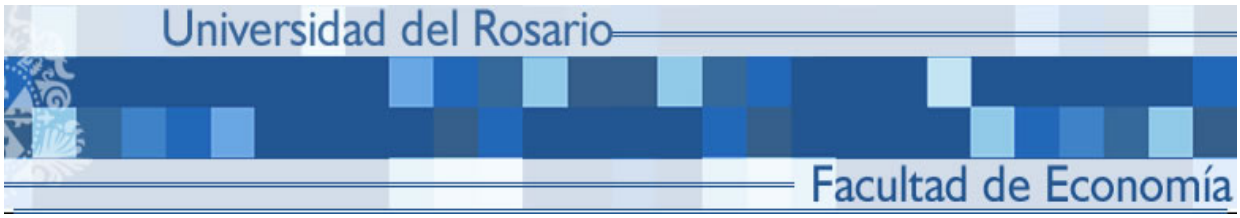

POVERTY IMPACTS OF INCREASED OPENNESS AND FISCAL POLICIES IN A DOLLARIZED ECONOMY: A CGE-MICRO APPROACH FOR ECUADOR

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Abstract

We quantify the effects on poverty and income distribution in Ecuador of bilateral trade liberalization with the US and a budget-neutral value added tax increase which seeks to compensate tariff revenue losses. We stress the study of fiscal policies that the government could tap in order to compensate for tariff revenue loss. This is a very important issue for Ecuador because this country adopted the US dollar as its currency in 2000, forgiving the use of important policy instruments. To study these issues we combine a reduced-form micro household income and occupational choice model (using 2005/6 data from the Ecuadorian LSMS) with a standard single-country computable general equilibrium model (employing a 2004 SAM). We follow a sequential approach that simulates the full distributional impact of trade and tax policies. We find that the impact of these policy changes on extreme poverty and income distribution is small but positive.

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Poverty Impacts of Increased Openness and Fiscal Policies in a Dollarized Economy: A CGE-Micro Approach for Ecuador

1. Introduction

We use a combined micro-simulation and computable general equilibrium model of the Ecuadorian economy to measure the impact on poverty and income distribution of changes in fiscal policy in response to trade openness in Ecuador. This study is part of a growing branch of the empirical economics literature that tries to examine the effects on poverty and income distribution in countries that have opened their markets to global competition. We add to it the study of fiscal policies that the government could tap in order to compensate tariff revenue loss. The impact analysis of changes in fiscal policies on poverty and income distribution is a very important issue for a country such as Ecuador where poverty rates are high, particularly in the rural sector.

Ecuador is immersed in a process of economic policy changes that started in the early 1990s, led by changes in trade policy. Trade policy changes included tariff reform, important reductions in import restrictions, export promotion laws, the modernization of trade institutions, and the simplification of trade procedures. Policy changes have also included changes in the tax system. The ultimate goal of these changes is to create jobs, foster economic growth and reduce poverty in Ecuador. However, little has been done to study the impacts of changes in fiscal and trade policies on poverty in Ecuador.

Currently, Ecuador has put off negotiations for a free trade agreement with the U.S., Ecuador's main trade partner, but negotiations for free trade agreements with Chile, Canada, and the European Union are in place. The changes in tariff collection that these free trade agreements will bring about could spell reduced government revenues that will eventually have to be made up by increasing other taxes or reducing expenditure. Given the rigidities in the Ecuadorian government budget, it is more likely that an increase in taxes will be adopted.[1] Some proposals have suggested an increase in the value added tax. It has also been proposed the elimination of current VAT exemptions which will affect agricultural income and food expenditures the most. Both, VAT tax rate increases and elimination of VAT exemptions could heavily influence poverty since poverty tends to concentrate in the rural sector and the poor in general expend a large share of their income in food.

The analysis of fiscal policy changes is a key issue for the Ecuadorian economy, which adopted the US dollar as its currency in 2000 as a way to halt a deep economic crisis that hit this economy in the late 1990s. With dollarization authorities lost monetary and exchange rate policy instruments to face economic imbalances.

The ultimate goal of this research is to contribute to the availability of tools to perform income distribution and poverty impact studies of changes in fiscal and trade policies in Ecuador. We believe that two key tools to perform such impact analyses are CGE models and micro-simulations.

This study differs from previous CGE studies of Ecuador because (a) it links fiscal and trade policy changes to poverty and income distribution effects, using a single-country CGE model *and* a micro simulation model; (b) it links macroeconomic variables to income distribution across different labor groups (according to area –rural and urban, and education level – primary and higher than primary; for wage earners and the self-employed); and (c) the CGE and micro models designed and used in this research are intended to be kept and further applied in Ecuador as an analysis tool of the poverty impacts of other policy changes, and, potentially, to the analysis of the impacts of important trade policy developments with neighboring and partner countries (Colombia and Peru).

The main research questions we pose in this study are: (i) What would be the macroeconomic effects of a policy of partial trade liberalization[2] (zero tariff rates, with a key trade partner) and a change in the value added tax system designed to keep the government budget neutral? (ii) What would be the changes brought about on the poverty headcount, the poverty gap, and the intensity of poverty [FGT(0), FGT(1), FGT(2)] after freer trade and changes in the value added tax rates are implemented? and, (iii) Are there any other possible tax/trade scenarios that could have less negative impacts on the poor?

Through this research we document the main domestic prices and labor market effects of trade liberalization policies in Ecuador and establish the links between the CGE and micro-model regarding these prices and labor market effects; document the changes in income distribution and poverty resulting from combined freer trade and changes in value added tax policies; and, establish the main links and mechanisms by which these trade and fiscal policies affect income distribution and poverty across and within different labor types (wage, self-employment; rural, urban; and, by education level). The types of factor incomes to be considered are constrained by data availability.

The reminder of this report is organized as follows. Section 2 presents an overview of the Ecuadorian economy; section 3 discusses relevant work on CGE modeling and micro-simulation models; sections 4, 5, and 6 lay out the methodology, scenarios, and data applied, respectively. Section 7 discusses the main research results and section 8 present conclusions. Annexes present further details on data and methodological issues.

---

[1] The problem of earmarked revenues and expenditures that gives rigidities to the Ecuadorian government budget is illustrated by the World Bank (2003, 2005).

[2] As tariffs vis-à-vis the rest of the world will not be removed.

2. Overview of the Ecuadorian Economy

Ecuador is a small, open, middle-income, oil-revenue dependent economy. In 2005, Ecuadorian GDP totaled US$ 36.5 billion, whereas GDP per capita reached US$ 2,761 (or US$ 1,550 in US dollars of 2000). Ecuadorian exports as a share of GDP reached an annual average of 24 percent in the last five years, 2001-2005. The central government budget of Ecuador is characterized by both high dependence on oil revenues (around 30 percent as annual average for the period 2001-2005) and deficits (an annual average of 0.7%, as a percentage of GDP, for the period 2001-2005). See Table 1.

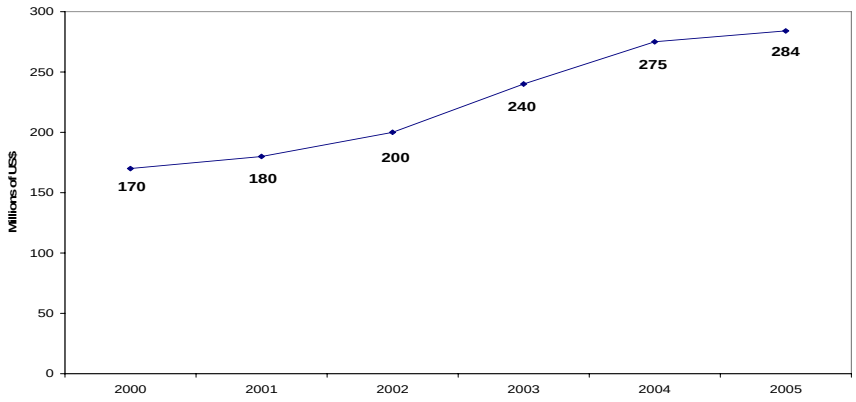
Table 1.- Central Government Budget. Deficit (-) or Surplus (+), 1998-2005

Transaction / Period	1998	1999	2000	2001	2002	2003	2004	2005
GDP (US$ millions)	23,255	16,674	15,934	21,250	24,899	28,636	32,636	36,489
Oil revenues (% Total Revenues)	28%	37%	43%	33%	30%	33%	30%	26%
Deficit or Surplus (US$ millions)	-959.2	-475.7	19.3	-222.3	-184.6	-108.5	-319.2	-180.4
Deficit or Surplus (% GDP)	-4.1%	-2.9%	0.1%	-1.0%	-0.7%	-0.4%	-1.0%	-0.5%
Deficit or Surplus (% Total Revenues)	-29.7%	-17.7%	0.6%	-5.8%	-4.0%	-2.3%	-6.2%	-3.0%

Sources: Statistics of the Central Bank of Ecuador and the Ministry of Finance

A heavy burden on the government budget is the presence of expensive and badly targeted subsidies. The case of liquefied petroleum gas for domestic use stands out. In the last six years, since the dollar was adopted as a currency in Ecuador, the government has spent US$1.35 billion on subsidizing liquefied petroleum gas (LPG) for domestic consumption (Figure 1). Cuesta et. al. (undated) asserts that the richest 20 percent of the population consume 21 percent of the LPG for domestic use whereas the poorest 20 percent of the population consume only 15 percent of the LPG. LPG is also used for public transport.

Figure 1.- Ecuador: Total subsidy for gas for domestic use



Source: World Bank (2004), Ministry of Finance.

In the 1ate 1980s Ecuador began a turnaround in trade policy, from an import-substitution policy to an export-oriented – less protective – trade policy. A key reform was undertaken regarding tariffs. These reforms brought down the tariff range from 29 – 290 percent in 1989 to 0 – 40 percent in 1994 (the highest tariff rate was applied to vehicle imports). The average nominal tariff was reduced from 29 percent in 1989 to 11 percent in 1994 (see Tamayo, 1997). However, there still remain sectors with high protection rates (nominal and effective). These generally include agricultural sectors, where a sizeable fraction of the Ecuadorian poor concentrates (Table 2).

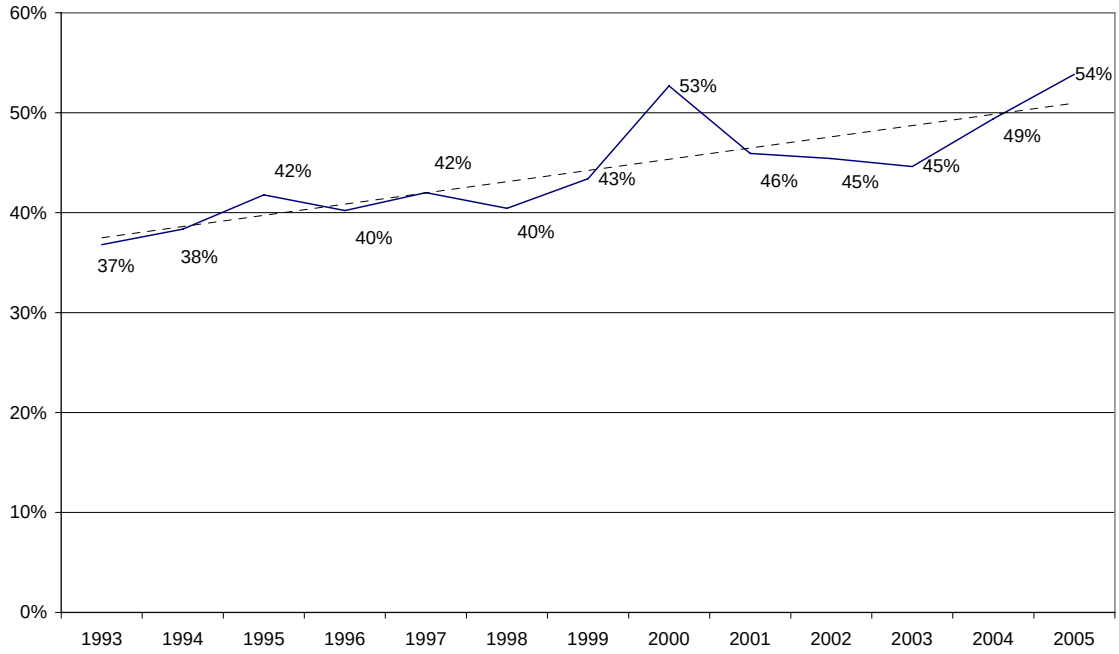
Table 2.- Ecuador: MFN tariff structure, up to January 2005[1]

Product description By WTO category	MFN				
	No. of lines	Average (%)	Range (%)	Coefficient of variation	Average bound tariff [2] (%)
Agricultural products	926	15.7	0–85.5	0.6	25.4
Animals and products of animal origin	107	17.4	0–85.5	0.5	29.0
Dairy products	34	34.4	5–72	0.7	42.8
Coffee and tea, cocoa, sugar, etc.	168	17.5	5–45	0.4	27.8
Cut flowers, plants	48	9.0	0-15	0.5	19.1
Fruit and vegetables	212	15.8	5–20	0.2	24.9
Cereals	33	21.5	0-45	0.7	28.5
Oilseeds, oils and fats and products thereof	97	15.1	0–38.7	0.5	27.4
Beverages and spirits	52	19.1	10–20	0.1	26.2
Tobacco	12	16.7	10–20	0.3	26.7
Other agricultural products n.e.c.	163	8.7	0-20	0.5	18.1
Non-agricultural products (including petroleum)	6.023	10.8	0-35	0.6	20.3
Non-agricultural products (excluding petroleum)	5.981	10.8	0-35	0.6	20.4
Fish and fishery products	141	18.3	5–20	0.2	28.3
Mineral products, precious stones and precious metals	374	9.4	0-20	0.6	19.6
Metals	694	9.1	0-20	0.5	20.9
Chemicals and photographic goods	1.405	7.0	0-20	0.6	10.8
Leather, rubber, footwear and travel goods	211	12.5	0-20	0.5	23.9
Wood, wood pulp, paper and furniture	329	12.4	0-20	0.4	23.4
Textiles and clothing	936	18.1	5–20	0.2	28.4
Transport equipment	217	10.7	0-35	0.8	22.2
Non-electrical machinery	722	7.4	0-20	0.6	19.7
Electrical machinery	405	10.0	0-20	0.6	22.2
Non-agricultural products n.e.c.	547	12.9	0-20	0.5	23.7
Petroleum	42	5.2	0-15	0.9	14.5

Source: World Trade Organization Report on Ecuador Trade Policies, Table III.1, pp. 31-33.
1. Excluding 18 tariff lines in Chapter 98, classifying goods imported by express mail which are subject to a 20 per cent duty. For the 155 tariff items subject to the Andean price band system, the common external tariff rates, not the applied rates, were taken into account.
2. The bindings are given in HS 92 and the applied rates in HS 2002; consequently, there may be differences in the number of lines included in the analysis.

