)]\} + \sum_{\substack{f \in FAC \\ r \in REG}}\{VRTFS(f,r) * rtff(f)\} +$ $\sum_{\substack{i \in IDNG \\ r \in REG}}\{VRTDI(i,r) * rtif(i,r)\} + \sum_{\substack{i \in GOV \\ r \in REG}}\{VRTDI(i,r) * rtgovf(i,r)\} + \sum_{r \in REG}\{FORSAV(r) * fsav(r)\}$
87)	$GOVREV * grev = GOVEXP * gexp + GOVSAV * gsav$
88)	$qcgds = qa$("a-cgds")
89)	$pcgds = pap$("a-cgds")
90)	$TOTSAV * walras1 = \sum_{e \in ENT}\{ENTSAV(e) * esav(e)\} + \sum_{h \in HOU}\{HOUSAV(h) * housav(h)\} + GOVSAV * gsav + \sum_{r \in REG}\{FORSAV(r) * [fsav(i) + xr]\}$
91)	$walras2 = qcgds + pcgds$
92)	$walraslack = walras1 - walras2$
CAPITAL ACCUMULATION	
93)	$0.01 * CAPSTOCKOLDP * kstk = CAPADD * delunity$

Appendix Table 11. Definition, estimation, and updates of the values used for the calibration of the model

IDENTIFICATION	DEFINITION	ESTIMATION
	READ DIRECTLY FROM THE SAM	
VTCAM(c,a)	Market value of consumption good c produced by activity a that is traded	*ptoa(c,a)*qtoa(c,a)*
VHCAHM(a,c,h)	Market value of consumption good c produced by activity a consumed by household h	*ptoa(c,a)*qntah(a,c,h)*
VFAA(f,a)	Firm value of factor of production f used by activity a	*pfa(f,c) * qf(f,c) for sluggish factors* *pf(f)*qf(f,c) for mobile factors*
VIAA(c,a)	Firm value of intermediate input c used by activity a	*pq(c) * qint(c,a)*
VEWF(c,r)	Value of exports of commodity c to region r valued at world prices (in foreign currency)	*pewf(c,r) * qed(c,r)*
VEWD(c,r)	Value of exports of commodity c to region r valued at world prices (in domestic currency)	*pewd(c,r) * xr * qed(c,r)*
VEBD(c,r)	Value of exports of commodity c to region r valued at border prices	*pebd(c,r) * qed(c,r)*
VEMD(c,r)	Value of exports of commodity c to region r valued at domestic market prices	*pepd(c,r) * qed(c,r)*
VDH(c,h)	Value of consumption of composite commodity c by household h	*pq(c) * qqh(h,c)*
VDGOV(c)	Value of consumption of composite commodity c by government	*pq(c) * qg(c)*
VDTRP(c)	Value of consumption of composite commodity c by transaction services	*pq(c) * qtd(c)*
VMMS(c,r)	Value of imports of commodity c from region r valued at domestic market prices	*pmms(c,r) * qms(c,r)*
VMBS(c,r)	Value of imports of commodity c from region r valued at border prices	*pmbs(c,r) * qms(c,r)*
VMWS(c,r)	Value of imports of commodity c from region r valued at world prices (in domestic currency)	*pmws(c,r) * xr * qms(c,r)*
VMWF(c,r)	Value of imports of commodity c from region r valued at world prices (in foreign currency)	*pmwf(c,r) * qms(c,r)*
VDM(c)	Value of domestic sales of domestically-produced commodity c valued at market prices	*pdm(c) * qd(c)*
VRTFF(f,r)	Value of regional transfers to factor of production f from region r (in foreign currency)	*rtff(f,r)*
VRTFS(f,r)	Value of regional transfers to factor of production f from region r (in domestic currency)	*rtfd(f,r)*
VFTDI(i,f)	Income of factor of production f transferred to domestic non-government institution i	*yfi(i,f)*
VFTRF(f,r)	Income of factor of production f transferred to region r (in foreign currency)	*ftrf(f,r)*
VFTRD(f,r)	Income of factor of production f transferred to region r, (in domestic currency)	*ftrd(f,r)*

