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## ARTÍCULO

# IMF PROPOSED TAX REFORMS IN ECUADOR: A GENERAL EQUILIBRIUM ANALYSIS

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**Ramírez-Álvarez, J., Feijoó, G., & Maldonado-Hidrobo, K. (2025). IMF proposed tax reforms in Ecuador: A general equilibrium analysis. *Cuadernos de Economía*, *44*(95), 677-703.**

This paper evaluates ex-ante the macroeconomic effects that a possible tax reform of the Value Added Tax and Income Tax for firms and individuals would generate in the Ecuadorian economy within the 2020 IMF technical agreement to increase the tax resources given the COVID-19 crisis. A static Computable General Equilibrium Model is developed with updated information from the Social Accounting

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Matrix up to 2019. The results suggest that a tax increase would generate more income for the Government, but at the same time, it would contract the economy and slightly increase income inequality.

**Keywords:** Value added tax; corporate income tax; computable general equilibrium model; ex-ante evaluation.
**JEL:** H20, H24, H25, C68.

**Ramírez-Álvarez, J., Feijoó, G., & Maldonado-Hidrobo, K. (2025). Reformas tributarias propuestas por el Fondo Monetario Internacional en Ecuador: un análisis de equilibrio general. *Cuadernos de Economía*, *44*(95), 677-703.**

Este artículo evalúa ex-ante los efectos macroeconómicos que generaría una posible reforma tributaria al impuesto al valor agregado y al impuesto a la renta para empresas y personas en la economía ecuatoriana, en el marco del Acuerdo Técnico con el Fondo Monetario Internacional del 2020. Para ello, se desarrolla un modelo de equilibrio general computable estático con información de la Matriz de Contabilidad Social al 2019. Como era de esperarse, los resultados muestran que un incremento de impuestos generaría mayores ingresos al Estado, sin embargo, contraería el aparato económico y aumentaría ligeramente la desigualdad de la renta.

**Palabras clave:** impuesto al valor agregado; impuesto a la renta; modelo de equilibrio general computable; evaluación ex-ante.
**JEL:** H20, H24, H25, C68.

# INTRODUCTION

The coronavirus pandemic (SARS-CoV-2) caused the most outstanding health, economic, and social crisis since World War II. (ECLAC, 2020). In 2020, the world economy suffered a contraction of 3.5% of the Gross Domestic Product (GDP). More than 90% of the economies went into recession, with the Latin American region being one of the most affected, with a 6.8% decrease in the GDP (Akyüz, 2021).

To combat the effects of the pandemic, countries in the Latin American and Caribbean region implemented fiscal policy strategies to strengthen health systems and provide liquidity to businesses and households. These policies consisted of deferring and reducing various taxes, which led to a decrease in tax collection and repercussions on the fiscal revenues of many governments. Thus, some countries in the region had to request financing from multilateral organisations such as the International Monetary Fund (IMF) in order to obtain the necessary resources to face the COVID-19 crisis (ECLAC, 2020).

In May 2020, the IMF approved loan requests for Bolivia, Ecuador, El Salvador, Paraguay, and other countries through Rapid Financing Instruments, which provided emergency financial assistance to support balance of payments needs and the most affected sectors. To resume its relationship with the IMF, the Government of Ecuador signed a technical agreement in October 2020 that proposes changes in public finances, the remuneration regime, and the tax system. The reforms proposed by the IMF focused on the two highest revenue taxes for the State: Value Added Tax (VAT) and Income Tax (IT). For 2019, these two taxes generated approximately 70% of tax revenues (Servicio de Rentas Internas, 2020).

Within the framework of the technical agreement, the IMF proposed an increase of three percentage points to the Value Added Tax (VAT), the elimination of the tax credit of the Foreign Currency Outflow Tax (FCOT) in the payment of the Corporate Income Tax (CIT), and the removal of tax exemptions in the Personal Income Tax (PIT). According to the IMF, these reforms are expected to generate growths of 1.25%, 0.30%, and 0.49% of the GDP, respectively (IMF, 2020).

Under the Ecuadorian Constitution, these reforms may be controversial because the tax system must sustain the economy's efficiency, fiscal sufficiency, and progressiveness. This situation becomes relevant when considering the guidelines of the Ecuadorian Development Plan, which stresses the importance of these principles in the tax system.

In this context, this study aims to answer the following questions: What are the possible effects of tax reform on VAT and IT in Ecuador? What is the incidence of eliminating FCOT credit on the value added? What is the revenue effect of increasing the VAT rate by 3%? To what extent are the changes in IT and VAT regressive?

The main objective of this research is to evaluate ex-ante the macroeconomic effects of a possible tax reform of VAT, CIT, and PIT on the Ecuadorian economy within

the framework of the technical agreement with the IMF of October 2020. For this purpose, we built a static Computable General Equilibrium Model (CGEM) with 21 productive sectors, 10 representative households divided by income deciles, two factors of production, one external sector, and the Government. This model was calibrated with information from the updated Social Accounting Matrix (SAM) in 2019.

The paper is structured as follows. Section one examines some ex-ante evaluations of tax reforms made in the region and their main results. Section two describes the design, construction, and calibration of the CGEM used in the present study. Section three defines the tax policy scenarios and analyses the model simulations on the GDP, tax revenues, household consumption, and income inequality. Finally, section four presents the conclusions of the study.

# LITERATURE REVIEW

Several CGEM applications have been conducted worldwide to evaluate development and tax policies. Table 1 shows the most recent applications in the last 10 years to quantify ex-ante the possible macroeconomic effects of a change in VAT, CIT, or PIT. In summary, these studies show that reducing the VAT would increase household income, total consumption, and the population's living standards, along with exports and investment. On the contrary, an increase in the VAT would contract domestic production, reduce real wages, and increase inequality; however, it would generate higher revenues for the State. Regarding the income tax, an increase in the PIT would affect household income and have a relatively small impact on poverty and inequality. On the other hand, a reduction in the CIT would increase production and household income and generate an almost null effect on prices. It would also cause a slight increase in income inequality.