As a result, Ecuador experienced a great increase in trade openness in the last decade. As figure 2 indicates, openness of the Ecuadorian economy went from 37% in 1993 to 54% in 2005. The consolidation of agreements such as the Andean Community, the opening-up of new markets (for example Canada, Russia and China), and the continuation of trade preferences that Ecuador receives from the U.S. (ATPA and ATPDEA) seem to have also contributed to this result.

Figure 2.- Ecuador: Openness, 1993-2005



Source: Data from the Central Bank of Ecuador, and own construction.
Note: Openness is measured as imports plus exports as a percentage of gross domestic product.

In 2004, Ecuador (and the rest of the Andean Community nations, Bolivia, Colombia, Peru, and Venezuela) signed a Free Trade Agreement with the MERCOSUR (Argentina, Brazil, Uruguay, and Paraguay). In 2004-2005, Ecuador, Colombia and Peru conducted negotiations for a free trade agreement with the U.S. The agreement was expected to start in 2007, right after the trade preferences that the U.S. gives –unilaterally– to the Andean countries end. Andean partners Colombia and Peru already signed an FTA with the U.S., but the current Ecuadorian government halted negotiations. Ecuadorian authorities, together with authorities from other Andean countries have started negotiating a free trade agreement with the European Union. The U.S., the Andean Community and the European Union markets purchase around 70 percent of total Ecuadorian exports. Similarly, Ecuador receives over 55 percent of its total imports from the U.S., the Andean Community and the European Union (Table 3).

Table 3.- Ecuador: Exports and Imports by country

Exports as a Percentage Share of Total Exports

Country/Region	1998	1999	2000	2001	2002	2003	2004	2005
U.S.A.	39%	38%	38%	38%	41%	41%	43%	50%
Andean Community	13%	11%	14%	18%	16%	17%	13%	15%
E.U.	21%	18%	12%	14%	16%	17%	13%	13%
Asia	8%	11%	12%	10%	9%	6%	5%	2%
Central America and Caribbean	2%	3%	3%	9%	8%	4%	2%	3%
Rest of America and the world	17%	19%	21%	11%	10%	15%	24%	17%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Imports as a Percentage Share of Total Imports

Country/Region	1998	1999	2000	2001	2002	2003	2004	2005
U.S.A. [1.]	30%	30%	25%	25%	23%	21%	21%	20%
Andean Community	18%	20%	23%	22%	22%	23%	25%	22%
E.U.	15%	14%	11%	12%	14%	12%	10%	10%
Asia	14%	11%	15%	16%	15%	15%	16%	20%
Central America and Caribbean	0%	1%	0%	1%	0%	1%	0%	1%
Rest of America and the world	23%	24%	26%	25%	26%	28%	28%	27%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Source: Central Bank of Ecuador, and own construction.
Note: 1. U.S. import data include Puerto Rico.

These changes in trade policy have had and will continue to have an economic and social impact on Ecuador that in turn may trigger changes in other policies. A very likely course that the government may pursue in seeking to compensate its revenue loss due to tariff reductions/elimination that foreign trade agreements will bring about is an increase in taxes.[3] Tariffs represented an average of 9 percent of total revenues for the central government for the period 2001-2005 (Table 4). Unless the government reduces its current expenditure or generates more revenue from sources other than taxes, the government will have to decide how to compensate its tariff revenue loss. Such fiscal impacts have even more relevance in a dollarized economy like Ecuador's (surrendering other key instruments of economic policy like those in monetary and exchange rate policies). Fiscal policies in Ecuador are a unique and key instrument in managing the economy. Changes in fiscal policies will in turn affect poverty and income distribution. Despite the importance of the analysis of trade, fiscal and poverty impacts in Ecuador there has been little research on the subject.

[3] Policy changes adopted by the current government in late October 2007 have actually reversed the policy of tariff liberalization in certain HS lines. The government has raised tariffs in about thousand HS lines that include agriculture (cereals, dairy products, meats, etc.) and manufactures (such as shoes, textiles, etc.), arguing that these tariff increases will protect domestic industry from 'unfair' foreign competition and foster domestic industry production and employment. The private sector has raised its concerns about this increase in tariffs. The tariff increased is limited by the WTO ceilings on tariffs as Ecuador is a member of the WTO since late 1995.

Table 4.- Non-financial Public Sector, Selected Operations. 1998-2005 [1.]

Percentage of GDP

Transactions/Period	1998	1999	2000	2001	2002	2003	2004	2005
Total REVENUES [2.]	17.32	21.08	25.9	23.57	26.16	25.4	26.92	25.06
Oil	3.93	6.29	9.16	6.43	5.73	6.12	6.99	6.06
Non-oil	13.32	14	15.79	16.63	19.67	18.95	19.15	18.83
Value Added Taxes (VAT)	3.58	3.54	5.61	6.93	6.87	6.39	6.23	6.78
Income taxes	1.52	0.86	1.97	2.57	2.45	2.71	2.91	3.25
Tariff collections	2.55	1.86	1.36	1.69	1.7	1.46	1.55	1.54
Social Security contributions	1.94	1.38	1.43	2.16	3.16	3.31	3.3	3.04
Others	2.96	3.79	3.75	2.54	4.55	4.21	4.27	4.22
Total EXPENDITURES [3]	22.13	24.98	24.41	23.53	25.35	24.21	24.66	24.33
Current Expenditures	17.16	18.98	19.42	16.83	18.84	18.85	19.35	19.32
Interest	4.25	7.1	6.6	4.74	3.47	3.01	2.63	2.21
Wages and salaries	7.27	5.94	4.78	6.46	8.26	8.42	8.54	7.97
Purchase of goods and services	2.45	2.38	2.57	2.76	3.71	3.49	3.41	3.12
Others	3.2	3.56	5.47	2.88	3.41	3.93	4.77	6.02
Capital Expenditures	4.97	6	4.99	6.7	6.51	5.37	5.31	5.02
BALANCE	**-4.81**	**-3.9**	**1.49**	**0.04**	**0.82**	**1.67**	**2.26**	**0.73**

Sources: Statistics of the Central Bank of Ecuador and of the Ministry of Finance.
Notes: 1. Non-financial Public Sector includes the Central Government, Public Enterprises, Local Government, and other non-financial institutions of the government. 2. Other small revenues, excluded from this table, are: special consumption taxes, taxes on exits from the country, and taxes no longer applied after 2000 (like the tax on purchases and sales of foreign currency, and on circulation of capital). 3. In this table government expenditures are expenditures already accrued.

According to the 2005-2006 household survey data, there are 3,264,866 households in Ecuador, 66% of which are in urban areas. The average household size is 4 people. Only a small percentage of household heads are women (21%). There is a significant percentage of household heads with no education (7%), almost 30 percent of the total number of heads has secondary education, and only 17% of them have tertiary education or more (Table 5).

Table 5.- Households characteristics, 2005 [1.]

Characteristic	Number	Percentage
Urban	2,144,194	66%
Rural	1,120,672	34%
Total	3,264,866	100%
Head woman	679,819	20.82%
Head with No Education	234,227	7.2%
Primary Educated Head	1,524,814	46.7%
Secondary Educated Head	952,205	29.2%
Tertiary Educated Head	299,517	9.2%
Graduate Head	254,104	7.8%
Total	3,264,866	100.0%
Average Household Size	4	

Source: INEC's Life Condition Survey 2005-2006, and own calculations.
Note: 1. Excludes households that do not show any data on income.

Aggregate consumption amounts to 18.6 billion US dollars, 22% of which is done in rural areas. Aggregate consumption includes food, non-food items, durables, utilities, and rent.[4] Aggregate income adds up to 21.1 billion US dollars, and approximately one fourth of it goes to rural areas. Aggregate income includes wages and salaries, income from agricultural activities, income from household owned businesses, remittances, and aid (Table 6).

Table 6.- Aggregate Consumption and Income, 2005-2006 [1.]
Annual Values in millions of US dollars

Description	Millions of US dollars	Percentage
1. Aggregate Consumption		
Urban	14,500	78%
Rural	4,110	22%
Total	18,610	100%
2. Aggregate Total Income		
Urban	16,200	77%
Rural	4,910	23%
Total	21,110	100%

Source: INEC's Life Condition Survey 2005-2006, and own calculations.
Note: 1. Excludes households that do not show any data on income.

As shown in Table 7, poverty is widespread in Ecuador, particularly in rural areas where 12 percent of households are under the one dollar a day poverty line (indigence) and 47 percent are under the two dollar a day poverty line (poverty) (when measured by aggregate consumption). While there are differences in poverty incidence when households are headed by males or females (households headed by women tend to experience lower incidence rates, when poverty is measured by consumption), they tend to be wider under the two dollar a day yardstick and the aggregate consumption indicator. Also, the poverty gap is relatively wide for rural households, as well as the severity of poverty in rural areas.

Table 7.- Ecuador: Poverty indices at the base, 2005 [1,2,3.]

a. Measured by Aggregate Consumption

Households	Bellow one dollar a day			Bellow two dollars a day		
	FGT (0)	FGT(1)	FGT(2)	FGT (0)	FGT(1)	FGT(2)
Total	4.85%	0.012	0.005	26.05%	0.080	0.035
Rural	11.57%	0.030	0.012	47.09%	0.164	0.078
Urban	1.33%	0.002	0.001	15.05%	0.036	0.013
Headed by male	5.19%	0.013	0.005	27.41%	0.085	0.037
Headed by female	3.54%	0.009	0.004	20.88%	0.062	0.027

[4] Expenditure in durables was calculated as the flow of services from durables goods. It was calculated using data on durable spending and age of durable goods, as reported in the Ecuadorian household survey. See Deaton and Zaidi (2002) for details on estimation of aggregate consumption and its components.

b. Measured by Aggregate Income

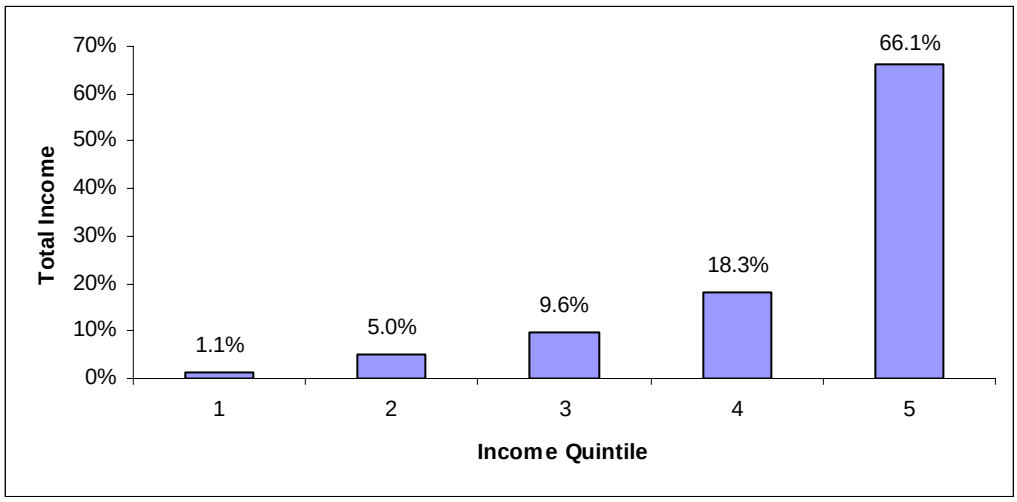
Households	Bellow one dollar a day			Bellow two dollars a day		
	FGT (0)	FGT(1)	FGT(2)	FGT (0)	FGT(1)	FGT(2)
Total	14.87%	0.107	7.526	35.28%	0.179	1.989
Rural	22.72%	0.097	0.088	49.55%	0.234	0.152
Urban	10.78%	0.112	11.412	27.82%	0.150	2.949
Headed by male	13.64%	0.089	7.715	33.91%	0.164	2.024
Headed by female	19.57%	0.176	6.805	40.46%	0.237	1.855

Source: INEC's Life Condition Survey 2005-2006, and own calculations.
Notes: 1. Excludes households that do not show any data on income. 2. As stated in the Introduction, poverty is measured using the customary poverty measures: incidence or FGT(0) measure, poverty gap or FGT(1), and severity of poverty or FGT(2) measure. 3. The poverty lines adopted are also the customary one dollar and two dollar a day poverty lines because we want the reader to be able to establish comparisons between the poverty situation in Ecuador and the poverty situation in other developing countries. 4. Aggregate consumption includes: food, non-food items, durables, utilities, and rent. 5. Aggregate income includes: wages and salaries, income from agricultural activities, income from household owned businesses, remittances, and aid.

When measuring poverty using aggregate total income there are also differences in poverty incidence. Households headed by women tend to experience, in this case, higher incidence rates than households headed by men. By income measure, poverty incidence, the poverty gap and the severity of poverty are relatively wider than the poverty measures by consumption. This hints a worrisome situation regarding income inequality.

In fact, a measure of income inequality –the distribution of income by quintile of income, shows that the lowest quintile gets only 1.1 percent of total income, while the highest income quintile receives two thirds of total income. See Figure 3.

Figure 3.- Distribution of Income by quintile



Source: INEC's Life Condition Survey 2005-2006, and own calculations.

Sanchez-Paramo (2005) points out two key problems with social expenditure in Ecuador: they are highly volatile and poorly targeted. Some social expenditures are progressive – primary and secondary education, for instance. But others are regressive, such as the case of the subsidy for cooking gas, which on several occasions has been recommended to be eliminated (see for instance, World Bank 2004). Several governments have tried to reform or eliminate the

gas subsidy, but it has proven a very hard political issue to deal with. The elimination of this subsidy could be a way to compensate tariff revenue loss, but the high political cost makes the adoption of this expenditure-reduction measure unlikely.

Table 8.- Ecuador: Social expenditure, Selected years
As percentage of GDP

Item	1973	1979	1981	1984	1992	1996	2000	2002	2003	2004	2005
Total	3.8	4.6	6.3	4.9	5.2	3.8	3.6	4.5	n.a.	n.a.	n.a.
Education [1]	3.2	3.5	4.8	3.7	3.8	2.5	1.7	2.4	2.36	2.63	2.59
Health [2]	0.5	1.0	1.3	1.1	1.1	0.8	0.6	1.2	1.08	1.14	1.16
Social Assistance	0.1	0.1	0.2	0.1	0.3	0.5	1.3	1.0	n.a.	n.a.	n.a.
Bono Solidario							0.8	0.4	n.a.	n.a.	n.a.
Other	0.1	0.1	0.2	0.1	0.3	0.5	0.5	0.6	0.75	0.63	1.09

Source: Sanchez-Páramo (2005), and for years 2003-2005 data from the Central Bank of Ecuador.
Notes: 1. 2003-2005 includes spending on Education and culture. 2. 2003-2005 includes spending on health and community developments.

The VAT in Ecuador

The VAT in Ecuador is levied on domestic sales and import sales of goods and services. Export sales of goods and services have a zero VAT rate. There is a rebate for intermediate and investment purchases, so we can see the VAT as administered using the "invoice method": all transactions being taxed, and firms deducting taxes paid on intermediate inputs as well as on purchases that add to their assets. The tax amount is reported on the invoices for inputs.

