Effects on the Mexican Economy derived from PRI's* fiscal reform proposal draft presented in 2011; a multisectorial analysis applying a General Equilibrium Model

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Abstract

Any proposal of economic policies, requires to be analyzed rigorously to know the extent of its results. In this work we use a general equilibrium model applied to Mexican economy, with the intention of getting the effects of the fiscal policy proposal announced at the beginning of 2011 by some legislators of the Partido Revolucionario Institucional. These results show that this proposal, would not affect groups with less income, but it would generate less revenue from taxes. Conclusions point out the importance to establish compensation mechanisms that help plan and discuss fiscal policies in order to promote a higher revenue from taxes and a better utilization of public funds.

Key words: Mexican economy, multisectorial analysis, general equilibrium model.

*Revolutionary Institutional Party of Mexico

1. Introduction

At the end of January 2011, some Mexican legislators indicated having worked in a fiscal proposal that, in general terms, pretends to merge the tax called "Impuesto Empresarial a Tasa Unica" (IETU) with the income tax (ISR) and at a lower rate of 25%, while establishing a value added tax (IVA) of 12% on all products and services, except on food and medicines, but including those "miracle" products of the medicine sector and "sumptuary" goods of food sector. But, Is this proposal going to increase tax revenue for the Federal Government?, and What are the effects on the whole economy if this proposal is adopted?

General equilibrium models have been used as tools to analyze effects on relative prices and quantities when fiscal and monetary policies are applied to the whole economy.

Serra (1981)[1] constructs a general equilibrium model for Mexico with the intention to know the effect of introducing IVA as substitute of tax on commercial income (ISIM). Results of his work point out that, in order to avoid the negative impact of IVA in redistribution of income, it was desirable to have a uniform IVA tax rate and a reimbursement to groups with the lowest income[2]. Later, Kehoe and Serra (1983)[3] elaborated a general equilibrium model for the Mexican economy, but incorporating unemployment rates thus, making a more robust model of actual reality. Their findings suggested that introducing IVA with constant government spending caused a reduction on the unemployment rate, as opposed to an assumption of constant fiscal deficit.

Additionally, Cordova (1991)[4] also uses a general equilibrium model for the Mexican economy, with the purpose of analyzing the effects of the reduction in tariffs experimented by Mexico after NAFTA, on employment, GDP and welfare levels. For the simulation of the reduction in tariffs, the author uses two approaches: the

[1]Serra Puche, J. "Política Fiscales en México: Un Enfoque de Equilibrio General", El Colegio de México.

[2]Serra Puche, J. "El análisis de equilibrio general de la economía Mexicana", SAI Consultores, S.C.

[3]Kehoe, T.J. y Serra Puche, J. "A Computational General Equilibrium Model with Endogenous Unemployment: An Analysis of the 1980 Fiscal Reform in Mexico", Journal of Public Economics 22.

[4]Córdova Gutiérrez, A. "Efectos de la Apertura Comercial sobre la Economía Mexicana: un Enfoque de Equilibrio General", Tesis de Licenciatura, ITAM.

first one is Keynesian with inflexibility in salaries, and thus in unemployment; the second one is Neoclassical with flexible salaries and the employment rate suffers no modifications. The main conclusions of his work show that a reduction in tariffs cause imports to be cheaper, discouraging production in the sector whose relative price decreases the most. For the Keynesian case, we observe a drop in employment and the most affected is the manufacturing sector. Private consumption increases as a result in the decrease of the compounded good. Also, external sector perceives a worsening in the current account.

In my previous work, Marquez (2006)[5], I used a general equilibrium model to calculate the impact on the Mexican economy of application of a fiscal policy that would have applied IVA of 15% to food, medicine, press & editorial and education sectors, which currently have IVA of 0% or in an exception regime. The most significant results showed that tax revenue increased around 16.8% but it affected the deciles with the lowest income; thus, implying the need of a compensation mechanism for that sector of the population.

This work tries to model the effects of the new fiscal policy proposal drafted by some legislators of the Partido Revolucionario Institucional (also known as PRI, the party that ruled Mexico for almost 70 years). We use a general equilibrium model because of its capacity to incorporate the adjustments in relative prices and quantities as result of changes in exogenous variables.

In the second section, we present the construction of the base general equilibrium model and the equation system that allows obtaining information about production sectors, private consumption, foreign market and investment.

The third and fourth parts, describes the assumptions used, as well as the information used in the calibration of parameters that are used in the equation system for the calculations of the original general equilibrium.

One of the key assumptions that allows fiscal policy comparison is that the economy, was in equilibrium at the base year with prices equal to one. Therefore, prices will be calculated as indexes that show percentage changes in prices and quantities.

[5]Márquez Peña, E. "Efectos del IVA en la Economía Mexicana. un Análisis Multisectorial a través de un Modelo de Equilibrio General Aplicado", Tesis de Licenciatura, ITAM

The base year for the construction of the general equilibrium is year 2000, using information from the input-product matrix calculated with the RAS method by Hernández Laos (2004). This matrix, includes sales of goods and services from each sector to other sectors and to final demand, as well as purchases to other sectors, rent from productive services and payments associated with production taxes. Additionally, for demand analysis we used the Encuesta Nacional Ingreso Gasto de los Hogares 2000 (ENIGH 2000) to construct a demand matrix for each population decil according to their income per capital. The construction method of the demand matrix can be found in Marquez (2006).