**Table 1.**
Ex-ante empirical evidence

| Reference/ Country | Scenarios | Results | Dimensions |
|---|---|---|---|
| Mardones (2010), Chile | VAT reduction and the increase in PIT for the wealthiest quintile | The VAT rate reduction increases the disposable income of the 5 most representative households. Even though all quintiles increase consumption, the change in quintile 1 is lower. On the other hand, the increase in PIT raises the disposable income of the first four quintiles. | 13 industries, 5 households (ranked by income quintile), the rest of the world, and the Government |

(*Continued*)

| Reference/ Country | Scenarios | Results | Dimensions |
|---|---|---|---|
| Sajadifar et al. (2012). Iran | VAT increase | Government revenue increases significantly, but household welfare declines. According to the authors, the VAT increase reduces the GDP, so they recommend increasing the VAT rate gradually. | 5 industries, households (urban and rural), Government, and the rest of the world |
| Amir et al. (2013), Indonesia | PIT and CIT reduction | Economic growth has a small positive impact under the balanced budget condition. There is also a minor impact on poverty and income inequality, as mainly higher-income households benefit. | 24 industries, 200 households (classified by income quantiles and area), Government, and the rest of the world |
| Oduber and De Moraes (2014), Colombia | VAT and PIT increase | Mainly GDP increases in the short and long term. According to the author, tax reform does not guarantee remarkable economic growth and improvement for development indicators. | 61 industries, 66 households (classified by area and income), Government, and the rest of the world |
| Bhattarai et al. (2017), United States | CIT reduction | There are significant positive effects on production, imports, exports, investment, capital formation, employment, and household welfare (for almost all deciles). | 27 industries, 10 households (classified by income quintiles),externalsector, and Government |
| Sotomayor (2017), Ecuador | VAT, CIT, and PIT increase | The VAT increase is the one that most contracted economic and social indicators. It reduces production, real wages, and household welfare. | 32 industries, 10 households (classified by income deciles), external sector, and Government |
| Benjasak and Bhattarai (2019), Thailand | VAT increase and CIT reduction | The VAT increase reduces the public deficit, raising household utility from the consumption of public goods. It also increases prices and reduces production in some sectors. On the other hand, the decline in the CIT rate increases production and household utility, generates almost no effect on prices, and raises public welfare. | 18 industries, one representative household, the external sector, and the Government |

(*Continued*)

| Reference/ Country | Scenarios | Results | Dimensions |
|---|---|---|---|
| Aminu (2019), Nigeria | VAT increase that ensures maximum revenue generation | Positive effects on the real GDP, investment, imports, government spending, household consumption, and government revenues in the middle-term. | 5 industries, 6 households (classified by poverty status and area), external sector, and Government |
| Bhattarai et al. (2019), Vietnam | VAT increase and CIT reduction | The VAT increase reduces household consumption, local demand, and the income from labour and capital. On the other hand, the reduction in the CIT generates not only additional production but also revenue for the Government. The only adverse effect is an insignificant increase in income inequality. | 33 industries, 5 households (classified by income quintiles),externalsector, and Government |

# METHODOLOGICAL STRATEGY: GENERAL EQUILIBRIUM MODEL

CGEMs are macroeconomic tools based on microeconomic theory, as they allow the representation of rational economic agents in various markets. These tools consider the real and nominal exchange through which agents participate in the economic system, as well as the public policies that pre-establish their welfare and whose modification becomes the researchers' interest (Burfisher, 2011; Dixon & Jorgenson, 2013).

In Ecuador, during the last three decades, several public policy evaluation studies have been carried out using a CGEM (Acosta & Pérez, 2005; Fargeix & Sadoulet, 1990; Jácome & Cicowiez, 2012; Kouwenaar, 1988; Ponce et al., 2010; Ramirez, 2007; Vos & León, 2003). These studies represent a solid theoretical basis to guide the design of equilibrium models for the Ecuadorian economy and to evaluate the effects of a possible tax reform.

Based on this literature, a static CGEM was constructed with particular attention to the VAT, CIT, and PIT, using macroeconomic information for 2019. The structure of the model follows the circular flow shown in figure 1, which involves the following agents: External sector, Government, 10 representative households divided by deciles $H = \{h_1, h_2, \dots, h_{10}\}$ and 21 productive sectors $J = \{j_1, j_2, \dots, j_{21}\}$ (see Appendix 2). These economic agents trade in 21 goods markets $I = \{i_1, i_2, \dots, i_{21}\}$, and two factor markets: labour and capital.

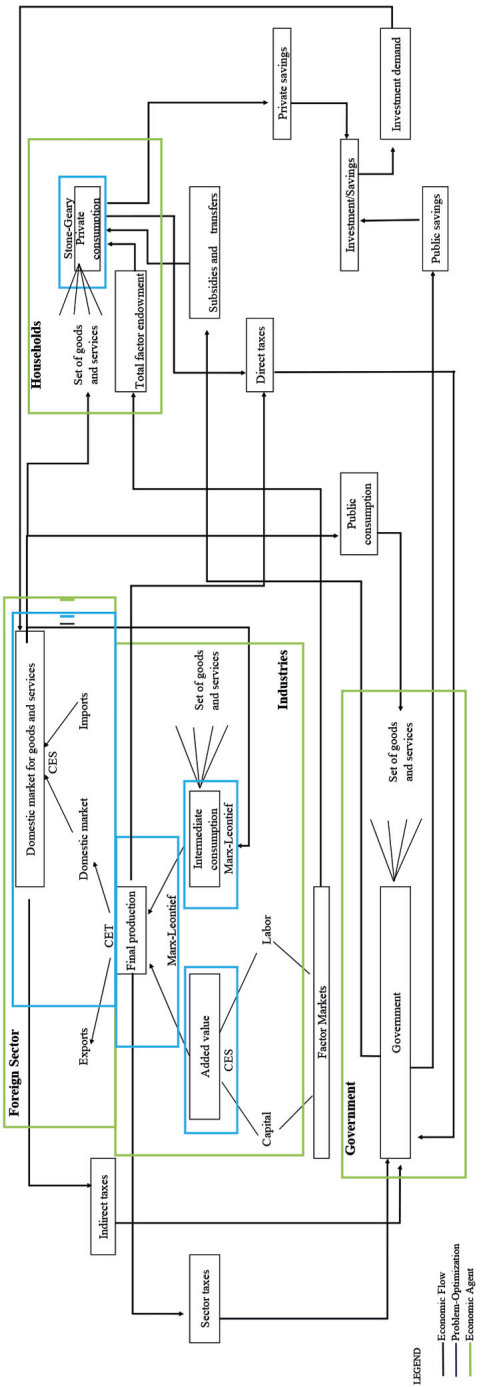



**Figure 1.**
Circular flow of the model

The model follows the main neoclassical assumptions: small open economy, the rationality of economic agents, technologies with constant returns to scale, and perfectly competitive markets. It also considers that goods and factor markets reach equilibrium through price adjustment without rigidities or market failures. Additionally, it is assumed that economic agents are representative. The design and calibration of the model are detailed below.

## Design

The price system of the model considers 5 fiscal policy instruments for each good $i \in I$: sectional taxes $t_i^{scn}$, customs duties $t_i^{dut}$, VAT rate $t_i^{VAT}$, other consumption taxes $t_i^{cons}$, and subsidies $sb_i$. These fiscal instruments make it possible to define producer prices $p_i^Q$, import prices $p_i^M$, and supply prices of goods $p_i^S$.

$$\begin{aligned} p_i^Q &= (1 + t_i^{scn})\hat{p}_i^Q \\ p_i^M &= \left(1 + t_i^{dut}\right)\hat{p}_i^M \\ p_i^S &= (1 + t_i^{cons})(1 + t_i^{VAT})\hat{p}_i^S + sb_i \end{aligned} \tag{1}$$

where $\hat{p}_i^Q$ is the producer price before taxes, $\hat{p}_i^M$ is the import price before customs duties, and $\hat{p}_i^S$ is the supply price before taxes and subsidies. Due to small open economy assumptions, the local economy has no impact on international prices, so it is assumed that prices for imports $\hat{p}_i^M$ and exports $\hat{p}_i^E$ are exogenous.