The current VAT rate stands at 12 percent, with a few but important exemptions rated at 0 percent.[5] Among the exemptions there are domestic sales of food products in primary stage, raw milk, bread, sugar, salt, fat, margarine, tractors and other farm equipment.

The Internal Revenue Service has been on target of VAT expected collections in almost all years during the 2000s (Table 9).

[5] The list of exemptions is important because raw food products, basic food items, agricultural inputs and equipment, transport and other services are exempt and constitute either an important income source for rural households -or affect income generation in the rural sector- or are important expenditure sources. Poverty tends to concentrate in the rural sector and food makes up for a relatively high expenditure share for poor households in general.

Table 9.- Ecuador: VAT collection, 2000-2005
(USD$ dollars)

	2000			2001		
	Expected	Collected	Fulfillment	Expected	Collected	Fulfillment
TOTAL Taxes	1,181,647,990	1,659,000.5	141.60%	1,754,886,072	2,345,653,385	133.66%
Value Added Tax	662,684,330	923,315.9	139.20%	1,122,579,977	1,472,766,164	131.19%
VAT - Domestic	400,261,335	542,156.5	135.30%	700,000,000	860,521,674	122.93%
VAT - Imports	262,422,995	381,159.4	145.10%	422,579,977	612,244,491	144.88%
	2002			**2003**		
	Expected	Collected	Fulfillment	Expected	Collected	Fulfillment
TOTAL Taxes	2,499,269,748	2,709,548,600	109.12%	3,037,700,000	2,908,089,354	95.73%
Value Added Tax	1,612,596,579	1,692,197,518	104.94%	1,884,000,000	1,759,265,836	93.38%
VAT - Domestic	966,720,909	977,373,946	101.10%	1,244,000,000	1,137,060,540	91.40%
VAT Rebate	-	-	-	(120,000,000)	(105,155,491)	87.63%
VAT - Imports	645,875,670	714,823,572	110.68%	760,000,000	727,360,788	95.71%
	2004			**2005**		
	Expected	Collected	Fulfillment	Expected	Collected	Fulfillment
TOTAL Taxes	3218000000	3264659987	101.45%	3,461,000,000	3,929,000,970	113.52%
Value Added Tax	1,910,000,000	1,911,205,924	100.06%	1,992,000,000	2,194,136,458	110.15%
VAT - Domestic	1,270,000,000	1,167,486,158	91.93%	1,290,000,000	1,238,953,061	96.04%
VAT Rebate	(150,000,000)	(121,933,955)	81.29%	(120,000,000)	(149,446,975)	124.54%
VAT - Imports	790,000,000	865,653,721	109.58%	822,000,000	1,104,630,372	134.38%

Source: Internal Revenue Service, Planning Department.

3. Literature Review

There are various ways to approach the analysis of the impact on poverty and income distribution of changes in economic policies within a combined CGE-micro-simulation framework. These approaches are classified according to the interrelation between the CGE and the micro model or data they apply (top-down, bottom-up, both top-down and bottom-up; layered, fully integrated; representative, extended representative or real household data). Two recent surveys (Bourguignon, Pereira, and Stern (2002), and Davies (2004)) highlight the main characteristics, applications, and advantages and disadvantages of these approaches. Lofgren, Robinson, and El-Said (2003) explain the representative household approach. Cockburn (2005) is an example of a fully-integrated CGE-micro-simulation model. Bourguignon, Robilliard and Robinson (2003) follow a top-down layered or sequential approach. Savard (2003) designed a top-down/bottom-up approach. In our study we make use of a sequential approach with a CGE and a micro model along the lines of Bourguignon, Robilliard and Robinson (2003), although introducing some variations that we explain latter on.

A recent study on the impact of trade liberalization on poverty in Ecuador using the CGE micro-simulation framework is Vos and De Jong (2003). But in this study there is no fiscal policy change involved, and the micro modeling is approached as a random process. We will depart from this approach and will try to model earnings and occupational choice households' decisions by building a system of equations as in Bourguignon, Robilliard and Robinson

(2003).[6] A key contribution is identifying the central links between the CGE and micro models and doing the microsimulation analysis with *real* household data

We build up a CGE model for Ecuador based on Löfgren, H., R. L. Harris, and S. Robinson (2002). This model has the basic desired characteristics we need, plus the potential inclusion of household consumption of non-marketed commodities, transaction costs, and activities generating multiple commodities and vice versa. All these are attractive features for a more realistic modeling of poverty impacts, especially for rural areas, were poverty is more concentrated in Ecuador. We model the VAT and other indirect and direct tax changes, the oil sector, and trade policy changes.

Fargeix and Sadoulet (1990) present one of the first applications of a CGE model for Ecuador. These authors analyze the impact on growth, inflation, and income distribution of alternative scenarios of adjustment programs in Ecuador. The paper was written with the 1980s background when a series of crisis hit this economy and thus several adjustment programs, aimed to cope with those crises, were adopted by Ecuadorian policy makers. These authors' work emphasizes the importance of a healthy fiscal stance for an economy's stability. Nonetheless, fiscal deficits continued to be a problem in Ecuador in the 1990s. Fiscal deficits, besides other economic imbalances and negative shocks, preceded the big crisis of 1999 that Ecuadorian authorities halted in 2000 with the adoption of the US dollar as the new Ecuadorian currency (See Table 1).

A most recent CGE model for Ecuador was developed by Castillo et.al. (2004). The authors apply a standard static CGE to analyze the impacts on GDP, imports, and exports of the FTA with the U.S. Castillo et.al., in contrast with other applied general equilibrium studies that also focus on production and trade impacts of the FTA (Wong 2006), find that GDP increases (1.58%), imports from the U.S. decrease (-1.32%), while exports to the U.S. increase by 1.7% as a result of the FTA (with full liberalization of tariffs applied to the U.S.). We find hard to believe that imports from the U.S. would actually decrease in an FTA scenario of full liberalization. Castillo et.al use data from input-output tables for 1993-2001 to construct SAMs with 9 sectors.

On the other hand, Wong (2006) applies the GTAP model with Ecuador input-output data included for the first time as a separate region. This author finds that a free trade agreement with the U.S. that implies a full liberalization increases imports from the U.S. by 44% (total imports increase by 1.8%). The main sectors that experiment big increases in imports from the U.S. are meat, dairy, rice, oils and fats, textiles and apparel, wood and wood products, and other manufactures. On impact, exports to the U.S. increase by 2.3% (total exports increase by 1%). The increase in exports would not preclude a fall in GDP by -1.4%, once the FTA en-

[6] See also Robilliard, Bourguignon and Robinson (2005), Robilliard, Bourguignon and Robinson (2001),

ters in effect. It is important to be noted that Ecuador already exports most of her products to the U.S. with a zero tariff. This is so because of the unilateral trade preferences the U.S. gives to Ecuador through the Andean Trade Preferences and Drug Eradication Act (ATPDEA).

None of these recent studies of the FTA with the U.S. analyze impacts on income distribution and poverty in Ecuador, except for Vos and De Jong (2003). These authors, as mentioned above analyze the income distribution impact, but of a Free Trade Agreement of the Americas (FTAA) scenario, as opposed to just an FTA with the U.S. The CGE model of these authors predicts that with an FTAA type of trade liberalization (that adjusts for changes in world prices using GTAP results), Ecuadorian imports would increase by 3.4%, exports would increase by 0.3%, and GDP would barely increase by 0.4%.

4. Methodology

The method we follow to address the impacts on poverty and income distribution of a combined policy of trade liberalization and a change in the VAT system to keep the budget neutral is to combine a CGE model with a micro-simulation model. The method includes four main stages, and has a sequential approach, given that the macro and the micro modeling parts are developed separately. We try to ensure consistency between the CGE and the micro model results. We believe this is an insightful approach as it allows us to transmit to the household level, domestic price and resource reallocation changes expected from trade liberalization that may have a key influence on household poverty and income distribution. It also allows us to analyze the full distribution of real household income within households and not just between households, which is a criticism received by models that use a representative household approach with few groups. The approach with real household data we follow is not free of criticism either. Main criticisms against this approach are the lack of feedback from households' results to the main macro model (the CGE country model, in our case), and the ad-hoc nature of the micro-model equations. As stated above, our micro-simulation work follows the spirit of the work in Bourguignon, Robilliard and Robinson (2003), Robilliard, A., F. Bourguignon, and S. Robinson (2001), and Bussolo and Lay (2005).

The four main modeling stages are:

1) Linking, in a consistent way, the micro and the CGE models. This step in turns implies, broadly speaking, two steps: (i) estimating the equations in the micro model and obtaining a set of coefficients and household characteristics that will be used to calibrate the CGE model, and (ii) running a benchmark simulation in the CGE model so that the model is calibrated, in a consistent way to the micro model dataset.

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and Bussolo and Lay (2005).

2) Solving the trade and fiscal policy changes in the CGE country model for Ecuador (which seek to raise revenues in response to the revenue lost due to tariff elimination, so as to keep the government budget neutral), and get a new set of variables (a vector of appropriate returns, wages, and aggregate employment variables) that are used to communicate with the micro-simulation model. An overview of the CGE model is presented below.
3) Using the micro-simulation model to generate changes in variables that account for heterogeneity in the household data (individual wages, self-employment income, and changes in employment) so that the results are consistent with the post-policy-change macro variables generated by the CGE model. We partly follow consistency rules provided by Bourguignon, Robilliard and Robinson (2003) that require changes in variables of the micro model equations to be equal to changes in similar variables of the CGE model.
4) Evaluating the impact of the policy changes on poverty and income distribution, with due regard for the marginal impact of the fiscal policy changes.

A key issue in this research is how to make the proper links between the CGE country model and the micro-simulation model to ensure consistency between them.

One step prior to the modeling stages involves a good deal of data work. The data work includes (i) cleaning up the rural and urban household survey data, (ii) constructing income distribution and poverty indicators using the (initial) rural and urban household survey data, and, (iii) calibrating the CGE model with the make and use table and Social Accounting Matrix data (See Annex 2 for additional details).

4.1 The Micro Model

As in Bourguignon, Robilliard and Robinson (2003), the micro model is based on a set of reduced form equations that describe wages, self-employment income, and the occupational choices of individuals in the household survey.

The wage earnings equation is a semi-logarithmic equation of the logarithm of wages of individual *i* in household *m* ($\log w_{mi}$) with independent variables (x_{mi}): age, years of schooling, years of schooling squared (to account for non-linearity in income generation), number of children under 18 year-old age, and dummies for: gender, marital status and head of household.

$$\log w_{mi} = \alpha_{g(mi)} + x_{mi} \cdot \beta_{g(mi)} + \upsilon_{mi} \qquad (1)$$

The function $g(\cdot)$ is an index function that indicates the labor market segment to which member *i* in household *m* belongs to. These labor market segments are: urban skilled, urban unskilled, rural skilled, and rural unskilled.

The self-employment income equation is a semi-logarithmic equation of the logarithm of self-employment income of household *m* ($\log y_m$), with independent variables (Z_m): age of head of household, years of schooling and years of schooling squared of the head of household,

land size of the farm field of those households that have farm income, and dummies for: gender and marital status of the head of the household. This self-employment income equation also includes a variable for the number of household members actually involved in self-employment (N_m).

$$\log y_m = \gamma_{f(m)} + Z_m \cdot \delta_{f(m)} + \lambda_{f(m)} \cdot N_m + \eta_m \quad (2)$$

The index function f(·) denotes whether a household earns profits in rural or urban areas.

We estimate both total wages and earnings equations first by OLS and then by Heckman two-stage to account for sample selection bias, which may arise given that the wage and self-employment income are observed only for those who actually participate in the labor market.

The occupational choice equation is a multinomial logit of three occupational alternatives: i) inactive or unemployed (benchmark, not estimated), ii) self-employed, and, iii) wage earner.

Table 10 presents data on number of workers and their wage and earnings. There are fewer self-employed (41%) than wage earners (59%), and the latter have a bigger share of total wages and earnings (55%) than do self-employed people. These differences hold for urban and rural areas, although in rural areas wage workers earnings' share (44%) is lower than self-employed earnings' share (56%) in total wages and earnings.[7]

Table 10.- Number of Workers, Wages and Earnings. 2005-2006

Description	TOTAL		URBAN		RURAL	
	Value	Percentage	Value	Percentage	Value	Percentage
Numbers of Wage workers	3,270,907	59%	2,254,662	62%	1,016,245	54%
Numbers of self-employed	2,279,231	41%	1,401,028	38%	878,203	46%
Total	5,550,138	100%	3,655,690	100%	1,894,448	100%
Wages workers, Annual Millions of US$	10,800	55%	8,750	52%	2,050	44%
Earnings, Annual Millions of US$*	8,830	45%	6,260	48%	2,570	56%
Total	19,630	100%	15,010	100%	4,620	100%

Source: INEC's Life Condition Survey 2005-2006, and own calculations.

In the occupational choice model, individuals decide whether to be (i) inactive, (ii) self-employed, or (iii) wage-worker, based on the utility associated to each choice. The base category is "inactive", and its associated utility is zero. For the other two categories, the multinomial equations (IW_{mi}, N_m) we apply include as independent variables (z_{mi}): years of schooling, year of schooling squared, number of children under 18 years, other income (exogenous, such as remittances and aid) and dummies for: gender, marital status, and for somebody in the household who owns a family business.

$$IW_{mi} = Ind\,[a^{w}_{h(mi)} + z_{mi} \cdot b^{w}_{h(mi)} + u^{w}_{mi} > Sup(0, a^{s}_{h(mi)} + z_{mi} \cdot b^{s}_{h(mi)} + u^{s}_{mi})] \quad (3)$$

where, IW_{mi} stands for members who work as wage worker as established by the 'Ind' indicator function. This equation states that an individual will be wage-employed if the utility associated with wage-employment is higher than the utility of being self-employed or inactive.

$$N_m = \Sigma_i\, Ind\,[a^{s}_{h(mi)} + z_{mi} \cdot b^{s}_{h(mi)} + u^{s}_{mi} > Sup(0, a^{w}_{h(mi)} + z_{mi} \cdot b^{w}_{h(mi)} + u^{w}_{mi})] \quad i=1, ..k_m \quad (4)$$

where, as before, N_m is the number of household members working in self-employment activities. This equation states that an individual *i* of household *m* will prefer self-employment if its associated utility is higher than the utility of inactivity or wage-employment. The index function $h(\cdot)$ in equations (3) and (4) assigns the individual to a demographic group (head, spouse, and other household member).

An income accounting equation (Y_m) complements the earnings and occupational choice model..

$$Y_m = \Sigma_i\, w_{mi}\, IW_{mi} + y_m\, Ind(N_m > 0) + y_{om} \quad (5)$$

where, Y_m is total household income, y_{om} is exogenous income such as government transfers, remittances, aid, etc., and w_{mi}, IW_{mi}, and y_m are defined as above.