Appendix Table 11. Continued

IDENTIFICATION	DEFINITION	ESTIMATION
	READ DIRECTLY FROM THE SAM	
VTII(i,j)	Income transfer from domestic non-government institution j to i	*trii(i,j)*
VTGI(i)	Income transfer from government to domestic non-government institution i	*gtdii(i)*
VRTDIF(i,r)	Income transfer from region r to domestic institution i, (in foreign currency)	*rtif(i,r)* $\forall i \in IDNG$ *rtgovf(r) for GOV*
VRTDI(i,r)	Income transfer from region r to domestic institution i, (in domestic currency)	*rtid(i,r)* $\forall i \in IDNG$ *rtgovd(r) for GOV*
NYIDNG(i)	Net income of domestic non-government institution i	*yn(i)*
FORSAV(r)	Foreign savings of region r	*fsav(r) * xr*
VDEP	Value of capital depreciation	*pcgds * gfs("f_cap")*
	ESTIMATED IN THE MODEL FROM THE READS ABOVE	
VFA(a)	Aggregate value of factors of production used by activity a	Sum{f, FAC, VFAA(f,a)}
VIA(a)	Aggregate value of intermediate inputs used by activity a	Sum{c,COM, VIAA(c,a)}
VAP(a)	Value of output of activity a at producer price	VFA(a) + VIA(a)
VCAM(c,a)	Market value of consumption good c produced by activity a	VTCAM(c,a) + Sum{h,HOU, VHCAHM(a,c,h)}
VAM(a)	Market value of output of activity a	Sum{c,COM, VCAM(c,a)}
VTOM(c)	Market value of consumption good c that is traded	Sum{a,CONACT, VTCAM(c,a)}
VEM(c)	Aggregate value of exports of commodity c valued at domestic market prices	Sum{r, REG, VEMD(c,r)}
VDS(c)	Value of domestic sales of domestic commodity c valued at wholesaler prices	VTOM(c) – VEM(c)
VFS(f)	Value of endowment of factor of production f at supplier price	Sum{a, ACT, VFAA(f,a)}
VMM(c)	Aggregate value of imports of commodity c valued at domestic market prices	Sum{r, REG, VMMS(c,r)}
VQS(c)	Value of composite commodity c valued at supply prices	VMM(c) + VDM(c)

Appendix Table 11. Continued

IDENTIFICATION	DEFINITION	ESTIMATION
VQD(c)	Value of composite commodity c valued at demand prices	Sum{c,COM, VIAA(c,a)} + Sum{h,HOU, VDH(c,h)} + VDGOV(c) + VDTRP(c)
VDTS	Total value of demand by transaction services	Sum{c, COM, VDTRP(c)}
VTFDCH(c)	Value of final demand for composite commodity c by households	Sum{h, HOU, VDH(c,h)}
VTFDH	Value of total final demand by households	Sum{c, COM, VTFDCH(c)}
VRTF(f)	Aggregate value of regional transfers to factor of production f	Sum{r, REG, VRTFS(f,r)
FACINC(f)	Gross income of factor of production f	VFS(f) + VRTF(f)
VFTD(f)	Aggregate income of factor f transferred to domestic non-government institutions	Sum{i, IDNG, VFTDI(i,f)}
VFTR(f)	Aggregate income of factor f transferred to other regions	Sum{r, REG, VFTRD(f,r)}
GYIDNG(i)	Gross income of domestic non-government institution i	Sum{f, FAC, VFTDI(i,f)} + Sum{j, IDNG, VTII(i,j)} + Sum{r, REG, VRTDI(i,r)} + VTGI(i)
UTILBUD(h)	Budget available for utility maximization by household h	NYIDNG(h) - Sum{j, IDNG, VTII(i,j)} + Sum{r, REG, VDITR(i,r)}
ENTSAV(e)	Savings of enterprises	NYIDNG(e) - Sum{j, IDNG, VTII(i,e)} + Sum{r, REG, VDITR(e,r)}
VNTH(h)	Total expenditure on non-traded commodities by household h	Sum{c,COM, a, CONACT, VHCAHM(a,c,h)}
VTH(h)	Total expenditure on tradable commodities by household h	Sum{c,COM,VDH(c,h)}
HOUSAV(h)	Value of savings by household h	UTILBUD(h) – VNTH(h) – VTH(h)
GROSSINV	Gross investment	Sum{c, COM, VIAA(c, ”cgds”)}
NETINV	Net investment	GROSSINV - VDEP
VOM(c)	Market value of commodity c	VTOM(c) + Sum{h,HOU, a, CONACT, VHCAHM(a,c,h)}

Appendix Table 11. Continued

IDENTIFICATION	DEFINITION	ESTIMATION
GOVREV	Total government revenue	Sum{a,CONACT, VAM(a) – VAP(a)} + Sum{c,COM, VQD(c) - VQS(c)} + Sum{i,IDNG, GYIDNG(i) - NYIDNG(i)} + Sum{c,COM, Sum[r,REG, VEWD(c,r) - VEBD(c,r)]} + Sum{c,COM, Sum[r,REG, VMBS(c,r) - VMWS(c,r)]} + Sum{r,REG, VRTDI(*"gov"*,r)}
GOVEXP	Current expenditure of government	Sum{c, COM, VDGOV(c)}+ Sum{i, IDNG, VTGI(i)}+ Sum{r, REG, VDITR("gov",r)}
GOVSAV	Government savings	GOVREV - GOVEXP