Four economic agents interact within this price system: households, firms, the external sector, and the Government. Households represent individuals who act as final consumers for each decile $h \in H$ and each good $i \in I$. These agents maximise a Stone-Geary type utility function over their consumption $C_{hi}$, subject to a budget constraint with disposable income $Y_h^{\text{dis}}$. This utility function assumes that consumers buy a given subsistence level of each good $\gamma_{hi}$ and then allocate the remaining income according to the preference parameters $\beta_{hi}$. Formally:

$$\begin{aligned} &\text{Max} \prod_{i \in I} (C_{hi} - \gamma_{hi})^{\beta_{hi}} \\ &\text{s.a:} \sum_{i \in I} p_i^s C_{hi} = Y_h^{dis} \end{aligned} \tag{2}$$

Disposable income $Y_h^{\text{dis}}$ is determined by a marginal propensity to consume $\phi_h^{\text{dis}}$ on secondary income $Y_h^{\text{sec}}$.

$$Y_h^{dis} = \phi_h^{dis} Y_h^{\text{sec}} \tag{3}$$

Secondary income $Y_h^{sec}$ is obtained from primary income $Y_h^{pri}$ plus net current transfers $CTr_h$ and capital transfers $KTr_h$ with the rest of the agents.

$$Y_h^{sec} = Y_h^{pri} + CTr_h + KTr_h \tag{4}$$

On the other hand, Primary income $Y_h^{pri}$ is generated from income from the supply of labour and capital. $w_L \sum_{j=1}^{J} L_j$ and capital $w_K \sum_{j=1}^{J} K_j$, assuming a fixed distribution parameters $\phi_{hL}^{fac}, \phi_{hK}^{fac}$ for the payment of each factor of production.

$$Y_h^{pri} = \phi_{hL}^{fac} w_L \sum_{j \in J} L_j + \phi_{hK}^{fac} w_K \sum_{j \in J} K_j \tag{5}$$

In industries, it is assumed that each representative firm $j \in J$ produces intermediate and final goods to maximise profits. In this sense, they first minimise their costs, subject to a technology restriction nested in three levels: value added, intermediate consumption, and final production.

At the first level, two production factors generate value-added $VA_j$: labour $L_j$ and capital $K_j$, considering the prices $w_L, w_K$. For the demand of both factors, a Constant Elasticity of Substitution function CES is assumed, with elasticity $\frac{1}{1-\rho_j}, (\rho_j \leq 1)$, share coefficients $\alpha_j^L, \alpha_j^K$, and the productivity coefficient $A_j^{VA}$. Thus, the value-added problem for the industry $j \in J$ is:

$$\begin{aligned} &\text{Min } w_L L_j + w_K K_j \\ &\text{s.a: } VA_j = A_j^{VA}\left(\alpha_j^L L_j^{\rho} + \alpha_j^K K_j^{\rho}\right)^{\frac{1}{\rho_j}} \end{aligned} \tag{6}$$

At the second level, it is assumed that all inputs $X_{ji}, i \in I$ make up the intermediate consumption $IC_j$ as perfect complementary goods with supply prices $p_i^S$. In this sense, a Marx-Leontief technology with fixed proportions $\theta_{ji}$ is assumed. Thus, the problem in intermediate consumption for industry $j \in J$ is:

$$\begin{aligned} &\text{Min } \sum_{i \in I} p_i^S X_{ji} \\ &\text{s.a: } IC_j = \min_{i \in I}\left\{\frac{X_{ji}}{\theta_{ji}}\right\} \end{aligned} \tag{7}$$

At the last nested level, final production $Q_j$ integrates value-added $VA_j$ and intermediate consumption $CI_j$ using a Marx-Leontief technology. For this purpose, prices $p_j^{VA}, p_j^{CI}$, and fixed proportions $\gamma_j^{VA}, \gamma_j^{CI}$ are considered. Thus, the problem in final production for industry $j \in J$ is:

$$\begin{aligned} &\text{Min } p_j^{VA} VA_j + p_j^{CI} CI_j \\ &\text{s.a: } Q_j = min\left\{\frac{CI_j}{\gamma_j^{CI}}, \frac{VA_j}{\gamma_j^{VA}}\right\} \end{aligned} \tag{8}$$

It should be noted that it is assumed that industries can produce only one good or service characteristic of their production process, so:

$$Q_j = Q_i, \forall j = i$$

In the external sector, the decision problems for imports and exports of each good $i \in I$ are considered separately. For both problems, it is assumed that industries seek to minimise costs and maximise profit.

On the one hand, the firms that produce $Q_i$ decide whether to place their production on the local market $D_i$ or to export to the international market $E_i$, taking into account the prices $p_i^E, p_i^M$, respectively. To represent this decision, a Constant Elasticity of Transformation function CET is used with elasticity $\frac{1}{1-\omega_i}$ $(\omega_i \geq 1)$, share coefficients $\delta_i^E, \delta_i^M$ for each type of market, and the productivity coefficient $A_i^E$. In this sense, the problem of the external sector in the exports of the good $i \in I$ is:

$$\begin{aligned} &\text{Min } p_i^E E_i + p_i^M D_i \\ &\text{s.a: } Q_i = A_i^E \left(\delta_i^E E_i^{\omega_i} + \delta_i^D D_i^{\omega_i}\right)^{\frac{1}{\omega_i}} \end{aligned} \tag{9}$$

On the other hand, the supply of goods comes from both the local market $D_i$ and imports $M_i$, considering the prices of each market. $p_i^D, p_i^M$, respectively. To represent the imperfect substitution between both markets, a CES function is used with elasticity $\frac{1}{1-\sigma_i}(\sigma_i \leq 1)$, share coefficients $\delta_i^D, \delta_i^M$ for each type of market, and the productivity coefficient $A_i^M$. Therefore, the problem of the external sector in the imports of the good $i \in I$ is:

$$\begin{aligned} &\text{Min } P_i^D D_i + P_i^M M_i \\ &\text{s.a: } S_i = A_i^M \left(\delta_i^D D_i^{\sigma_i} + \delta_i^M M_i^{\sigma_i}\right)^{\frac{1}{\sigma_i}} \end{aligned} \tag{10}$$