Micro model and CGE model: benchmark equilibrium

To analyze whether there is consistency (at the benchmark equilibrium) between the data in the micro model and the data in the CGE model we compare these two sets of data. According to the data comparison between the 2005 household survey data and the 2004 Social Accounting Matrix of Ecuador, there are no significant differences between aggregate total income in the two data sets (the difference between aggregate income data amounts to 2 percent). Differences in aggregate consumption are higher (15 percent) so we keep income data fixed and re-balance consumption data in the SAM (details are found in annex 3).

Linking the micro-simulation model with the CGE model

To ensure consistency in the model simulations, household data should match CGE model data after performing changes in policy in the CGE. The micro-simulation model is linked with the CGE model through a set of aggregate changes in wage employment, wages, and self-employment income. The changes in some or all of these aggregates are triggered by a policy change or shock that hits the economy (in the CGE model). These changes are incorporated then in the micro-simulation into the household behavior for wages, income, and employment, so that consistency requirements are met. This is the so-call "consistency" of the micro model with the CGE model. In summary, the general post-simulation consistency rules imply:

[7] Data on total wages and earnings should be taken with care as these data may be subject to problems of under-reporting and omission.

Percentage changes in summary figures from Household data = Percentage changes in aggregates in the CGE model. So that:

For the number of wage earners: the percentage change in the number of all wage earners from the household survey (the sum over each individual, whether heads, or other members in a household and then sum over all households) equates the percentage change of total wage employment by labor market segment arising from the CGE simulations. This consistency rule applies for the case of unemployment, where adjustments are expected in the number of unskilled wage workers.

Similarly, for wages: the percentage change of total wages based on household survey data (by labor market category) should be equal to the percentage change in the total wage bill, by labor market segment, as arising from the CGE model simulations. For self-employment income, the percentage change in total income in each category from household data should equal the percentage change in self-employed earnings from the CGE model. These consistency rules for both wages and earnings apply for the case when adjustments in salaries and earnings are expected.

To ensure consistency with income data in the baseline from the Ecuadorian household survey, we follow recent literature and add back estimated residuals into the estimated household behavior equations.

We simulate changes in wages and earnings via changes in intercepts, that is, we do not re-estimate micro equations behavior. Consistency checks are performed in each simulation results.

4.2 Overview of the CGE Model

We use a static CGE model. We acknowledge that a dynamic model could also tackle interesting medium- and long-run developments of the economy, such as labor market dynamics, trade balance, capital formation, and the rate of growth, that have an impact on poverty. However, our focus is the impact effects, not the very long-run effects of trade and fiscal policies and hence it is well served by using a static model.[8] Our concern on the fiscal implications of trade liberalization policy is justified by a number of studies which conclude that fiscal deficits should be corrected early in the trade reform process. "*Since trade taxes are a major revenue source for most developing countries, careful planning is needed to ensure that revenue reducing effects of rate reduction do not upset the fiscal balance…, but it is also necessary to*

[8] Nonetheless, we consider that the future development of a dynamic CGE model for Ecuador is important and would greatly contribute to understand relevant issues for its economy. A key step for this is to develop a static CGE model which is able to capture key features of the Ecuadorian economy such as the oil refining sector, the VAT system, trade policies, and household characteristics. Also from the national capacity building viewpoint it is preferable to start from a static rather than a dynamic model.

look at ways of shifting away from trade taxes to less distortionary forms of taxation, such as VAT." (Nash and Takacs, eds (1998), pp. 186-7. See also IMF (2005).

The basic structure of the model can be summarized as follows. Technology is modeled at the top by a Leontieff function of value added and aggregate intermediate input. Value added is a CES function of primary factors (labor and capital) and the aggregate intermediate input is a Leontieff function of disaggregated intermediate inputs. Each activity can produce more than one commodity following fixed yield coefficients. Also a commodity can be produced by more than one activity. There are 27 sectors, nine primary or extractive, eight agro-industrial, seven industrial, and three services. These sectors produce 27 commodities, 17 of which are produced by more than one activity.

There are several institutions in the model. Households, receive income from factors (labor and capital) and transfers from other institutions, consumption is the residual after paying taxes, savings, and transfers to other institutions, and is spent according to LES demand functions derived from a Stone-Geary utility function. Households are split into urban and rural. Self-employment also generates income for households but no attempt is made to distinguish between labor and capital due to lack of reliable data to do so. A treatment that is consistent with the structure of the microsimulation model. Enterprises only get income from capital. This income is allocated between corporate taxes, and transfers to households. The government collects all tax-generated income and derives no income from resources at its own disposition. It expends in acquiring goods -basically services- transfers to households, payments to other regions, and savings. Government consumption is fixed in real terms while transfers to domestic institutions are CPI-indexed, and savings is a residual.

As for factor markets we have four labor types, organized by educational level and area of residence. Educational levels comprise no formal education and primary, and secondary and higher. The first group is taken as non-skilled labor and the second as skilled. Each of these types is split into rural and urban, according to the area of residence. The other factor included is capital. There is no distinction so as to capital types. There is no land in this model due to the fact that there is no good quality information for incorporating it into the SAM. We use two alternative closure rules for factor markets: one in which supplies are inelastic and returns clear the market and one in which there is elastic supply and the employment level clears the market.

Marketed outputs are imperfectly substitutable under a CES function. Aggregated domestic output is allocated between domestic consumption and export through a CET function. Export demands and supplies are infinitely elastic.

We have three foreign regions in the model, the US, the Andean Community, and the Rest of the World. These are incorporated in a nested structure that allows for a richer modelization of the trade liberalization scenarios considered (since it first splits preferential from non-

preferential markets and then distinguishes between preferential markets, as shown in the figure in Annex 4).

Aggregate composite imported commodities and domestic output are imperfect substitutes in demand (using a CES function) and imports are differentiated by region of origin using a single nest structure, as illustrated in annex 4.

As mentioned bellow, we model different alternatives for the tax replacement. Effective tax rates are redefined for each tax type. These are the product of the original effective tax rates and a newly defined variable that may adjust. The latter, when let endogenously vary, allows us to modify the effective tax rate so that the desired constraint is met (in this case, government income).

The general form of the approach is:

TAXAD(S) = taxrate(S) * TAXADJ

where, *taxrate* is the effective tax rate calculated from SAM data (indexed on the appropriate set), *TAXADJ* is the endogenously determined adjustment parameter for the corresponding tax rate type, and *TAXAD* is the resulting effective tax rate. The precise form of this set of equations is provided in the annex. Furthermore, in order to implement the tax replacement mechanism, when the VAT and direct taxes are jointly used, we recourse to a new variable that links the tax types as shown in the equations bellow.

TINS(INSDNG) = tins0(INSDNG) * TINSADJ * MMULTI

TVAD(A) = tva(A) * TVADADJ * MMULTI

where TINS is the effective direct tax rate and TVAD is the effective value added tax rate.

To model VAT rates that may differ among commodities we have to recourse to auxiliary external calculations to take this feature into account, as explained in the annex.

Closures and calibration

We use two sets of closures (corresponding to the scenarios under analysis). In both the exchange rate is fixed, as the economy is dollarized, and the current account is fixed too, so as to avoid the "free lunch" effect that arises when foreign savings adjust to fill the current account gap. Also the consumer price index is the numeraire. The sets are differentiated through the labor market closure we use. In the first one we assume that there is full employment of all factors and factor returns adjust to clear the markets (the classical trade model closure). In the second, we assume that there is unemployment in the unskilled salaried labor market segment, both rural and urban, a common feature of most Latin American Economies as we discuss later (the classical development theory closure).

Regarding the savings-investment closure, we assume the adjustment is balanced and, therefore, the marginal propensity of households to save adjusts, as does the investment demand

for fixed capital formation. Also, the investment share of absorption is endogenous, as is the government's consumption share in absorption.

As for the government closure, government savings are exogenous and government income is also fixed. For scenarios (i.a) to (i.c) implementing alternative ways of adjusting the VAT system -as described below, total government income is fixed, but income arising from sources other than the VAT (such as direct taxes to domestic institutions, factor income taxes, activity taxes, etc.) is allowed to vary while the corresponding rates are kept fixed. Meanwhile, government income from the VAT is also allowed to vary but the VAT rate adjusts endogenously. For scenario (ii), implementing the mix between the VAT and direct taxes to make up for tariff revenue losses, households disposable income is fixed and government income from all sources is allowed to vary. The tax rate adjustment factor common to the VAT and to direct taxes to domestic institutions is allowed to adjust, while the rest of tax rates are kept fixed. Lastly, for implementing scenario (iii), in which only direct taxes are used to compensate for tariff revenue losses, only the corresponding tax rate is allowed to vary.

Additionally, as we consider short term impacts from trade liberalization, capital is fully used and sector specific, so there is no mobility between sectors.

As mentioned in the section on the consistency between the macro and micro models, the CGE is calibrated in such a way that it is consistent with data coming from the household survey employed. In particular, total household income is consistent in the SAM and in the micro model database, the sectoral division of income comes from the original SAM, and the split between urban and rural households, both in terms of factor income and from self-employment, is consistent with that in the household survey.

5. Scenarios

The alternative simulations that serve to analyze poverty and income distribution effects of a combined policy of bilateral trade liberalization with changes in the value added tax system designed to compensate for government's tariff revenue loss in Ecuador are the following.

i) Tariff elimination vis-à-vis Ecuador's main trade partner, the U.S., plus alternative changes in the VAT system (tax replacement policy) to keep the government budget neutral. The alternatives for implementing this tax replacement mechanism are:
   a. Adjustment in the VAT rate preserving its current structure. That is, all commodities that are currently exempted continue being so and the tax rate adjusts only for taxed commodities.
   b. Adjustment in the VAT rate eliminating current exemptions. Currently taxed commodities are charged a higher rate than those currently exempted.
   c. Adjustment in the VAT rate, using a flat rate for all goods.

ii) For scenario (i.a), it is implemented a tax replacement using a mixture of the change in the VAT system and an increase in direct taxes. The shares are equal for both tax types.

iii) Alternatively, the change in the VAT system is replaced by a (sole) change in direct taxes to make up for tariff revenue loss.

As mentioned when describing the closure rules we follow, we consider two alternative behaviors for the labor market. First we consider that there is full employment in all factor markets and that factor returns clear the corresponding markets. While this is a commonly used assumption in trade models, it may be considered as lacking realism, at least in a developing country context. In this sense, the scenarios where this assumption is used must be taken as an "upper bound" for the effects of trade liberalization on poverty, since only factor returns are affected and no change is brought about in employment levels (nor there is an effect from sectoral demands for factors as these are perfectly mobile between sectors, in the case of labor).

On the other extreme, we find the assumption that there is unemployment at least in some labor market segments and that any adjustment takes place by movements in factor usage, leaving the current factor return level unchanged. In other words, there is excess factor supply (with zero opportunity cost) in such a way that their corresponding price will not change as more or less of the factor is demanded.

In our particular case, we assume that only the unskilled salaried labor market segment (both urban and rural) is characterized by unemployment. This arises from several stylized facts from the Ecuadorian factor market. As other Latin American economies, the Ecuadorian economy is relatively scarce in capital, so this factor tends to be fully employed. On the other hand, skilled labor tends to be scarce too and mainly affected by temporary voluntary unemployment. As a matter of fact, according to our calculations based on the Ecuadorian LSMS 2005-6, the skilled –defined as having at least one year of secondary school- account for around 27% of the labor force (population 13 years old and older), 13% of salaried workers, and 6% of self-employed. As for the self-employed segment, Loayza and Rigolini (2006) estimate the share of self-employment in the labor force above 35% and our own estimates show it in the neighborhood of 22%. More importantly, as the unskilled self-employed and skilled self-employed tend to have low opportunity costs of entering the segment (the former) and enter the segment voluntarily (the latter) and (both) face very low barriers to entry, there is virtually no unemployment in this market.

6. Data

We use an input-output table and a social accounting matrix (SAM) for Ecuador for the year 2004, both developed by the Central Bank of Ecuador. We also use the 2005-2006 survey of urban and rural households' life conditions ("Encuesta de Condiciones de Vida," ECV or

LSMS). This survey follows the same methodology and format as the World Bank's Living Standards Measurement Study (LSMS) household surveys. Annex 1 provides a description of the database.

The survey includes data on income and occupational choices at the individual level, as well as income on agricultural and business activities and expenditures at the household level. This survey is carried out by the Ecuadorian Institute of Statistics and Census (INEC, by its acronym in Spanish). The unit of study of the ECV is the household and its members. Further details on the data used are included in the Annex.

7. Results

Micro model regression estimations

The wage and earnings equations are estimated by OLS for each of the labor market categories indexed by g (urban skilled, urban unskilled, rural skilled, and rural unskilled) and f (urban, rural), respectively. Tables A6.1 and A6.2, in Annex 6, show the results of these two regressions. The regressions for wages and earnings show, in general, expected signs and significant effects. Working-age male household members command higher wages than female ones, age has a positive and significant effect on wages and earnings (except in the equation for urban self-employment income, where age is not significant), married members show higher wages than not married members (except in the equation for urban self-employment income, where marital status is not significant), and the head of household have a higher wage than the rest of working-age household members.

Education pays off to wage workers as a higher wage for urban-skilled, urban-unskilled, and rural unskilled wage-workers. Thus, for the urban-skilled group each additional year of education would imply a 25 percent increase in wages; for the urban-unskilled group, one additional year of education adds a 12 percent to wages; and, for the rural-unskilled category, one more year of education raises wage earnings by 7 percent. The effect of formal education on wages of rural-skilled workers is negative, although not significant.

For self-employed individuals, higher education also has a positive and significant effect on earnings. For urban self-employed individuals one more year of education increases earnings by 7.5 percent, and for rural households one more year of education raises self-employment earnings by 6.5 percent.

The problem with applying OLS estimation is that the regression uses observed data, or the wages and earnings of those individuals who work (observable), which produces inconsistent estimates of the coefficients of the wage (α, β) and earnings (γ, δ, λ)equations (See Section 4.1 above). This situation should be less of a problem in large samples.

Econometricians have dealt with this problem of sample selection using the omitted variable approach. For those variables that appear in the equation that determines the sample selection (where the dependent variable is a dummy for observed or not observed), the marginal effect of that independent variables on wages (or earnings, as it may be the case) in the *observed sample* includes two components: the direct effect (as estimated in the observed sample) and the effects coming from the influence of that independent variable on the probability of being in the sample. The Heckman two-step estimators account for this sample selection bias. We apply this estimator to the wage and earnings equations. Results for the Heckman two-step estimations are shown in Tables A6.3 and A6.4.

The Heckman two-step estimates present similar effects as those in the OLS regressions, for both the wage and earnings equations. That is, our samples are large enough, so we can use the OLS estimates. The OLS estimates for the wages and earnings regressions will later be used in the micro simulation that communicates the survey data (from the micro model) with the SAM data (from the CGE model).