Appendix Table 12. List of shocks applied to assess the impact of DR-CAFTA

PRODUCTS SUBJECT TO IMPORT TARIFF REDUCTION	YEARS OF DR-CAFTA									
	1	2	3	4	5	6	7	8	9	10
1. CORN	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-8.3%	-8.3%	-8.3%	-8.3%
2. RICE	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3.BEANS	-6.7%	-6.7%	-6.7%	-6.7%	-6.7%	-6.7%	-6.7%	-6.7%	-6.7%	-6.7%
4. WHEAT	-59.8%	-10.1%	-10.1%	-10.1%	-10.1%	0.0%	0.0%	0.0%	0.0%	0.0%
5. TUBERS	-99.5%	-0.1%	-0.1%	-0.1%	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
6. BANANA	-57.7%	-5.6%	-5.6%	-5.6%	-5.6%	-3.9%	-3.9%	-3.9%	-3.9%	-3.9%
7. OTHER FRUITS AND NUTS	-54.6%	-6.6%	-6.6%	-6.6%	-6.6%	-3.8%	-3.8%	-3.8%	-3.8%	-3.8%
8. OILSEEDS	-83.3%	-1.2%	-1.2%	-1.2%	-1.2%	-1.2%	-1.2%	-1.2%	-1.2%	-1.2%
9. LIVE PLANTS	-23.8%	-5.4%	-5.4%	-5.4%	-5.4%	-5.4%	-5.4%	-5.4%	-5.4%	-5.4%
11. TOBACCO RAW	-25.5%	-6.7%	-6.7%	-6.7%	-6.7%	-6.7%	-5.8%	-5.8%	-5.8%	-5.8%
12. OTHER CROPS	-29.4%	-8.2%	-8.2%	-8.2%	-8.2%	-3.4%	-3.4%	-3.4%	-3.4%	-3.4%
13. LIVE ANIMALS	-21.6%	-9.8%	-9.8%	-9.8%	-9.8%	-5.1%	-5.1%	-5.1%	-5.1%	-5.1%
14. OTHER ANIMALS	-10.0%	-10.0%	-10.0%	-10.0%	-10.0%	-10.0%	-10.0%	-10.0%	-10.0%	-10.0%
15. WOOD	-10.0%	-10.0%	-10.0%	-10.0%	-10.0%	-10.0%	-10.0%	-10.0%	-10.0%	-10.0%
16. FISH RAW	-34.6%	-4.7%	-4.7%	-4.7%	-4.7%	-4.7%	-4.7%	-4.7%	-4.7%	-4.7%
17. METALS	-61.2%	-2.8%	-2.8%	-2.8%	-2.8%	-2.8%	-2.8%	-2.8%	-2.8%	-2.8%
18. MINERALS EXCEPT METALS	-44.4%	-4.5%	-4.5%	-4.5%	-4.5%	-4.5%	-4.5%	-4.5%	-4.5%	-4.5%
19. PROCESSED MEAT	-13.4%	-6.5%	-6.5%	-6.5%	-6.5%	-6.5%	-6.5%	-6.5%	-6.5%	-6.5%
20. PROCESSED FISH	-85.6%	-1.9%	-1.9%	-1.9%	-1.9%	-1.1%	-1.1%	-1.1%	-1.1%	-1.1%
21. PROCESSED FRUITS	-81.1%	-2.6%	-2.6%	-2.6%	-2.6%	-1.4%	-1.4%	-1.4%	-1.4%	-1.4%
22. ANIMAL AND VEGETABLE OIL	-47.7%	-4.5%	-4.5%	-4.5%	-4.5%	-4.4%	-4.4%	-4.4%	-4.4%	-4.4%
23. DAIRY PRODUCTS	-30.8%	-6.9%	-6.9%	-6.9%	-6.9%	-6.8%	-6.8%	-6.8%	-6.8%	-6.8%
24. MILLING PRODUCTS	-6.7%	-6.7%	-6.7%	-6.7%	-6.7%	-6.7%	-6.7%	-6.7%	-6.7%	-6.7%
25. BAKERY PRODUCTS	-6.7%	-6.7%	-6.7%	-6.7%	-6.7%	-6.7%	-6.7%	-6.7%	-6.7%	-6.7%