Regarding the Government, a fiscal balance equation considers current and non-current revenues, fiscal spending, household transfers, and consumption subsidies. Here, government revenues $Y^{gov}$ comes from factor revenues $Yf_{fac}^{gov}$, tax revenues from direct taxes $Yt_{dir}^{gov}$ and indirect taxes $Yt_{ind}^{gov}$, transfers from the external sector $Tr_{ext}^{gov}$, and transfers from the rest of the agents $Tr_{ag}^{gov}$.

$$Y^{gov} = Yf_{fac}^{gov} + Yt_{dir}^{gov} + Yt_{ind}^{gov} + Tr_{ext}^{gov} + Tr_{ag}^{gov} \tag{11}$$

In government spending $G^{gob}$, there is the spending on public goods and services $Gq_i^{gob}$, transfers to households $Tr_{gob}^{h}$, transfers to the rest of the world $Tr_{gob}^{ext}$, and other transfers to agents $Tr_{gob}^{ag}$.

$$G^{gob} = \sum_{i \in I} Gq_i^{gob} + Tr_{gob}^{h} + Tr_{gob}^{ext} + T_{gob}^{ag} \tag{12}$$

Once government revenues and expenditures have been defined, the fiscal deficit $Def^{gob}$ can be represented by the following expression:

$$Def^{gob} = Y^{gob} - G^{gob} \tag{13}$$

All the agents described above are involved in the equilibrium of the markets for goods and productive factors. In the market, equilibrium is reached for each good $i \in I$ when total supply $S_i$ equals the sum of intermediate consumption $X_{ji}$, household consumption $C_{hi}$, Government spending $Gq_i^{gob}$ and investment $Inv_i$. On the other hand, in the factor market, equilibrium is achieved when the demand of capital $K_j$ and labour $L_j$ of the industries is equal to the total endowment of these factors $K$ and $L$, respectively. Formally:

$$S_i = \sum_{j \in J} X_{ji} + \sum_{h \in H} C_{hi} + Gq_i^{gob} + Inv_i \tag{14}$$

$$\sum_{j \in J} L_j = L, \qquad \sum_{j \in J} K_j = K \tag{15}$$

Finally, the model design considers the following Neo-Keynesian-type closure rules. (Robinson, 2006; Zalai & Révész, 2016).

- *External sector*: The exchange rate is exogenous because the Ecuadorian economy is dollarised, so the adjustment variable is external savings.

- *Public sector*: Tax rates and government consumption are exogenous. Therefore, the fiscal deficit is determined endogenously.
- *Savings-investment gap*: Real investment and marginal propensities to save are exogenous, so the adjustment is achieved through forced savings[1].

In addition, the wage is chosen as the numeraire so that the prices of goods and services are measured in terms relative to it.

## Calibration

For the definition of the baseline scenario and the calibration of the model, the Social Accounting Matrix (SAM) was prepared for 2019 based on the Supply Utilisation Tables, Input-Output Matrix, and Economic Tables of the National Accounts System of the Central Bank of Ecuador. The construction of this matrix followed the methodology proposed by Benítez (2005) for the Ecuadorian SAM and the RAS bi-proportional adjustment method.

In general terms, the SAM used in this study considers the homogeneous production of 21 productive sectors, two production factors, 4 institutional agents (industries, households, Government, and external sector), and 5 fiscal accounts: value added tax (VAT), corporate income tax (CIT) and personal income tax (PIT), production tax, customs duties, and subsidies (See Appendix 1).

Regarding elasticities, we used the CES elasticities for imports, CET elasticities for exports, CES elasticities for value-added, and the elasticities-expenditure from MAMS and MACEPES applications proposed by Jácome and Cicowiez (2012), León et al. (2008) and Vos and León (2003) (See Appendix 2).

# RESULTS

## Description of the scenarios

The International Monetary Fund (IMF), within the framework of the 2020 technical agreement, made a diagnosis of the Ecuadorian tax system. According to the IMF, Ecuador's tax revenues are relatively lower than other countries in the Latin American region due to low tax rates, small tax bases, high personal deductions, and deficient tax laws (IMF, 2020).

In this context, the IMF proposed increasing the VAT rate, maintaining non-taxable consumer goods. In addition, it suggested an IT reform focused on the upper end of the income distribution and a CIT reform aimed at broadening the taxable base. According to the IMF, these measures could generate permanent revenues of more than 2.52% of the GDP (IMF, 2020).

[1] This rule is implemented by introducing a distortion factor in marginal labour productivity. In this way, changes in real wages make it possible to generate the savings needed to finance real fixed investments.

In this context, the present study proposed to evaluate the following counterfactual scenarios:

- Scenario 1 (Sc1.VAT): Increase VAT rate by 3% (from 12% to 15%).
- Scenario 2 (Sc2.IT): Elimination of the FCOT's credit for the payment of CIT, the non-exemption of wage benefits[2], and the non-deduction of personal expenses[3]
- Scenario 3 (Sc3.VAT-IT): Increase the VAT rate by 1% (from 12% to 13%) and reduce deductible personal expenses by 20% for the payment of PIT.

The first two scenarios respond to the reforms proposed by the IMF, while the third represents a proposal set forth by this study that seeks to meet the objective of collecting US$1.9 billion in the first two years. To this end, it is proposed to collect 35% of this value (US$ 700 million) through VAT and IT during the first year.

The third scenario also aims to fulfil the progressivity principle established in the Ecuadorian Constitution and seeks to continue deducting personal expenses through invoicing. To evaluate the latter scenario, we use CGEM simulations and the expense distribution recorded in the 2014 National Survey of Urban and Rural Household Income and Expenditures (ENIGHUR).

## Gross domestic product

### *Real and nominal terms*

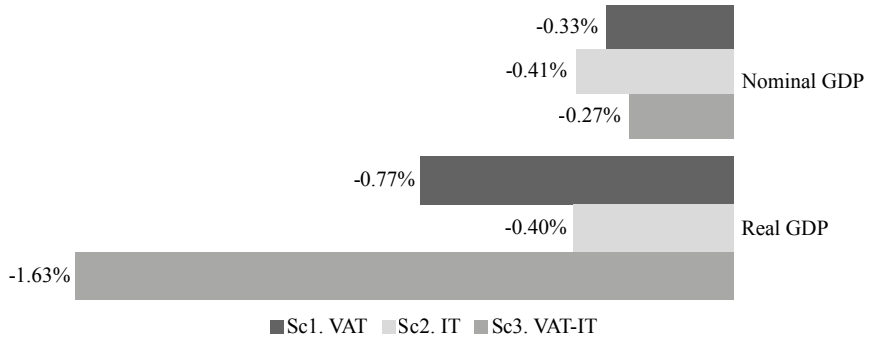
Model simulations suggest that all three scenarios contract the Gross Domestic Product (GDP) in real and nominal terms (figure 2).