Table A6.5 presents results for the occupational choice model of working-age household members for the three demographic groups considered (head, spouse, and other household members). The base category is inactive (its coefficients of direct effects are zero). The depicted coefficient estimates show the effects of the independent variables (gender, schooling, marital status, number of children under 18 year-old, exogenous income (aids and remittances), and a dummy for own family business) in the underlying expected utility equations of an occupational choice model. These estimates of a^w, b^w,a^s, b^s,and their correspondent residuals will later be applied to the microsimulation that communicates the micro model with the CGE model results.

CGE results

The main results arising from the CGE model are summarized in Table 11. From there it can be appreciated that, in nominal terms, absorption decreases under all scenarios, while private consumption increases between 2.5% and 4.5%. Fixed investment decreases sizably as the economy adjusts to bilateral trade liberalization under a fixed current account and stock changes decrease modestly. The value of exports and imports decreases under all scenarios but the one implementing the tax replacement mechanism with a flat VAT rate. Finally, the GDP (value added) decreases in all cases between 0.3 and 0.64 percentage points, while in spending terms it decreases between 0.13 and 0.55 percentage points, except under the scenario with a flat VAT when it increases meagerly.

Table 11. Main macroeconomic results from the CGE simulations

Nominal terms, percentage changes

Variable	Labor market	Scenario				
		i.a	i.b	i.c	ii	iii
Absorption	Full employment	-0.593	-0.558	-0.269	-0.538	-0.520
	Unemp. (unskilled)	-0.624	-0.608	-0.310	-0.508	-0.470
Private consumption	Full employment	4.484	3.635	2.472	4.377	4.339
	Unemp. (unskilled)	4.345	3.567	2.521	4.126	4.051
Fixed investment	Full employment	-16.863	-14.027	-8.874	-16.246	-16.034
	Unemp. (unskilled)	-16.576	-14.054	-9.222	-15.319	-14.892
Stock change	Full employment	-0.407	-0.417	-1.960	-0.624	-0.697
	Unemp. (unskilled)	-0.380	-0.387	-1.945	-0.622	-0.702
Exports	Full employment	-0.312	-0.184	0.313	-0.233	-0.206
	Unemp. (unskilled)	-0.336	-0.243	0.252	-0.160	-0.100
Imports	Full employment	-0.291	-0.171	0.292	-0.217	-0.192
	Unemp. (unskilled)	-0.313	-0.227	0.235	-0.149	-0.094
GDP (value added)	Full employment	-0.606	-0.571	-0.277	-0.551	-0.532
	Unemp. (unskilled)	-0.638	-0.622	-0.318	-0.520	-0.481
GDP (factor cost)	Full employment	-0.233	-0.502	0.054	-0.166	-0.143
	Unemp. (unskilled)	-0.263	-0.553	0.010	-0.128	-0.082

Source: CGE results.

Scenarios: i.a: tax replacement with VAT under current structure; i.b: tax replacement with differential VAT for formerly exempted commodities; i.c: tax replacement with flat VAT; ii: tax replacement with a mix of VAT and direct taxes; iii: tax replacement with direct taxes only.

As for wages and income changes, Table 12 presents percentage changes in urban and rural households' factor income with respect to the base year. Under the full employment set of scenarios, all urban labor returns fall and the same happens with income from self-employment. As a result, as shown in the table, urban households' income from all sources decreases. In contrast, rural wages for unskilled labor and income from self-employment increase, while wages for rural skilled laborers decrease. Therefore, as seen in the table, rural households' income from unskilled labor and from self-employment increases in all cases but the scenario that implements the flat VAT rate (i.c). Meanwhile, income from skilled laborers' wages decrease under all scenarios. On the other hand, under the set of scenarios with unemployment in the unskilled labor market, urban wages for skilled workers and urban income from self-employment decrease in all cases. The same happens with rural wages for skilled labor while income from self-employment increases. As a consequence, as shown in the table, urban income from skilled wages and self-employment decreases, rural income from wages for skilled workers decreases, and rural income from self-employment increases, except under scenario i.c. Lastly, income from unskilled wages falls for urban households while it increases for rural households, as employment in this labor market segment falls in the urban setting and increases in the rural one.

Table 12. Percentage changes in income, by source, for urban and rural households

Labor market	Household ty-pe.income source	Scenario				
		i.a	i.b	i.c	ii	iii
Full employm.	UrbH.UnskL	-1.148	-1.094	-0.403	-0.736	-0.593
	UrbH.SkL	-1.699	-1.386	-0.522	-1.290	-1.148
	UrbH.SE	-1.462	-1.236	-1.200	-1.130	-1.014
Unemploym.	UrbH.UnskL	-0.968	-0.958	-0.392	-0.528	-0.378
	UrbH.SkL	-1.733	-1.460	-0.597	-1.201	-1.021
	UrbH.SE	-1.495	-1.310	-1.274	-1.044	-0.891
Full employm.	RurH.UnskL	0.633	0.350	-0.143	0.992	1.117
	RurH.SkL	-1.201	-1.008	-0.489	-0.812	-0.677
	RurH.SE	1.661	0.702	-0.677	1.977	2.086
Unemploym.	RurH.UnskL	0.434	0.172	-0.196	0.844	0.982
	RurH.SkL	-1.244	-1.091	-0.566	-0.731	-0.557
	RurH.SE	1.555	0.602	-0.711	1.907	2.026

Source: CGE results.
Scenarios: i.a: tax replacement with VAT under current structure; i.b: tax replacement with differential VAT for formerly exempted commodities; i.c: tax replacement with flat VAT; ii: tax replacement with a mix of VAT and direct taxes; iii: tax replacement with direct taxes only.

These changes are partly driven by a decrease (ranging from 0.75 to 1.4 percentage points) in the quantity produced by the services sector (except transportation, storage, mail, and communications) which is by far the largest demander of unskilled urban and rural labor, skilled urban and rural labor and the largest generator of income from self-employment, both urban and rural. On the other hand, the increase in wages for unskilled rural workers is mainly driven by the expansion in production from cultivation of bananas, coffee, and cocoa; transport and storage services; other crops; and cereals cultivation. Regarding the increase in rural self-employment income, it is basically linked to an expansion of animal production; transport and storage services; other crops; and meat production.

Impact on poverty and income inequality

Assuming *unemployment* amongst the unskilled wage workers, a labor market feature that is thought to be prevailing in the Ecuadorian labor market –as discussed above, we obtain positive, but small, impacts on poverty of a combined zero-tariff policy of Ecuador with the U.S. and an adjustment in the VAT rate preserving its current structure to keep a balanced government budget (scenario i.a.). A point estimate of the incidence of indigence would change from the baseline of 14.87 percent down to 14.46 percent, and the incidence of poverty from 35.28 percent to 35.21 percent. Consistent with our results at the macro level, trade liberalization and taxes act in a different manner in rural and urban areas. Urban poverty suffers a small increase (from 27.82 percent to 27.90 percent) while rural poverty decreases (from 49.55 percent to 49.21 percent). See Table A6.6.

If the adjustment in the VAT rate includes also the elimination of current exemptions (scenario i.b), similar results on poverty still hold, but with lower reductions in poverty-incidence rates. If the VAT adjustment uses a flat rate for all goods (scenario i.c), there are still positive effects on indigence rate but lower than in the first scenario, and poverty rates rise slightly. Finally, if either direct taxes are applied in combination with changes in the VAT rate, or if just changes in direct taxes are used to make up for tariff revenue loss (scenarios ii, and iii, respectively) the impacts on poverty are positive, and slightly bigger than those in the first scenario.

Assuming *full employment* and similar scenarios, the adjustments in income of all wage workers and self-employed that now take place imply –in almost all cases- slightly deeper effects on incidence rates of indigence and poverty, but the directions of the changes are, in general, the same as those in the previous scenarios (Table A6.6 end).

Any of the policy changes of trade liberalization with the U.S. and changes in taxes to make up for revenue loss implemented have barely impact on income distribution (Figures A6.1).

8. Conclusions

In this paper we explore the impact of trade and fiscal policy changes on poverty and income distribution in the context of the Ecuadorian economy. Trade policy changes come from the implementation of a free trade agreement with the United States, while fiscal policy changes arise from the implementation of several alternatives to compensate for revenue losses stemming from tariff elimination. In particular, both the VAT and direct taxes are used as tax replacement mechanisms under diverse arrangements.

As follows from previous sections, partial trade liberalization has relatively modest effects at the macro level. GDP, measured as value added, decreases in nominal terms in the range of 0.6 to 0.3 percentage points, while measured at factor costs varies between -0.56 and 0.2 percent. Private consumption increases between 2.5 and 4.5 percent. And fixed investment, which is allowed to endogenously adjust while the current account and government income and savings are kept fixed, decreases in the range of 8.9 and 16.9 percent.

Urban wages for skilled and unskilled workers decrease in the range of 1.7 to 0.4 percent; skilled workers being the most negatively affected. The average decline differential between both types of labor ranges between 0.5 and 0.6 percentage points. Rural wages for skilled workers decrease by 0.8 percentage points in average, while wages for unskilled workers increase about 0.6 and 0.7 percent in average, depending on the particular scenario. Income from

urban self-employment unambiguously decreases but, in average, does so slightly less than skilled wages, while income from rural self-employment increases between 1.3 and 1.4 percentage points in average, according to the set of scenarios considered. The latter is the largest average return change arising from trade and fiscal policy changes.

These factor return changes, being small in relative terms, suggest that the impact on poverty and income distribution must be small too. In effect, this is what the micro simulation results show.

Under the *full employment* scenarios, the total *extreme poverty* rate (US$1 a day) falls between 0.15 and 0.62 percentage points. The largest decreases tend to be associated to *rural* poverty and to poverty for households headed by a female. In contrast, the total *poverty* rate (US$2 a day) increases (in the range between 0.08 and 0.26 percentage points) or slightly decreases (in the range between 0.02 and 0.05 percentage points). The biggest poverty increases correspond to *urban* households.

In the case of the scenarios with *unemployment* in the unskilled labor market segment, the total *extreme poverty* rate (US$1 a day) falls between 0.07 and 0.49 percent. Again, it is rural households, but also households headed by males which show the largest decreases in extreme poverty. Moving to the total poverty rate (US$2 a day), poverty incidence decreases meagerly, around 0.04 percent to 0.14 percent, and it increases only for the case of adjustments in the VAT rate that applies a flat rate for all goods.

Regarding income distribution, results show that there is practically no effect arising from trade and fiscal policies. Both under the full employment and the unskilled labor unemployment sets of scenarios, income distribution remains unchanged as it refers to the first two quintiles. Negligible changes, with very little variations, are shown for the three top quintiles; the highest quintile tends to decrease its share in total income in favor of the fourth and third quintiles, the fourth being the more frequently benefited.

From the standpoint of the alternative tax replacement mechanisms, results under *full employment* conditions indicate that making up tariff revenue loss with changes in direct taxes would yield the better outcome for rural *extreme* poverty alleviation (a 1.46% decrease). In contrast, implementing a flat VAT for all goods would lead to the best outcome for urban *extreme* poverty alleviation while yielding the worst for rural households *extreme* poverty alleviation (0.20% and 0.07% decrease, respectively). Seemingly, a sort of middle ground would be found by implementing a mixture of VAT (keeping its current structure) and direct tax rates changes. This would reduce rural extreme poverty by 1.39 percentage points and urban extreme poverty by 0.16 percentage points.

The magnitude of these results is very much in line with those of other studies. Interestingly, in this case the same forces that lead to slight decreases in extreme poverty rates, lead too to slight increases in poverty rates. This points out the potential of policy changes to create both

beneficial and harmful effects. Unless specific policy measures are taken in order to assure that growth is pro-poor, there is no assurance that an improved resource allocation would yield the desired outcomes in terms of poverty alleviation and a more egalitarian distribution of income.

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ANNEXES

Annex 1.- Description of the data used

A.1.1 'Encuesta de Condiciones de Vida' (ECV) or Living Standards Measurement Study (LSMS) 2005-2006

The LSMS surveys are multi-purpose and multi-sector as they include many aspects related to individual and households welfare. They include individual data, but the unit of analysis is the household. The survey comprises data on: demographic characteristics of households' members, housing, health, education, migration, economic activities, fertility and maternal health, household expenditures, household income, household businesses, independent workers, and agricultural units.

The ECV 2005-2006 includes data collected in rural and urban households located in the Coastal region, the Highlands (Sierra), Amazon region of Ecuador.[9] This survey is divided in five domains, each corresponding to a city or group of towns with similar socio-economic characteristics for which certain estimations are desired. The five domains are: (1) Quito (the capital of Ecuador), (2) Guayaquil (the biggest and most populated city, and main economic center of Ecuador), (3) cities of regional influence, (4) cities where great deal of agro-industrial, informal, or craftsmanship activities are developed, and (5) cities that provide residency or services to farmers.

It is important to note that the ECV data is representative of the domain from which it is taken. According to INEC, the sample may replicate with good precision (5% error and 95% confidence level) the situation related to living conditions of the Ecuadorian population in those areas.

A.1.2 Social Accounting Matrix (SAM) 2004

The 2004 make and use tables for the Ecuadorian economy have 60 commodities and 47 activities, while the SAM 2004 comprises 27 commodities and 27 activities. Households are broken down in urban and rural and by quintile for each location. Factor income is assigned to each household type according to labor type (no education, primary, secondary, and college for urban and rural labor), gross surplus from enterprises, and "mixed income" (income from self-employment split according to "firm" size –family, small, and big in urban and rural settings). The SAM is organized according to the scheme presented in Table A1.1 bellow.

[9] INEC defines rural areas as towns with less than 5,000 inhabitants living in their delimited sectors, areas that surround capitals of provinces and other big cities in a province, and, scattered towns or villages.

Table A1.1.- Ecuador SAM 2004: Basic Structure

Values in millions of US dollars

	Commodities	Activities	Income generation	Income distribution	Income use	Capital	ROW
Commodities		Intermediate inputs 22,446.8			Final consumption 25,676.2	Investment 7,632.4	Exports 8,984.9
Activities	Production matrix 53,643.2						
Income generation		Value added 27,654.2					Income from ROW 10,350
Income distribution	Taxes on commodities 969.8		Income 29,590.4	Transfers, property rents, other income 4,886.4			Transfers from ROW 1,935.8
Income use				Disposable income 32,605.8	In kind transfers 1,751		
Capital					Savings/Credit 6,929.6		Capital transfers from ROW 702.8
ROW	Imports 9,657.8		Factor income to ROW 10.5	Other payments to ROW 1,965.9		S/I balance 681.4	

Source: Central Bank of Ecuador

Rows represent income; columns represent expenditure

Annex 2.- Household Survey data cleaning: highlights

We perform error and consistency checks in the LSMS 2005 survey, as a result of these checks we found two undesiderable features that were corrected.

First, one household presented different weights for one of its individual components (in this LSMS Ecuadorian survey, all individuals within a household show the same weight). We corrected this individual weight assigning it the correct household weight.