Appendix Table 12. Continued

Products subject to import tariff reduction	Years of DR-CAFTA									
	1	2	3	4	5	6	7	8	9	10
26. Processed sugar	-86.5%	-1.9%	-2.1%	-2.1%	-2.1%	-0.9%	-1.1%	-1.1%	-1.1%	-1.1%
27. Cacao	-79.0%	-3.7%	-3.9%	-3.9%	-3.9%	-0.9%	-1.2%	-1.2%	-1.2%	-1.2%
28. Processed food	-86.5%	-1.7%	-1.8%	-1.8%	-1.8%	-1.3%	-1.3%	-1.3%	-1.3%	-1.3%
29. Beverages	-66.3%	-4.5%	-4.6%	-4.6%	-4.6%	-2.9%	-3.1%	-3.1%	-3.1%	-3.1%
30. Processed tobacco	-100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
31. Textiles and apparels	-100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
32. Other products	-93.3%	-1.3%	-1.3%	-1.3%	-1.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%
33. Products from petroleum	-83.3%	-2.9%	-2.9%	-2.9%	-2.9%	-1.0%	-1.0%	-1.0%	-1.0%	-1.0%
34. Chemical products	-80.0%	-1.6%	-2.2%	-2.2%	-2.2%	-1.7%	-2.5%	-2.5%	-2.5%	-2.5%
35. Machinery	-65.8%	-2.6%	-3.6%	-3.6%	-3.6%	-3.1%	-4.4%	-4.4%	-4.4%	-4.4%

Products subject to import tariff reduction	Years of DR-CAFTA									
	11	12	13	14	15	16	17	18	19	20
1. Corn	-13.4%	-13.4%	-13.4%	-13.4%	-13.4%	0.0%	0.0%	0.0%	0.0%	0.0%
2. Rice	-8.3%	-8.3%	-8.3%	-8.3%	-16.8%	-16.8%	-16.8%	-16.8%	0.0%	0.0%
3.Beans	-6.7%	-6.7%	-6.7%	-6.7%	-6.7%	0.0%	0.0%	0.0%	0.0%	0.0%
4. Wheat	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
5. Tubers	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
6. Banana	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
7. Other fruits and nuts	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
8. Oilseeds	-1.2%	-1.2%	-1.1%	-1.1%	-1.1%	0.0%	0.0%	0.0%	0.0%	0.0%
9. Live plants	-5.4%	-5.4%	-5.4%	-5.4%	-5.4%	0.0%	0.0%	0.0%	0.0%	0.0%
11. Tobacco raw	-5.8%	-1.8%	-1.8%	-1.8%	-1.8%	-0.9%	-0.9%	-0.9%	-0.9%	-0.9%
12. Other crops	-3.5%	-3.4%	-3.4%	-3.4%	-1.8%	-1.8%	-1.8%	-1.8%	0.0%	0.0%
13. Live animals	-2.8%	-2.8%	-2.1%	-2.1%	-2.3%	-0.4%	-0.4%	-0.4%	0.0%	0.0%
14. Other animals	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Appendix Table 12. Continued

Products subject to import tariff reduction	Years of DR-CAFTA									
	11	12	13	14	15	16	17	18	19	20
15. Wood	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
16. Fish raw	-4.7%	-4.7%	-4.7%	-4.7%	-4.7%	0.0%	0.0%	0.0%	0.0%	0.0%
17. Metals	-2.8%	-2.8%	-2.8%	-2.8%	-2.8%	0.0%	0.0%	0.0%	0.0%	0.0%
18. Minerals except metals	-4.3%	-4.3%	-2.1%	-2.1%	-2.1%	0.0%	0.0%	0.0%	0.0%	0.0%
19. Processed meat	-6.4%	-6.4%	-5.1%	-5.1%	-5.1%	0.0%	0.0%	0.0%	0.0%	0.0%
20. Processed fish	-0.4%	-0.4%	-0.2%	-0.2%	-0.2%	0.0%	0.0%	0.0%	0.0%	0.0%
21. Processed fruits	-0.4%	-0.4%	-0.2%	-0.2%	-0.2%	0.0%	0.0%	0.0%	0.0%	0.0%
22. Animal and vegetable oil	-2.4%	-2.4%	-2.4%	-2.4%	-2.4%	0.0%	0.0%	0.0%	0.0%	0.0%
23. Dairy products	-1.4%	-1.4%	-1.4%	-1.4%	-1.5%	0.0%	0.0%	0.0%	0.0%	0.0%
24. Milling products	-6.7%	-6.7%	-6.7%	-6.7%	-6.7%	0.0%	0.0%	0.0%	0.0%	0.0%
25. Bakery products	-6.7%	-6.7%	-6.7%	-6.7%	-6.7%	0.0%	0.0%	0.0%	0.0%	0.0%
26. Processed sugar	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
27. Cacao	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
28. Processed food	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
29. Beverages	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
30. Processed tobacco	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
31. Textiles and apparels	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
32. Other products	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
33. Products from petroleum	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
34. Chemical products	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
35. Machinery	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Source: own estimates. Raw coffee is not included in the list of products because no trade was reported during the reference year.
Rows might not add to 100% due to rounding errors.