The scenarios Sc1.VAT and Sc3.VAT-IT present a greater contraction in the real GDP than in the nominal GDP. This result is explained by the VAT increase that directly affects market prices and reduces demand while maintaining market spending with more minor variations. Regarding the Sc2.IT scenario, the nominal and real GDP variations are similar because IT reform does not affect the price level directly; instead, it reduces production and consumption via income.

[2] Wage benefits refer to the payment of two additional salaries in the year, known as the thirteenth and fourteenth salary. The thirteenth salary is an additional salary received at the end of the year, meanwhile the fourteenth salary is one minimum wage received in August or March. All employees in the public and private sectors receive the wage benefits.

[3] The tax base of the PIT is obtained by subtracting personal expenses (for housing, food, clothing, education, art, culture, and health) from the total taxable income. The regulations establish that personal expenses cannot exceed US$ 3,675.75 per year for each type of personal expense, except for health expenses, which can reach a maximum amount of US$ 14,703.00 per year.

**Figure 2.**
Percentage changes in the real and nominal GDP from the baseline scenario




## *Real GDP: Expenditure approach*

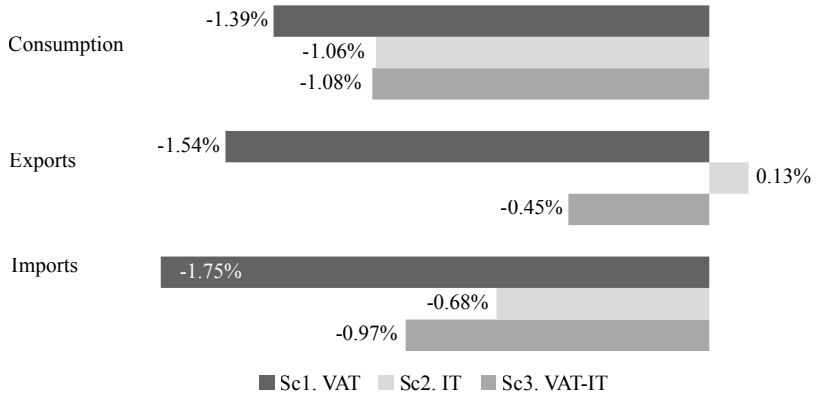
In the Sc1.IVA scenario, the 1.63% reduction in the real GDP is explained by the negative variation in private consumption (1.39%), exports (1.54%), and other GDP components (1.75%). It should be noted that investment and government spending are exogenous variables in the model due to the closing rules, so they do not show any variation.

Since exports are exempt from VAT, domestic industries would be encouraged to offer their production to international markets to offset part of the decline of domestic sales. However, the VAT increase would generate an increase in the prices of commodities and manufacture of products, so the producer would decrease exports to fulfil the foreign prices. Likewise, imports show a reduction because of the fall in private consumption and the increase in relative prices due to the VAT increase (figure 3).

The Sc2.IT scenario shows a real GDP contraction of 0.40%, mainly due to decreased household consumption (1.06%). Regarding the external sector, imports contract by 0.68% because of the generalised fall in private consumption. In contrast, exports increased slightly by 0.13% due to the lack of domestic demand. Despite this increase, the GDP contracted due to the relatively low weight of this expenditure component in GDP.

For the Sc3.VAT-IT scenario, the effect of the two measures combined generates a 0.77% reduction in the real GDP, in which all components via expenditure, consumption (1.08%), exports (0.45%), and imports (0.97%) decrease.

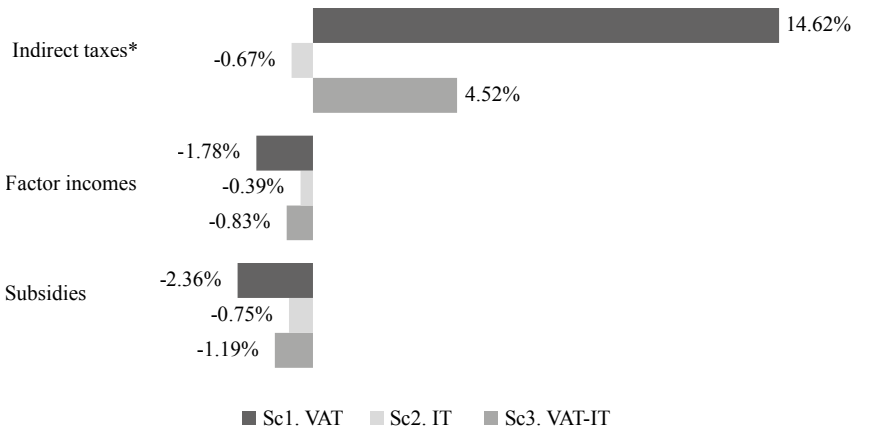
**Figure 3.**
Percentage changes of expenditure components of real GDP from the baseline scenario




## *Real GDP: Income approach*

Figure 4 shows the changes in the income components of the real GDP with respect to the baseline scenario. In general, it is observed that subsidies and factor incomes fall in all three scenarios.

**Figure 4.**
Percentage changes of income components of the real GDP from the baseline scenario




Note. The tax component only includes VAT collection.

In the Sc1. IVA scenario, subsidies, and factor incomes contract by 2.36% and 1.78%, respectively. This is explained by the drop in production caused by the

reduction in consumption. On the other hand, indirect taxes increase by 14.62% due to the 3% increase in the VAT rate.

In the Sc2.IT scenario, indirect taxes decrease by 0.67%, as a result of the elimination of tax benefits for the payment of income tax that discourages local production. On the other hand, to compensate for the increase in the CIT tax burden, industries reduce the demand for labour and capital, which generates a contraction in production and a fall in subsidies. In this scenario, subsidies and factor incomes decrease by 0.75% and 0.39%, respectively.

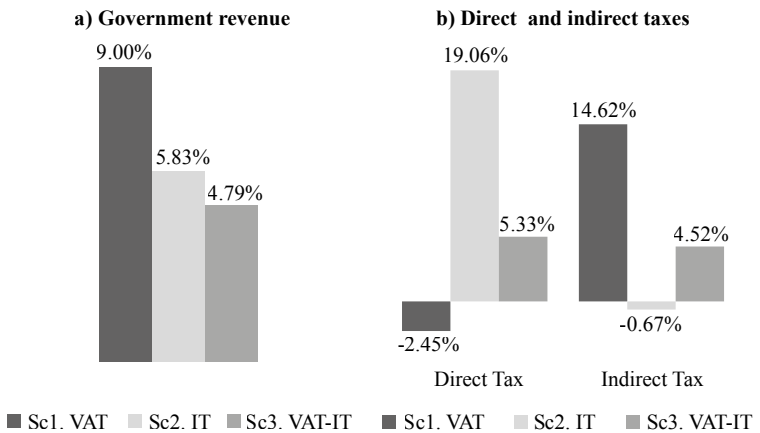
Similarly, for the Sc3.VAT-IT scenario, subsidies (1.19%) and factor incomes (0.83%) decrease because of the reduction in consumption (due to the increase in VAT) and household income (due to the rise in PIT). In contrast, indirect taxes grow by 4.52% due to a 1% increase in the VAT rate.