Second, we observed that several households did not present at all data on income, and some of the household that did not present income data did not present either data on some consumption categories that we use to construct aggregate consumption (durables, utilities and rent). We eliminated these zero-income observations, which in turn implied that we recalculated the weights of all households in the survey, multiplying all original weights by a factor that accounted for the weights of the households that were eliminated. The factor we use to recalculate household weights is a ratio of the sum of weights of households with zero income (total observations: 142, with a total weight sum of 38,541) to the sum of weights of the rest of households left in the survey (total observations: 13,439, with a total weight of 3,226,325). By adjusting the household weights we ensure that we end up with the same total household (and individual) weights in the survey (3,264,866).

Annex 3.- Conciliation between the survey data and the SAM data

Given that the two main data we use –the Ecuadorian household survey 2005 and the Ecuadorian Social Accounting Matrix 2004)– will be connected in the micro simulations, we perform a consistency check between them to find out whether there would be a need to reconcile the two data sets.

We compare the aggregate consumption expenditure and aggregate total income accounts. The criterion was to verify whether discrepancies are high or not. If discrepancies are of the order of 5-10 percent it can be assumed that the data are compatible, in particular for income (our connecting variable between the micro model and the CGE model results).

We found an income discrepancy of 2 percentage points between total income of the SAM data and total income of households in the survey data.

On the consumption side, we found a higher discrepancy in totals. The difference between the aggregate total consumption in the SAM data and the aggregate total consumption in the household survey data amounts to 15 percent. However, when we compared the share in consumption by area (urban and rural) and quintile of consumption we found that there were no noticeable differences as the shares in each data set are similar for consumption within rural and urban areas. See Table A3.1 below.

Therefore, we divided the SAM totals on the income side in such a way as to preserve the urban-rural split found in the LSMS on a sectoral (activity) basis, maintaining the sectoral shares found in the SAM. A similar procedure was followed for the different factor incomes. In this way we got consistent data between the LSMS and the SAM on the income side. Since this procedure generated some inconsistencies in the consumption data, due to the fact that urban-rural shares for each commodity did not matched the urban-rural division of income, we used RAS to adjust these shares and get an adequately balanced SAM that is consistent with the micro data.

Table A3.1. Summary of Data comparison between Household Survey data and SAM data

SAM 2004	HH Survey 2005-06
INCOME ACCOUNTS	
(Thousands of US$)	(Thousands of US$)
Total Wages	Total Wages
4,120,189	6,920,000
3,886,167	3,930,000
8,006,356	10,850,000
Self-employment income	
3,850,140	Total Agriculture
8,476,208	1,565,100
12,326,348	
	Total HH Business
Net Taxes/Prod.	8,387,800
189,708	
	Total Independent Income
Capital income	6,872,000
9,068,131	
	Total Remittances
	730,300
	Total Aid
	610,800
TOTAL Income Generation	TOTAL HH income
29,590,543	**29,016,000**
Income, Difference (SAM - HHSurvey)/ SAM	**2%**
CONSUMPTION	
21,959,903	18,558,000
Consumption, Difference	**15%**
Consumption by quintile:	
Urban	
q1.- 1,400,177 (6%)	q1.- 1,230,000 (7%)
q2.- 1,820,254 (8%)	q2.- 1,500,000 (8%)
q3.- 2,477,636 (11%)	q3.- 2,070,000 (11%)
q4.- 3,567,427 (16%)	q4.- 3,150,000 (17%)
q5.- 7,036,238 (32%)	q5.- 6,530,000 (35%)
Total: 16,301,732 (74%)	Total: 14,480,000 (78%)
Rural	
q1.- 485,986 (2%)	q1.- 294000 (2%)
q2.- 631,789 (3%)	q2.- 447000 (2%)
q3.- 859,964 (4%)	q3.- 607000 (3%)
q4.- 1,238,221 (6%)	q4.- 910000 (5%)
q5.- 2,442,211 (11%)	q5.- 1820000 (10%)
Total: 5,658,171 (26%)	Total: 4,078,000 (22%)

Annex 4.- CGE model structure

The basic structure of the model can be summarized as follows.[10] Technology is modeled at the top alternatively by a CES or a Leontieff function of value added and aggregate intermediate input. Given the available information on the sectoral behavior in the Ecuadorian economy, we use the Leontieff. Value added is a CES function of primary factors (labor, capital, and land, however we have no land in the model) and the aggregate intermediate input is a Leontieff function of disaggregated intermediate inputs. Each activity can produce more than one commodity following fixed yield coefficients. Also a commodity can be produced by more than one activity.

There are 27 sectors, nine primary or extractive, eight agro-industrial, seven industrial, and three services. These sectors produce 27 commodities, 17 of which are produced by more than one activity.

There are several institutions in the model. The first one, households, receives income from factors and transfers from other institutions (government, the rest of the world, and other households). Consumption income is the residual after paying taxes, savings, and transfers to other institutions, and is spent according to LES demand functions derived from a Stone-Geary utility function.

Households are split into urban and rural and no further division among them is preserved. They derive income from labor and capital, as well as from self-empoyment. However, the latter is attained as a payment from firms and is net of corporate taxes (which are paid for by firms). Inter-household transfers are possible and there are in fact transfers from urban to rural ones. As mentioned, self-employment also generates income for households. While this income arises from labor and capital owned by them, no attempt is made to introduce this distinction, due to lack of reliable data to do so. Instead, self-employment generated income gets the same treatment as income stemming from any factor, a treatment that is consistent with the structure of the microsimulation model.

Enterprises may receive factor income and transfers from other institutions. However, here they only get income from capital. This income is allocated between direct taxes, and transfers to other institutions (households in this case).

The government collects all tax-generated income and derives no income from resources at its own disposition. It expends in acquiring goods -basically services- transfers to households, payments to other regions, and savings. Government consumption is fixed in real terms while transfers to domestic institutions are CPI-indexed, and savings is a residual.

As for factor markets we have the following. There are four labor types, organized by educational level and area of residence. Educational levels comprise no formal education and primary, and secondary and higher. The first group is taken as non-skilled labor and the second as skilled. Any grade attained at each of these levels suffices to classify a person in the category, that is, there is no requirement to have completed the whole set of grades belonging to a category. Each of these types is split into rural and urban, according to the area of residence.

The other factor included is capital. There is no distinction so as to capital types. Also there is no land in this model. This is due to the fact that there is no good quality information for incorporating it into the SAM. As mentioned, self-employment is included explicitly in the model, getting the treatment referred to above.

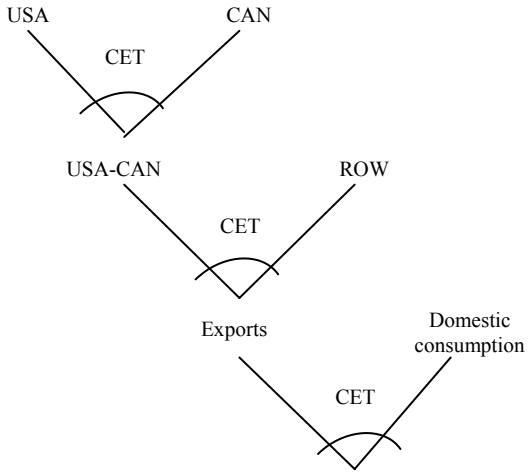
There are three alternative closure rules for factor markets: one in which supplies are inelastic and returns clear the market, one in which there is elastic supply and the employment level clears the market, and one in which there are segmented markets and activities are forced to fully employ their specific factor. Here we employ the first two closure types.

Regarding commodity markets, domestic output is sold in the market and no home consumption is considered. Marketed outputs are imperfectly substitutable under a CES function. Activity-specific commodity prices clear the implicit market for each disaggregated commodity. Aggregated domestic output is allocated between domestic consumption and export through a CET function. Export demands and supplies are infinitely elastic.

[10] This overview is based on Lofgren et al (2002).

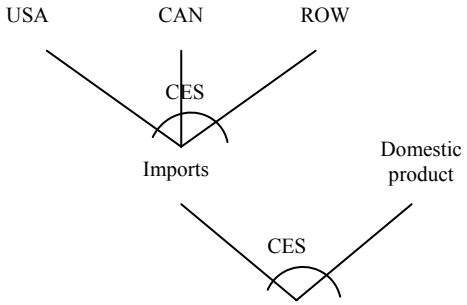
Departing from the basic model, we have three foreign regions in the model, the US, the Andean Community, and the Rest of the World. These are incorporated in a nested structure that allows for a richer modelization of the trade liberalization scenarios considered since it first splits preferential (the US and the Community of Andean Nations) from non- preferential markets (the Rest of the World) and then distinguishes between preferential markets (that is, between the US and the CAN), as shown in Figure 4.1.

Fig. 4.1.- Exports structure in the CGE model



Domestic demand comes from households and government consumption, investment, and intermediate input consumption. Aggregate composite imported commodities and domestic output are imperfect substitutes in demand (using a CES function). Of course, imports are differentiated between the three regions of origin but a single nest structure is used in this case, as illustrated in Figure 4.2.

Fig. 4.2.- Impors structure in the CGE model



There are several taxes in the model. There are taxes on firms (basically a tax on capital earnings), taxes on activities, a value added tax which is also charged to the activities, tariffs, sales taxes (charged on certain commodities), and other taxes paid by households. With the exception of the last one, they are all fixed ad valorem rates. Taxes paid by households (direct taxes) are a fixed share of household income. Their treatment in the model depends on the closure rule in use. As we need fixed government savings, direct tax rates may be either uniformly increased by a certain, endogenous, amount of points for selected institutions or endogenously scaled for selected institutions. In any case government consumption is fixed.

We adapt the basic model for modeling the different alternatives considered for the tax replacement. Firstly, government income is split according to its source (from direct taxes, from sales taxes, from the value-added tax, etc.). Then, effective tax rates are redefined for each tax type. These are the product of the originally modeled effective tax rates and a newly defined variable that may adjust. The latter, when let endogenously vary, allows us to modify the effective tax rate so that the desired constraint is met (in this case, government income).

The general form of the approach is:

TAXAD(S) = taxrate(S) * TAXADJ

where, *taxrate* is the effective tax rate calculated from SAM data (indexed on the appropriate set), *TAXADJ* is the endogenously determined adjustment parameter for the corresponding tax rate type, and *TAXAD* is the resulting effective tax rate. The precise form of this set of equations is provided in the annex.

A limitation of the current procedure is that it operates under the original Lofgren et al (2002) model structure where the VAT is linked to the activities instead of to the commodities. Since we want to model VAT rates that may differ among commodities we have to recourse to auxiliary external calculations to take this feature into account. In particular, we use data from the original Ecuadorian SAM to derive an effective VAT rate for each activity based upon the commodities' VAT rates and the I-O matrix. This allows us to externally recalculate the VAT rate that accrues to each activity when individual commodity VAT rates change. Then this new activity VAT rates are feed back into the model to carry out the simulations. For this we use the following equation:

TVADSIM('A','escenario') = factor(A) * tva('A')

where, TVADSIM defines the VAT rate applied to activity A in each particular scenario, factor(A) is the activity specific factor that adjusts the VAT rate to the desired level (given the changes sought for the commodities VAT rates), and tva is the effective VAT rate obtained from SAM data.

Furthermore, in order to implement the tax replacement mechanism when the VAT and direct taxes are jointly used, we recourse to a new variable, MMULTI, that links the tax types as shown in the equations bellow. In this way, when a mix of the two tax types is used as a tax replacement mechanism, MMULTI is let to be endogenously determined, while the two variables adjusting the corresponding effective tax rates (TINSADJ and TVADADJ, respectively) are appropriately set to the desired tax mix (i.e. they are made exogenous at desired levels between 0 and 1). The procedure draws from Cororaton and Cockburn (2005)

TINS(INSDNG) = tins0(INSDNG) * TINSADJ * MMULTI

TVAD(A) = tva(A) * TVADADJ * MMULTI

An additional aspect regarding the tax structure of the model is that we consider government subsidies to household domestic gas consumption. In Ecuador, while output prices of gas for domestic consumption are fixed by the government, the purchases of such gas (all imported) are in international prices. While there is no practical way of targeting this specific destination of the subsidy (actually anecdotal evidence suggests that sizeable deviations to other uses of this good occur), we simply account for the implicit subsidy to the oil sector as a whole. This approach is convenient and fits our purposes in this study.

Lastly, while foreign savings is originally the difference between foreign currency spending and receipts, in our version of the model we simply split factor transfers to the three foreign regions, on the spending side, and foreign transfers (from each region) to domestic institutions, while foreign savings is kept aggregated.

Annex 5.- CGE model: Key Equations

Price block

Import prices

$$PM_C = \left[\frac{QMUSACAN_C}{QM_C} * pmusacan_{C+} \frac{QMRDM_C}{QM_C} * pmrdm_C \right] + \sum_C PQ_C * icm_C$$

$$PMUSA_C = pwmusa_C * (1 + TIMP_C) * EXP$$

$$PMCAN_C = pwcan_C * (1 + TIMP_C) * EXP$$

$$PMUSACAN_C = \frac{QMUSA_C}{QMUSACAN_C} * pmusa_C + \frac{QMCAN_C}{QMUSACAN_C} * pmcan_C$$

$$PMEDM_C = pwrdm_C * (1 + TIMP_C) * EXP$$

Export prices

$$PE_C = \left[\frac{QEUSACAN_C}{QE_C} * peusacan_C + \frac{QERDM_C}{QE_C} * perdm_C \right] - \sum_C PQ_C * ice_C$$

$$PEUSA_C = pweusa_C * (1 - TEXP_C) * EXP$$

$$PECAN_C = pwecan_C * (1 - TEXP_C) * EXP$$

$$PEUSACAN_C = \frac{QEUSA_C}{QEUSACAN_C} * peusa_C + \frac{QECAN_C}{QEUSACAN_C} * pecan_C$$

$$PERDM = pwerdm_C * (1 - TEXP_C) * EXP$$

Absorption

$$PQ_C * (1 - TCOM_C) * QQ_C = PDD_C * QD_C + PM_C * QM_C$$

Production and Trade block

Output Transformation

$$QE_C = \alpha^f_{usacanrdm_C} * \left[\delta^f_{usacanrdm_C} * QEUSACAN_C^{\rho^f_{usacanrdm_C}} + (1 - \delta^f_{usacanrdm_C}) * QERDM_C^{\rho^f_{usacanrdm_C}} \right]^{\frac{1}{\rho^f_{usacanrdm_C}}}$$

$$QEUSACAN_C = QERDM * \left[\frac{PEUSACAN_C}{PERDM_C} * \frac{(1-\delta^f_{usacanrdm_C})}{\delta^f_{usacanrdm_C}} \right]^{\frac{1}{\rho^f_{usacanrdm_C}}-1}$$

$$QEUSA_C = QECAN_C * \left[\frac{PEUSA_C}{PECAN_C} * \frac{(1-\delta^f_{usacan_C}}{\delta^f_{usacan_C}} \right]^{\frac{1}{\rho^f_{usacan_C}}-1}$$