In this context, all three scenarios would negatively affect the Ecuadorian economy as a whole. This result is congruent with simulations carried out by some economists, such as Alvarez and Polo (2014) and Sajadifar et al. (2012). The authors conclude that increasing both taxes would reduce household income, wages, and output.

## Tax revenues

The Sc1.VAT scenario shows the importance of VAT as a source of fiscal financing. The increase of 3% in the VAT rate would achieve an increase in government revenues of 9% (figure 5a), which is approximately US$ 1,323.10 million. In this scenario, VAT increases indirect tax collection by 14.62% (figure 5b), as opposed to direct taxes, which contract at 2.45%. This is not surprising; the increase in the VAT rate decreases household consumption and slows industry income and factor incomes, thus reducing income tax.

**Figure 5.**
Percentage changes in government revenue from the baseline scenario



The Sc2.IT scenario presents an increase in fiscal income but to a lesser extent than the first scenario. Eliminating tax advantages on income tax would increase the government revenues by 5.83%, representing US$856.57 million. To achieve this result, the IT increases the collection of direct taxes by 19.06%, while indirect taxes decrease by 0.67%.

As for the Sc3.VAT-IT scenario, more balanced results are obtained. The increase of 1% in the VAT rate and the reduction of deductible personal expenses generate an increase in government revenues of 4.79%, which is close to US$704.13 million. Thus, the VAT and income tax increase in the collection of indirect and direct taxes by 4.52% and 5.33%, respectively.

## Gross value added by sector

To measure the effect of tax reforms on industries, Gross Value Added (GVA) is used. Simulations suggest that GVA contracts for all three scenarios for most activities, but mainly for the service sector (table 2).

**Table 2.**
Percentage changes of sectoral GVA from the baseline scenario

| N | Industry | Sc1. VAT | Sc2. IT | Sc3. VAT-IT |
|---|---|---|---|---|
| 1 | Banana, coffee and cocoa cultivation | -3.15% | -0.48% | -1.43% |
| 2 | Agriculture | -2.76% | -0.71% | -1.41% |
| 3 | Livestock | -2.71% | -0.70% | -1.38% |
| 4 | Forestry | -3.80% | -0.95% | -1.83% |
| 5 | Aquaculture and shrimp fishing | -2.74% | -0.68% | -1.40% |
| 6 | Fishing and aquaculture | -3.31% | -0.86% | -1.68% |
| 7 | Crude oil and natural gas extraction | 1.00% | 1.33% | 1.17% |
| 8 | Oil and mining | 0.68% | 0.96% | 0.83% |
| 9 | Food manufacturing | -3.45% | -0.83% | -1.72% |
| 10 | Petroleum Refining | -3.98% | -0.81% | -1.76% |
| 11 | Non-food manufacturing | -2.72% | -0.61% | -1.27% |
| 12 | Electricity and water supply | -1.90% | -0.52% | -0.96% |
| 13 | Construction | -1.66% | -0.36% | -0.76% |
| 14 | Trade | -0.34% | -0.06% | -0.15% |
| 15 | Lodging and food services | -3.32% | -0.93% | -1.63% |
| 16 | Transportation, Warehousing and Communications | -2.57% | -0.66% | -1.26% |

(*Continued*)

| N | Industry | Sc1. VAT | Sc2. IT | Sc3. VAT-IT |
|---|---|---|---|---|
| 17 | Real estate, business, and rental activities | -3.25% | -0.84% | -1.58% |
| 18 | Financial services activities | -2.54% | -0.90% | -1.24% |
| 19 | Public administration, defence, mandatory social security plans | 1.33% | 0.23% | 0.59% |
| 20 | Education and Health and social services | 1.14% | 0.12% | 0.47% |
| 21 | Other services | -9.30% | -1.98% | -4.20% |

It is also observed that the distribution of GVA variations has the same directions in the three scenarios but different magnitudes. For example, in the Sc1.IVA scenario, other services fall by 9.30%. This value would be explained by a contraction in firms' innovation, transformation, and modernisation activities, which demand high amounts of labour and capital (Guo & Shi, 2021).

In contrast, the oil and mining, education, health, and public administration industries are the only ones where GVA shows growth. On the one hand, oil and mining activities focus on extracting primary resources, so they are independent of the production level of other industries or the general price increases in other sectors. On the other hand, public administration, education, and health services, since they account for all public spending, would not be affected by household consumption or income.

## Household consumption by deciles

Figure 6 shows that increasing the tax burden reduces private consumption in all decile households and all three scenarios. Authors such as Musgrave and Musgrave (1992) and Stiglitz (2000) point out the inverse relationship that conventionally exists between the tax burden and consumption, depending on the elasticities of goods.

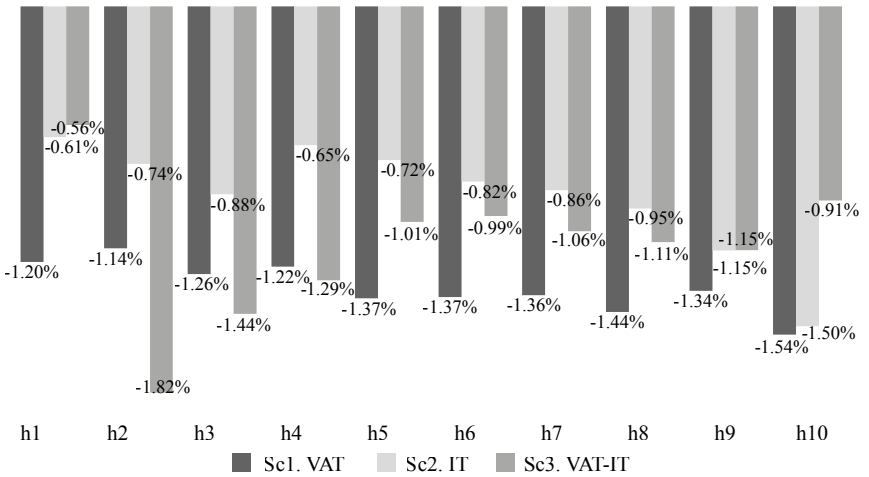
An increase in a consumption tax, as in the Sc1.VAT scenario, has a direct effect on the entire population. However, the impact of the VAT could be slightly greater for the highest-income deciles (decile 10) since lower-income households consume non-taxable basic goods (food, medicine, and transportation).

In the Sc2.IT scenario, the highest income deciles are those with the most significant contraction in consumption due to the adverse effects of removing tax advantages and benefits used mostly by these deciles. Therefore, an increase in the CIT would contract the consumption of higher-income households, which account for approximately 45% (deciles 9 and 10) of total household consumption.

The Sc3.VAT-IT scenario also shows a reduced consumption in all deciles due to falling incomes. On the one hand, deciles 2, 3, and 4 show a greater contraction in consumption, explained by the effects mentioned above for the Sc1.VAT scenario.

On the other hand, reducing deductible personal expenses increases the number of households that must pay income tax. However, this increase occurs mainly in lower and middle-class households, so these deciles sacrifice their consumption by allocating a larger portion of their income to tax payments.

**Figure 6.**
Percentage changes of household consumption by deciles from the baseline scenario



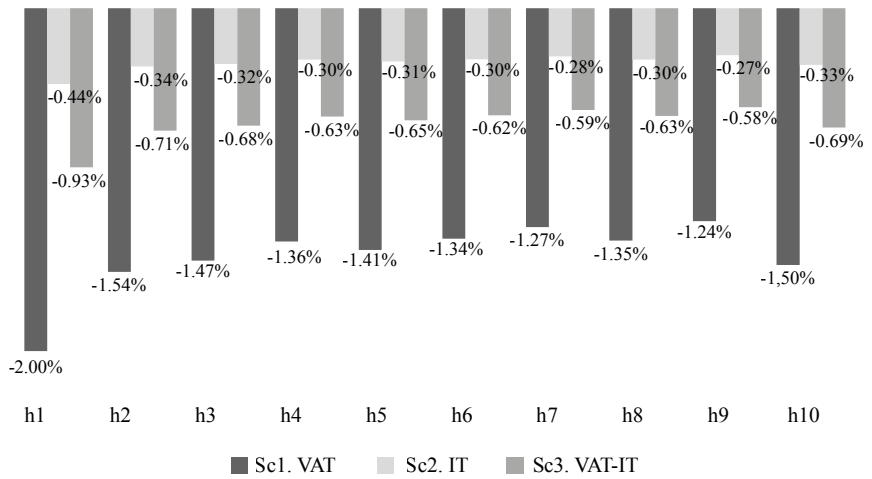

## Household income by deciles

Regarding income composition, a similar distribution of variations is obtained in the three scenarios (figure 7). The simulations of the Sc1.VAT scenario show a reduction in income in all deciles. On the one side, although the VAT does not tax a large part of the basic consumption of lower-income households, an increase in this tax would affect households in deciles 1 and 2 to a greater extent. On the other side, households with higher incomes (deciles 9 and 10) would cushion this tax burden with the capital income they receive from companies, which would mean a reduction in revenue of up to 1.50%. This fact is congruent with the hypothesis presented by Stiglitz (2000) and Sevilla (2004), who consider VAT a regressive tax that affects the lowest deciles to a greater extent.

In the Sc2.IT scenario, the effect of IT on household income is lower compared to the other scenarios. Here, it is noted that removing the FCOT's credit, wage exemptions and personal expense deductions would contract income from 0.44% for decile 1 to 0.33% for decile 10. Although this tax is levied on the income of industries, the effect is transferred through the reduction of transfers made to households. According to Musgrave and Musgrave (1992), the income tax reduces the supply of capital, and therefore, so does the supply of labour due to their

complementarity. In this way, an effect on income would be expected mainly on lower deciles because they depend more on wage income.

**Figure 7.**
Percentage changes in household consumption by industry from the baseline scenario




Finally, in the Sc3.VAT-IT scenario, an increase in the VAT rate would have a greater impact on the lowest income deciles because of the effects previously presented in the first scenario. Regarding IT in this scenario, ENIGURH statistics suggest that reducing deductible personal expenses increases the number of taxpayers who must pay this tax, especially those from the middle and lower-middle class. Thus, the proportion of households that transfer a greater part of their income to the payment of IT increases. This results in an income reduction from 0.93% for decile 1 to 0.69% for decile 10.

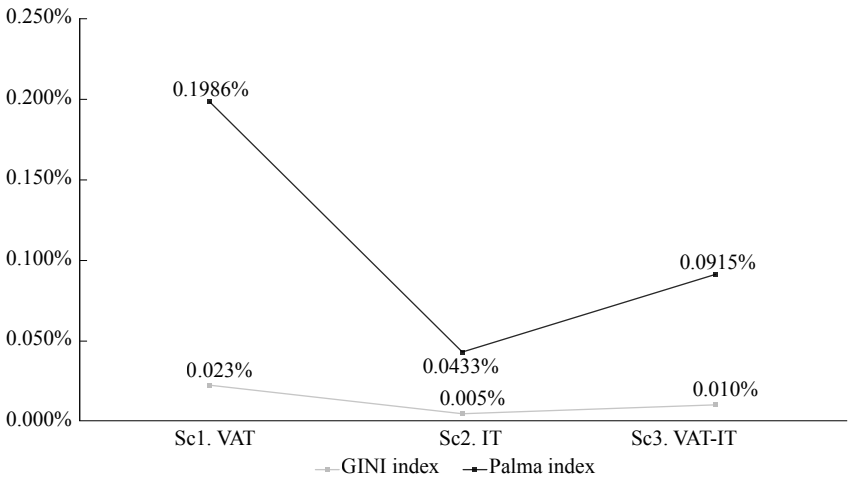
## Gini index and Palma index

To evaluate the distributive effects of each scenario, the Gini index and the Palma index[4] are calculated (figure 8). The variations do not exceed 1%, meaning the counterfactual simulations do not have a high redistributive effect concerning the baseline scenario. However, in the Sc1.VAT scenario, both indices show a greater increase in inequality, given that VAT is a regressive tax (Sevilla, 2004). Therefore, there would be an increase of 0.022% in the Gini index and 0.20% in the Palma index.

[4] The Palm Index measures the capture of the total income or consumption of the richest decile over the concentration of the bottom 40% of income. In comparison, the Gini index measures the concentration of the richest decile over the concentration of the bottom 40% of income.

Regarding the reform for direct taxes in the Sc2.IT scenario, the Gini and the Palma indices grow by 0.005% and 0.043%, respectively. This scenario is the most favourable for income redistribution since it slightly flattens the income of the highest deciles through the effect caused by the elimination of tax income benefits.

**Figure 8.**
Percentage variations of the Gini and Palma index from the baseline scenario




Finally, it is observed that the Sc3.VAT-IT scenario would not have the desired progressivity, as it maintains the effect of the two measures combined, which causes an increase of 0.0915% in the Gini and 0.010% in the Palma index.

# CONCLUSIONS

The objective of this study was to evaluate the macroeconomic effects of a possible tax reform of the Value Added Tax (VAT), the Corporate Income Tax (CIT), and the Personal Income Tax (PIT) on the Ecuadorian economy within the framework of the technical agreement with the IMF of October 2020. For this purpose, a Computable General Equilibrium Model (CGEM) is developed. The model was calibrated by updating the Social Accounting Matrix to 2019 for 21 productive sectors, 10 households by income, and 2 factor markets.