Composite supply

$$QM_C = \alpha^q_{usacanrdm_C} * \left[\delta^q_{usacanrdm_C} * QMUSACAN_C^{-\rho^q_{usacanrdm_C}} \right.$$

$$\left. + (1-\delta^q_{usacanrdm_C}) * QMRDM_C^{-\rho^q_{usacanrdm_C}} \right]^{-\frac{1}{\rho^q_{usacanrdm_C}}}$$

$$QMUSACAN_C = QMRDM_C * \left[\frac{PMRDM_C}{PMUSACAN_C} * \frac{\delta^q_{usacanrdm_C}}{(1-\delta^q_{usacanrdm_C})} \right]^{\frac{1}{(1+\rho^q_{usacanrdm_C})}}$$

$$QMUSA_C = QMCAN_C * \left[\frac{PMCAN_C}{PMUSA_C} * \frac{\rho^q_{usacan_C}}{(1-\rho^q_{usacan_C})} \right]^{\frac{1}{(1+\rho^q_{usacan_C})}}$$

Institution block

Institutional factor incomes

$$YIF_{i,f} = shif_{i,f} * \lfloor (1-TFAC_f) * YF_f - (trnsf_{USA,f} + trnsf_{CAN,f} + trnsf_{RDM,f}) * EXP \rfloor$$

Income of domestic non-governmental institutions

$$YI_{i,f} = \sum_f YIF_{i,f} + \sum_i TRII_{i,f} + trnsf_{i,gov} * CPI + (trnsf_{i,USA} + trnsf_{i,CAN} + trnsf_{i,RDM}) * EXP$$

Goverrntment revenue

$$YG = \sum_i TINS_i * YI_i + YGF + YGVA + YGACT + YGTARM + YGTARE + YGQQ + YGIF + YGTR$$

$$YGINODNG = \sum_i TINS_i * YI_i$$

$$YGF = \sum_f TFAC_f * YF_f$$

$$YGACT = \sum_a TVAD_a * PVA_a * QVA_a$$

$$YGTARM = \sum_C TIMP_C * pwm_C * QM_C * EXP$$

$$YGTARE = \sum_C TEXP_C * pwe_C * QE_C * EXP$$

$$YGQQ = \sum_C TCOM_C * PQ_C * QQ_C$$

$$YGIF = \sum_f YIF_{gov,f}$$

$$YGTR = (trnsf_{gov,USA} + trnsf_{gov,CAN} + trnsf_{gov,RDM}) * EXP$$

System constraint block

Current account balance of foreign regions

$$\sum_C pwm_C * QM_C + \sum_f (trnsf_{USA,f} + trnsf_{CAN,f} + trnsf_{RDM,f})$$

$$= \sum_C pwe_C * QE_C + \sum_i (trnsf_{i,USA} + trnsf_{i,CAN} + trnsf_{i,RDM}) + FSAV$$

Taxes

$$TINS_i = FINS_i * TINSADJ * MMULTI$$

$$TFAC_f = F_f * TFACADJ$$

$$TVAD_a = fva_a * TVADADJ * MMULTI$$

$$TACT_a = fa_a * TACTADJ$$

$$TIMP_C = fm_C * TIMPADJ$$

$$TEXP_C = fe_C * TEXPADJ$$

$$TCOM_C = fq_C * TCOMADJ$$

Annex 6.- Additional Tables

Table A6.1.- Wage-worker Regressions
OLS

Dependent variable is log of annual wage income for wage-earners

Variables	Labor market categories			
	Urban skilled	Urban un-skilled	Rural skilled	Rural unskilled
Gender	0.19926 **	0.32284 **	0.24373 *	0.38142 **
	[4.59]	[6.65]	[2.17]	[7.82]
Schooling (years)	0.25296 **	0.12832 **	-0.13948	0.07368 **
	[2.8]	[4.25]	[-0.81]	[4.02]
Schooling squared	-0.00408	-0.00619 **	0.01075	-0.00347
	[-1.34]	[-2.61]	[1.78]	[-1.93]
Head	0.26063 **	0.31975 **	0.27353 *	0.20495 **
	[5.84]	[6.84]	[2.53]	[4.36]
Marital status	0.26798 **	0.17500 **	0.16093	0.20488 **
	[6.45]	[3.96]	[1.32]	[4.82]
Nchild18	-0.03864 *	-0.03791 **	-0.00618	-0.00963
	[-2.47]	[-3.07]	[-0.24]	[-1.19]
Age (years)	0.02379 **	0.01286 **	0.02920 **	0.00515 **
	[13.42]	[8.50]	[5.28]	[3.55]
Constant	4.17123 **	5.96836 **	6.25778 **	6.14757 **
	[6.29]	[47.46]	[5.41]	[68.25]
Sample size	4,101	3,630	913	4353
R-square	0.30	0.14	0.29	0.11

Source: Authors' estimations based on Household Survey data 2005-2006 from INEC.
Notes: Values of t statistics in brackets. * significant at 5%, ** significant at 1%.

Table A6.2.- Earnings regression for Self-Employment
OLS

Dependent variable is log of annual earnings (profits) for self-employed income-earners, by household

Variables	Labor market categories	
	Urban	Rural
Gender, head	0.50307 **	0.24877 **
	[6.11]	[3.29]
Age, head (years)	0.00348	0.00656 **
	[1.77]	[4.1]
Schooling, head (years)	0.07465 **	0.06534 **
	[3.77]	[3.92]
Schooling squared, head	0.00150	-0.00061
	[1.52]	[-0.53]
Marital status, head	-0.07593	0.31457 **
	[-0.98]	[4.31]
landsize	0.00413	0.00023
	[1.59]	[0.68]
N_m (1)	1.24003 **	1.09157 **
	[30.07]	[34.55]
Constant	4.66665 **	4.87521 **
	[30.12]	[39.7]
Sample size	4,617	5,330
R-square	0.31	0.29

Source: Authors' estimations based on Household Survey data 2005-2006 from INEC.
Notes: Values of t statistics in brackets. * significant at 5%, ** significant at 1%.
N_m is the number of household member who work as self-employed.

Table A6.3.- Wage-worker Regressions
Two-Stage Heckman

Variables	Labor market categories							
	Urban skilled				Urban unskilled			
	log wage		dummy wage (1)		log wage		dummy wage (1)	
Gender	-0.1559	**	0.3874	**	0.3444	**	0.7536	**
	[-3.33]		[16.68]		[7.15]		[31.18]	
Schooling (years)	0.1073		0.0840	**	0.1282	**	-0.0035	
	[1.25]		[16.63]		[4.25]		[-0.7]	
Schooling squared	-0.0018				-0.0062	**		
	[-0.62]				[-2.61]			
Head	0.2630	**			0.3193	**		
	[6.33]				[6.82]			
Marital status	0.2389	**	-0.0181		0.1838	**	0.3140	**
	[5.4]		[-0.7]		[4.18]		[11.57]	
Nchild18	-0.0385	**			-0.0379	**		
	[-2.66]				[-3.07]			
Age (years)	0.0251	**	-0.0048	**	0.0126	**	-0.0078	**
	[13.49]		[-4.96]		[8.37]		[-11.6]	
Constant	6.9323	**	-1.2126	**	5.9152	**	-0.8018	**
	[10.96]		[-16.45]		[46.81]		[-16.6]	
Sample size	8,348				12,646			
	Rural skilled				Rural unskilled			
	log wage		dummy wage (1)		log wage		dummy wage (1)	
Gender	-0.4332	**	0.5454	**	0.3809	**	1.0600	**
	[-4.35]		[10.36]		[7.65]		[43.74]	
Schooling (years)	-0.2744	*	0.0743	**	0.0737	**	-0.0222	**
	[-1.99]		[6.72]		[4.03]		[-4.53]	
Schooling squared	0.0120	*			-0.0035			
	[2.49]				[-1.93]			
Head	0.2508	**			0.2050	**		
	[2.81]				[4.37]			
Marital status	0.2044		-0.0785		0.2048	**	0.2462	**
	[1.8]		[-1.36]		[4.85]		[9.17]	
Nchild18	-0.0428	*			-0.0096			
	[-2.35]				[-1.19]			
Age (years)	0.0263	**	0.0039		0.0052	**	-0.0134	**
	[4.96]		[1.58]		[3.63]		[-17.87]	
Constant	9.6066	**	-1.4384	**	6.1484	**	-0.6845	**
	[10.22]		[-9.55]		[65.27]		[-15.27]	
Sample size	1,989				15,334			

Source: Authors' estimations based on Household Survey data 2005-2006 from INEC.
Notes: Values of t statistics in brackets. * significant at 5%, ** significant at 1%. Dummy variable that takes the value of 1 if the individual is wage earner, 0 otherwise.

Table A6.4.- Earnings functions for Self-Employment
Two-Stage Heckman

Variables	Labor market categories					
	Urban			Rural		
	log earnings		dummy earnings (1)	log earnings		dummy earnings (1)	
Gender, head	0.4235	**	0.0694	0.3849	**	-0.2249	**
	[4.93]		[1.85]	[5.04]		[-5.06]	
Age, head (years)	-0.0083	**	0.0116 **	0.0025		0.0116	**
	[-4.09]		[16.69]	[1.55]		[14.2]	
Schooling, head (years)	0.0808	**	-0.0142 **	0.0718	**	-0.0346	**
	[4.33]		[-5.97]	[4.38]		[-9.27]	
Schooling squared, head	0.0021	*		0.0004			
	[2.3]			[0.39]			
Marital status, head	-0.4077	**	0.3392 **	0.0080		0.5918	**
	[-5.11]		[9.62]	[0.11]		[13.3]	
landsize	0.0060	*		0.0003			
	[2.43]			[0.81]			
N_m (1)	1.1101	**		1.0624	**		
	[26.54]			[33.11]			
Constant	6.5991	**	-0.3974 **	5.4234	**	0.5240	**
	[39.03]		[-7.73]	[44.67]		[9.4]	
Sample size	7,422			6,017			

Source: Authors' estimations based on Household Survey data 2005-2006 from INEC.
Notes: Values of t statistics in brackets. * significant at 5%, ** significant at 1%.
Dummy variable that takes the value of 1 if the individual is self-employed, 0 otherwise.

Table A6.5.- Occupational Choice Model

Variables	Demografic groups											
	Head				Spouse				Others			
	Occupational Choices				Occupational Choices				Occupational Choices			
	1		2		1		2		1		2	
Gender	0.7616	**	1.3424	**	1.2646	**	2.3497	**	0.6939	**	0.9937	**
	[6.45]		[12.16]		[4.35]		[9.13]		[9.27]		[22.37]	
Schooling (years)	0.0913	**	0.1141	**	0.0872	**	-0.0209		-0.1832	**	-0.1007	**
	[3.56]		[4.56]		[4.09]		[-0.84]		[-6.35]		[-5.21]	
Schooling squared	-0.0002		0.0009		-0.0018		0.0101	**	0.0145	**	0.0114	**
	[-0.10]		[0.61]		[-1.42]		[7.42]		[9.16]		[10.59]	
Marital status	0.0378		0.4368	**	12.4342	**	11.3028	**	1.2646	**	0.6937	**
	[0.32]		[3.96]		[70.14]		[87.76]		[13.77]		[11.06]	
Nchild18	0.2002	**	0.3388	**	0.0439	*	0.0242		-0.1883	**	-0.0361	**
	[6.40]		[11.13]		[2.48]		[1.05]		[-7.54]		[-2.9]	
Own family business	5.3063	**	-0.2306	**	3.1131	**	-0.4223	**	3.7471	**	-0.3080	**
	[29.68]		[-2.82]		[20.63]		[-5.76]		[11.34]		[-6.09]	
Aid and remittances	0.0000		-0.0004	**	0.0000		-0.0005	**	0.0000		-0.0006	**
	[-1.15]		[-6.55]		[0.34]		[-3.65]		[0.19]		[-4.36]	
Constant	-4.5476	**	-1.0185	**	16.3870		12.8799		-5.2893	**	-0.9523	**
	[-22.18]		[-9.18]						[-15.03]		[-9.70]	
Sample size	13,438		13,438		9,428		9,428		15,451		15,451	

Source: Authors' estimations based on INEC'S 2005-06 Household Survey data.
Notes: Values of t statistics in brackets. * significant at 5%, ** significant at 1%.
Choices: 0 inactive or unemployed, 1 self-employed, 2 wage earners.

Table A6.6.- Ecuador: Impacts on Poverty indices for each scenario
Assuming unemployment for unskilled wage-workers

Scenario i.a: Adjustment in the VAT rate preserving its current structure

	Bellow one dollar a day			Bellow two dollars a day		
	FGT (0)	FGT(1)	FGT(2)	FGT (0)	FGT(1)	FGT(2)
Total Households	14.46%	0.105	7.536	35.21%	0.177	1.990
Rural Households	21.75%	0.093	0.085	49.21%	0.229	0.147
Urban Households	10.65%	0.111	11.430	27.90%	0.150	2.953
Hhd, headed by male	13.20%	0.087	7.729	33.84%	0.162	2.026
Hhd. hedaded by female	19.26%	0.172	6.802	40.42%	0.234	1.852

Scenario i.b: Adjustment in the VAT rate eliminating current exemptions

	Bellow one dollar a day			Bellow two dollars a day		
	FGT (0)	FGT(1)	FGT(2)	FGT (0)	FGT(1)	FGT(2)
Total Households	14.58%	0.105	7.535	35.24%	0.178	1.990
Rural Households	22.16%	0.095	0.087	49.30%	0.231	0.150
Urban Households	10.62%	0.111	11.428	27.89%	0.150	2.952
Hhd, headed by male	13.34%	0.088	7.728	33.87%	0.163	2.027
Hhd. hedaded by female	19.30%	0.173	6.803	40.44%	0.235	1.853

Scenario i.c: Adjustment in the VAT rate, using a flat rate for all goods

	Bellow one dollar a day			Bellow two dollars a day		
	FGT (0)	FGT(1)	FGT(2)	FGT (0)	FGT(1)	FGT(2)
Total Households	14.80%	0.107	7.532	35.42%	0.179	1.991
Rural Households	22.80%	0.098	0.089	49.84%	0.235	0.153
Urban Households	10.62%	0.111	11.421	27.88%	0.150	2.951
Hhd, headed by male	13.57%	0.089	7.723	34.06%	0.164	2.026
Hhd. hedaded by female	19.48%	0.175	6.804	40.57%	0.236	1.854

Scenario ii: Tax replacement using a mixture of the change in the VAT system and an increase in direct taxes

	Bellow one dollar a day			Bellow two dollars a day		
	FGT (0)	FGT(1)	FGT(2)	FGT (0)	FGT(1)	FGT(2)
Total Households	14.38%	0.104	7.533	35.14%	0.177	1.989
Rural Households	21.56%	0.092	0.084	49.06%	0.228	0.147
Urban Households	10.62%	0.111	11.426	27.87%	0.150	2.952
Hhd, headed by male	13.10%	0.087	7.725	33.78%	0.162	2.025
Hhd. hedaded by female	19.22%	0.172	6.802	40.31%	0.234	1.852

Scenario iii: Change in the VAT system is replaced by a (sole) change in direct taxes to make up for tariff revenue loss

	Bellow one dollar a day			Bellow two dollars a day		
	FGT (0)	FGT(1)	FGT(2)	FGT (0)	FGT(1)	FGT(2)
Total Households	14.38%	0.104	7.532	35.14%	0.176	1.989
Rural Households	21.56%	0.092	0.084	49.06%	0.228	0.146
Urban Households	10.62%	0.111	11.424	27.87%	0.150	2.952
Hhd, headed by male	13.10%	0.087	7.724	33.78%	0.161	2.025
Hhd. hedaded by female	19.22%	0.172	6.802	40.31%	0.233	1.852

Source: Author's estimations using Ecuador 2005-06 Household Survey.

Table A6.6 (end).- Ecuador: Impacts on Poverty indices for each scenario
Assuming full employment

Scenario i.a: Adjustment in the VAT rate preserving its current structure

	Bellow one dollar a day			Bellow two dollars a day		
	FGT (0)	FGT(1)	FGT(2)	FGT (0)	FGT(1)	FGT(2)
Total Households	14.38%	0.103	7.535	35.36%	0.177	1.989
Rural Households	21.45%	0.090	0.083	49.01%	0.227	0.145
Urban Households	10.68%	0.110	11.429	28.23%	0.150	2.953
Hhd, headed by male	13.15%	0.086	7.728	33.96%	0.162	2.026
Hhd. hedaded by female	19.07%	0.170	6.801	40.72%	0.233	1.850

Scenario i.b: Adjustment in the VAT rate eliminating current exemptions

	Bellow one dollar a day			Bellow two dollars a day		
	FGT (0)	FGT(1)	FGT(2)	FGT (0)	FGT(1)	FGT(2)
Total Households	14.51%	0.104	7.534	35.44%	0.178	1.990
Rural Households	21.91%	0.092	0.085	49.26%	0.230	0.148
Urban Households	10.64%	0.110	11.427	28.22%	0.150	2.952
Hhd, headed by male	13.29%	0.087	7.727	34.04%	0.163	2.026
Hhd. hedaded by female	19.12%	0.171	6.801	40.77%	0.234	1.851

Scenario i.c: Adjustment in the VAT rate, using a flat rate for all goods

	Bellow one dollar a day			Bellow two dollars a day		
	FGT (0)	FGT(1)	FGT(2)	FGT (0)	FGT(1)	FGT(2)
Total Households	14.72%	0.105	7.530	35.54%	0.179	1.990
Rural Households	22.65%	0.096	0.087	49.91%	0.235	0.152
Urban Households	10.58%	0.110	11.420	28.03%	0.150	2.950
Hhd, headed by male	13.52%	0.088	7.722	34.16%	0.164	2.026
Hhd. hedaded by female	19.30%	0.173	6.803	40.78%	0.235	1.853

Scenario ii: Tax replacement using a mixture of the change in the VAT system and an increase in direct taxes

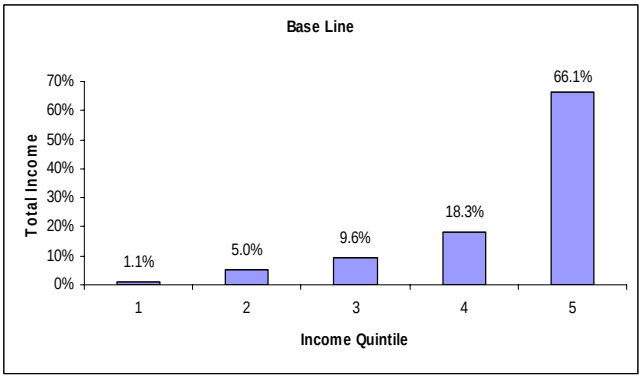
	Bellow one dollar a day			Bellow two dollars a day		
	FGT (0)	FGT(1)	FGT(2)	FGT (0)	FGT(1)	FGT(2)
Total Households	14.30%	0.103	7.533	35.26%	0.176	1.988
Rural Households	21.33%	0.089	0.082	48.91%	0.225	0.144
Urban Households	10.62%	0.110	11.426	28.13%	0.150	2.952
Hhd, headed by male	13.05%	0.085	7.725	33.84%	0.161	2.024
Hhd. hedaded by female	19.05%	0.170	6.800	40.67%	0.232	1.850

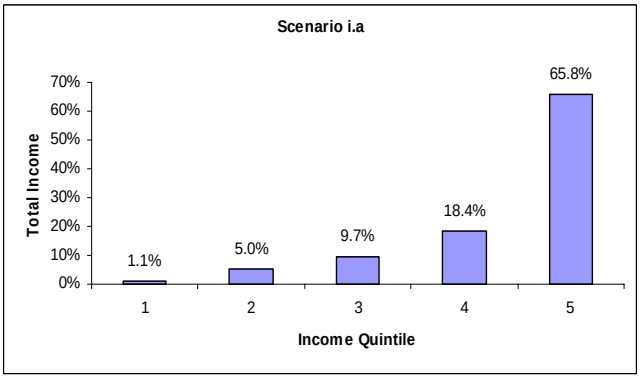
Scenario iii: Change in the VAT system is replaced by a (sole) change in direct taxes to make up for tariff revenue loss

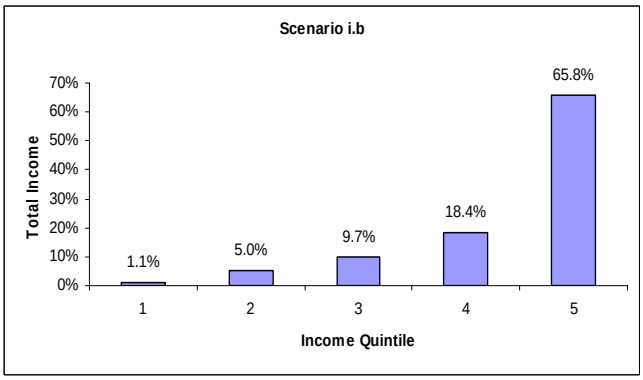
	Bellow one dollar a day			Bellow two dollars a day		
	FGT (0)	FGT(1)	FGT(2)	FGT (0)	FGT(1)	FGT(2)
Total Households	14.25%	0.103	7.532	35.23%	0.176	1.988
Rural Households	21.26%	0.089	0.082	48.88%	0.225	0.144
Urban Households	10.59%	0.110	11.425	28.09%	0.150	2.951
Hhd, headed by male	13.02%	0.085	7.724	33.80%	0.161	2.024
Hhd. hedaded by female	18.95%	0.169	6.800	40.65%	0.232	1.850

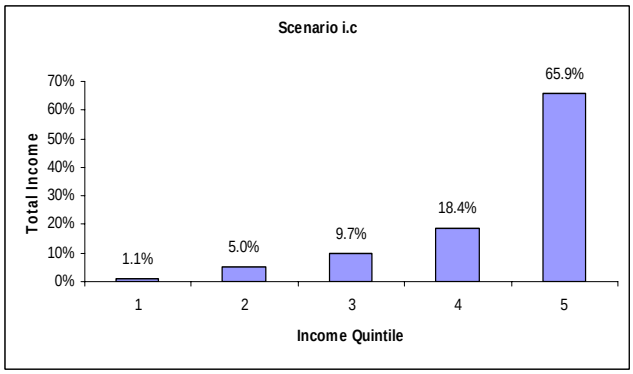
Source: Author's estimations using Ecuador 2005-06 Household Survey.

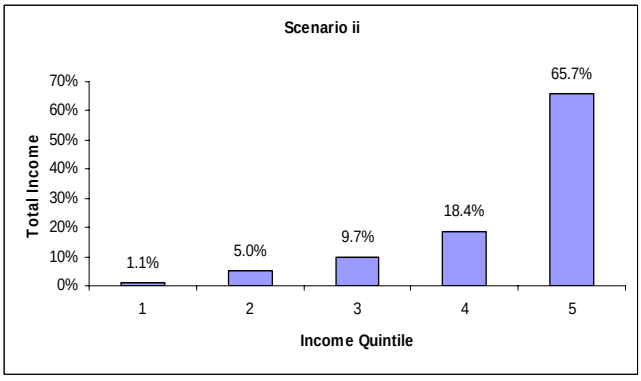
Figure A6.1- Impacts on Income Distribution
Assuming Unemployment for Unskilled Wage Workers

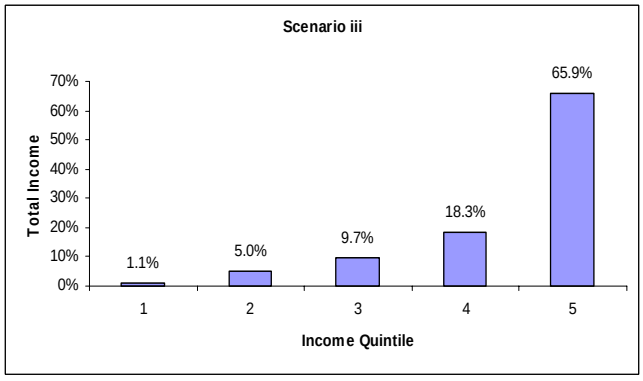






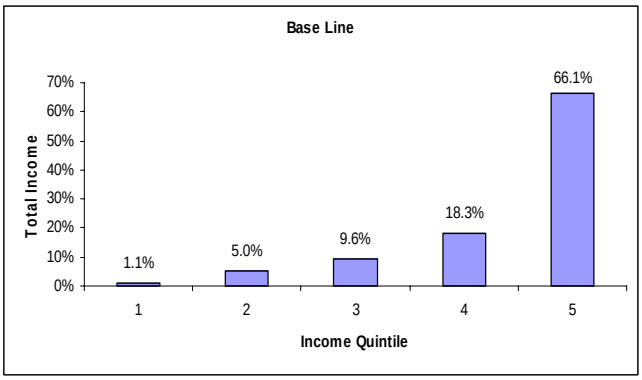


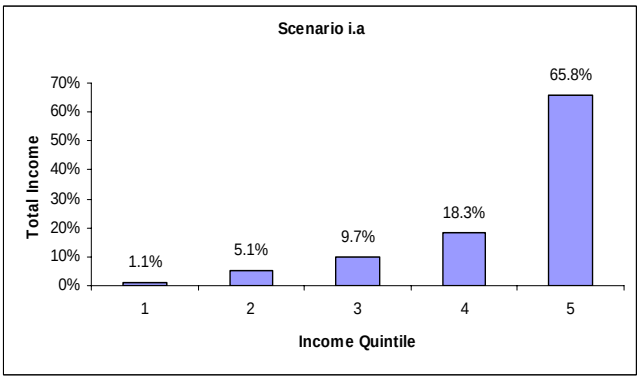


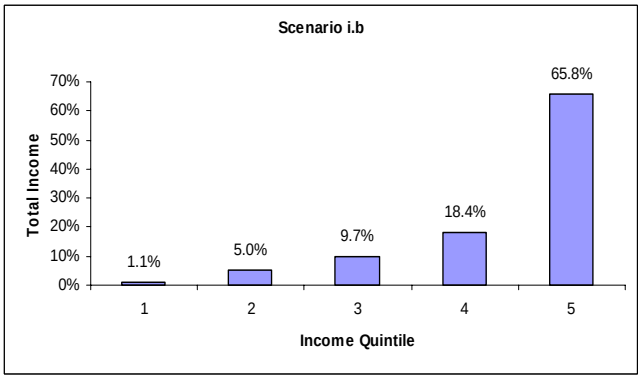


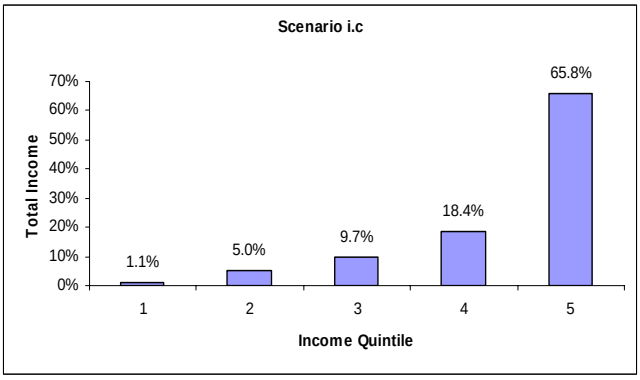
Notes:
Base Line: Own calculations using Income data from Ecuador 2005-06, Household Survey.
Scenario i.a: Adjustment in the VAT rate preserving its current structure.
Scenario i.b: Adjustment in the VAT rate eliminating current exemptions.
Scenario i.c: Adjustment in the VAT rate, using a flat rate for all goods.
Scenario ii: Tax replacement using a mixture of the change in the VAT system and an increase in direct taxes.
Scenario iii: Change in the VAT system is replaced by a (sole) change in direct taxes to make up for tariff revenue loss.

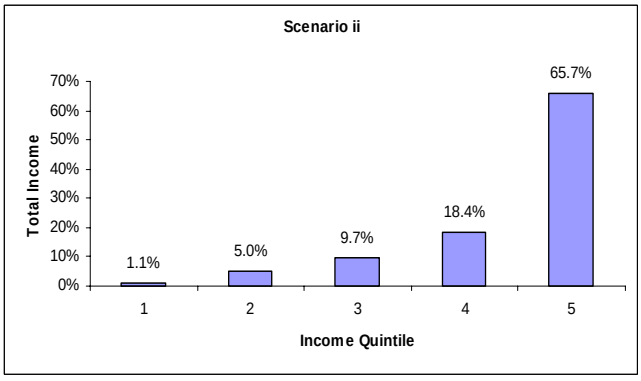
Figure A6.1.- (end) Impacts on Income Distribution
Assuming Full Employment

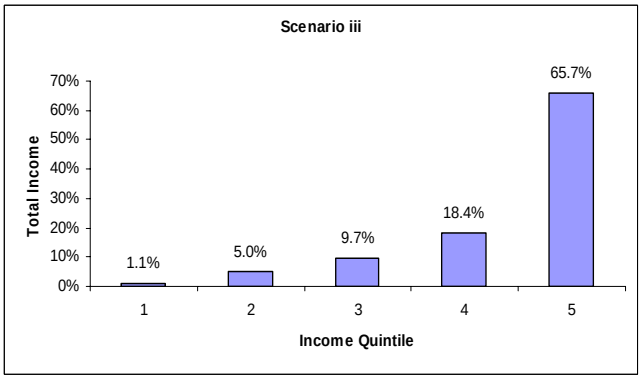












Notes:
Base Line: Own calculations using Income data from Ecuador 2005-06, Household Survey.
Scenario i.a: Adjustment in the VAT rate preserving its current structure.
Scenario i.b: Adjustment in the VAT rate eliminating current exemptions.
Scenario i.c: Adjustment in the VAT rate, using a flat rate for all goods.
Scenario ii: Tax replacement using a mixture of the change in the VAT system and an increase in direct taxes.
Scenario iii: Change in the VAT system is replaced by a (sole) change in direct taxes to make up for tariff revenue loss.