The results of the counterfactual simulations show that increasing tax rates according to IMF proposals would cause contractionary effects on economic and social indicators. The tax reform that would generate the greatest negative repercussions is the one related to the VAT (the increase of 3%), followed by tax reform on PIT and CIT (elimination of the foreign exchange tax credit for firms and elimination of exemptions and deductible personal expenses). In this case, the increase in the

VAT rate is the tax reform proposal that contracts the real GDP the most, increases income inequality, reduces household welfare, and generates more revenue for the Government. Therefore, if IMF proposals were implemented through the PIT and the CIT, the results would be less detrimental to macroeconomic aggregates. On the contrary, if the VAT rate increase were implemented, more resources would be obtained for the Government.

On the other hand, a simultaneous reform in both taxes (the increase of 1% in VAT rate and the reduction of deductible personal expenses) would increase Government revenues. Nevertheless, it would also lead to a contraction in the real GDP and losses in aggregate welfare levels, especially for the lower-middle class, due to the increase of taxpayers who would have to pay income tax.

As recommendations, studying policies aimed at efficient and socially optimal taxation is necessary. In this sense, Slemrod (1990) proposes three reforms focused on welfare economics: first, a tax on final consumption goods that increases Government revenues; second, a tax on industries that maintains productive capacity as much as possible; and third, a tax on individuals that seeks to reduce differences in income distribution.

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# APPENDIX 1.

Social accounting matrix 2019 at current prices in aggregate terms

| | | | I | II | III | | | IV | V | VI | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Industry | Income generation | Use of income | | | Taxes and subsidies | Capital | Rest of the world | |
| | | | Production sector | Factors | Industries | Homes | Government | Taxes and subsidies | Investment | Rest of the world | Total |
| I | Industry | Production sector | Intermediate consumption (77.549.821) | | | Household consumption (63.596.229) | Government Consumption (16.483.785) | | Investment (28.006. 467) | Exports (24.917.131) | Total demand (210.553.433) |
| II | Income generation | Factors | Value added (99.819.163) | | | | | | | Factored payment (8.036) | Factorial income (99.827.199) |
| III | Use of income | Industries | | Factored payment (20.679.827) | Transfer for indemnification (5.610.997) | Transfer for indemnifi- cation (6.335.498) | Grants and tax credit (7.555.096) | | Capital transfers (1.904. 860) | Remittances received (231.075) | Industry income (42.317.352) |
| | | Homes | | Factored payment (76.042.988) | Transfer for indemnification (4.936.881) | Transfers (0) | Grants and tax credit (7.156.665) | | Capital transfers (145.298) | Remittances received (2.954.316) | Household income (91.236.148) |
| | | Government | Sectional taxes (1.052.414) | Factored payment (3.088.956) | Administrative fees (11.981.722) | Administra- tive fees (8.366.139) | Adminis- trative fees (2.550.789) | Tax collection (12.075.721) | Capital transfers (4.751. 918) | Remittances received (218.153) | Government Income (44.085.812) |

(*Continued*)

| | | | I | II | III | | | IV | V | VI | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **Industry** | **Income generation** | **Use of income** | | | **Taxes and subsidies** | **Capital** | **Rest of the world** | |
| | | | **Production sector** | **Factors** | **Industries** | **Homes** | **Government** | **Taxes and subsidies** | **Investment** | **Rest of the world** | **Total** |
| **IV** | **Taxes and subsidies** | **Taxes and subsidies** | Indirect taxes and subsidies (7.236.432) | | Direct taxes (2.456.963) | Direct taxes (2.382.326) | | | | | Tax collection (12.075.721) |
| **V** | **Capital** | **Savings** | | | Industry savings (15.556.528) | Household savings (10.252.860) | Government Savings (8.823.730) | | | External savings (178.898) | Total savings (34.812.016) |
| **VI** | **Rest of the world** | **Rest of the world** | Imports (24.895.603) | Factored payment (15.428) | Remittances sent abroad (1.774.261) | Remittances sent abroad (303.096) | Remittances sent abroad (1.515.748) | | Capital transfers (3.473) | | Foreign exchange outflow (28.507.608) |
| | | **Total** | Total supply (210.553.433) | Factorial expense (99.827.199) | Industry spending (42.317.352) | Household spending (91.236.148) | Government Expenditure (44.085.812) | Tax collection (12.075.721) | Total investment (34.812. 016) | Foreign currency entry (28.507.608) | |

Note. Figures are expressed in millions of dollars.
Source: Central Bank of Ecuador

# APPENDIX 2.

Model elasticities

| N | CGEM Sector | CES Imports[a] | CET Exports [a] | CES value added [c] | Elasticities-expenditure Household consumption [a] |
|---|---|---|---|---|---|
| 1 | Banana, coffee and cocoa cultivation | 1,3 [c] | 0,4 | 0,2 | 0,8 |
| 2 | Agriculture | 0,9 | 0,6 | 0,2 | 1,1 |
| 3 | Livestock | 0,8 | 0,6 | 0,2 | 0,8 |
| 4 | Forestry | 0,8 | 0,6 | 0,2 | 0,8 |
| 5 | Aquaculture and shrimp fishing | 1,2 | 1,5 | 0,2 | 0,8 |
| 6 | Fishing and aquaculture | 0,8 | 1,5 | 0,8 | 0,8 |
| 7 | Crude oil and natural gas extraction | 0,8 | 0,8 | 0,2 | 1,2 |
| 8 | Oil and mining | 0,8 | 0,8 [b] | 0,2 | 0,8 |
| 9 | Food manufacturing | 0,9 | 0,9 | 1,1 | 0,8 |
| 10 | Petroleum Refining | 0,8 | 0,6 | 1,3 | 1,2 |
| 11 | Non-food manufacturing | 0,8 | 0,6 | 1,3 | 1,2 |
| 12 | Electricity and water supply | 0,2 | 0,2 | 1,3 | 0,8 |
| 13 | Construction | 0,0 | 1,0 | 1,7 | 0,8 |
| 14 | Trade | 0,0 | 1,0 [b] | 1,7 | 0,8 |
| 15 | Lodging and food services | 0,8 | 1,0 | 1,7 | 0,8 |
| 16 | Transportation, Warehousing and Communications | 0,8 | 1,0 | 1,7 | 0,8 |
| 17 | Real estate, business, and rental activities | 1,5 | 1,0 | 1,7 | 1,1 |
| 18 | Financial services activities | 1,5 | 1,5 | 1,7 | 1,1 |
| 19 | Public administration, defence, social security plans | 0,0 | 1,0 | 1,7 | 1,1 |
| 20 | Education and Health and social services | 0,0 | 1,0 | 1,7 | 1,1 |
| 21 | Other services | 1,5 | 1,0 | 1,7 | 1,1 |

Sources: [a] Vos and León (2003), [b] León et al. (2008), [c] Jácome and Cicowiez (2012).

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