In the fifth section, we present the changes in relative prices and quantities resulting from the fiscal policy simulation that (i) decreases income tax to 25% and (ii) establishes a value added tax (IVA) of 12% on all products and services, except on food and medicines and (iii) exclusively for the consumption of ninth and tenth deciles, food products pass from zero tax regime to 12% on IVA taxation; and for medicines, they pass from an exemption regime, to also 12% on IVA taxation. This is done due to the complexity of modeling the tax burden for "sumptuary" products in the food sector and to distinguish "miracle" products in the medicine sector, and because we assume that legislators will protect the population with the lowest income.

Conclusions are discussed in the last and sixth section of the paper.

2. Model

2.1. Considerations about the model

The following model represents a small open economy that is price acceptant, with five economic sectors: companies, families, government, foreign sector and investment sector.

Equations within the model include endogenous and exogenous variables, as well as parameters. Endogenous variables will be identified by capital letters; exogenous variables will be in capital letters and "hats", and parameters in lower-case or Greek letters.

2.2. Price System

Four prices are computed in the price system: price for domestic goods (Pid), price for compounded goods

(Pi), price of imports (Pim) and the international price of exports (Piwe). The first one is obtained from the zero-gain equation for companies[6].

$$P_i^d = \frac{va_i\,(1+t_i^{iva})\left(\frac{w_K}{1-\alpha_i}\right)^{1-\alpha_i}\left(\frac{w_L}{\alpha_i}\right)^{\alpha_i}}{c_i} + \sum_{j=1}^{n} a_{j,i}P_j \tag{1}$$

The second one is obtained by equaling the production value of the compounded good to the sum of values of imported and exported goods, considering that the function for the compounded goods has constant substitution elasticity (CES).

$$P_i = \frac{1}{b_i}\frac{\left(P_i^m\left(\frac{(1-\mu_i)P_i^d}{\mu_i P_i^m}\right)^{\sigma_i} + P_i^d\right)}{\left(\mu_i + (1-\mu_i)\left(\frac{(1-\mu_i)P_i^d}{\mu_i P_i^m}\right)^{\sigma_i-1}\right)^{\frac{\sigma_i}{\sigma_i-1}}} \tag{2}$$

Price for imports of good i (P_i^m) will be determined in an exogenous way by the foreign price of good i ($\widehat{P_i^*}$), the exchange rate (TC) and the import tariffs for good i (tmi). This will satisfy the assumption of a small open economy.

$$P_i^m = \widehat{P_i^*}\,(1 + tm_i)\,TC \tag{3}$$

International price for exports of good *I* (P_i^{we}) is determined by the domestic price of good *i* (P_i^d), by the exchange rate (*TC*) and by the subsidy on exports for good *i* (s_i).

$$P_i^{we} = \frac{P_i^d}{(1+s_i)\,TC} \tag{4}$$

2.3. Supply

In the supply side we consider "n" different productive sectors in the economy for final consumption goods which are made of intermediate inputs from other sectors and of value added. The decision of how many domestic goods are produced (x_i^s) is calculated by aggregating, through a Leontief function, the intermediate inputs and demand for labor and capital.

$$X_i^s = min\left(\frac{VA_i}{va_i}, \frac{II_{1,i}}{a_{1,i}}, \frac{II_{2,i}}{a_{2,i}}, \frac{II_{3,i}}{a_{3,i}}, ..., \frac{II_{j,i}}{a_{j,i}}\right) \tag{5}$$

[6]This consideration derives from the assumption that in a small open economy companies are price acceptant, so that revenue for each additional unit produced is equal to its cost

Being $II_{j,i}$ the quantity of intermediate input *j* used in the fabrication of final good *i* which is denoted by the following equation:

$$II_{j,i} = X_i^s\, a_{j,i} \tag{6}$$

where $a_{j,i}$ represents the technical coefficient of intermediate input *j*, that is, it corresponds to the minimum input for good *j* used for the fabrication of unit *i*.

In the generation of value added in the different sectors (VAi), productive services of capital and labor are used through a Cobb-Douglas function.

$$VA_i = c_i L_i^{\alpha i}\, K_i^{1-\alpha i} \tag{7}$$

To obtain demands for labor (L_i) and capital (K_i), companies make a minimization of capital and labor costs subject to a function on value added.

$$K_i = \frac{VA_i\left(\frac{w_L(1-\alpha_i)}{w_K\,\alpha_i}\right)^{\alpha_i}}{c_i} \tag{8}$$

$$L_i = \frac{VA_i\left(\frac{w_K\,\alpha_i}{w_L(1-\alpha_i)}\right)^{1-\alpha_i}}{c_i} \tag{9}$$

Where c_i, corresponds to the efficiency factor of sector *i*.

Total demand for capital (K^d) and labor the sum of demands in each sector *i*.

$$K^d = \sum_{i=1}^{n} K_i \tag{10}$$

$$L^d = \sum_{i=1}^{n} L_i \tag{11}$$

In the same manner, usage of productive services of capital and labor by productive industries of different goods, must match the total quantity available of those factors in the market:

$$K^d = \widehat{K_0^s} \tag{12}$$

$$L^d = \widehat{L_0^s} \tag{13}$$

Where $\widehat{K_0^s}$, represents the availability of capital and $\widehat{L_0^s}$ the availability of labor.

2.4. Government

For the purpose of this work, government consumption is assumed to be determined exogenously ($\widehat{Y_i^g}$), so that the Federal Government assigns a fixed percentage of its income to spending in the different goods produced in the economy.

$$\widehat{Y_i^g} = Y_i^g \tag{14}$$

Government income (Zg) comes from value added tax, capital tax, income tax and from import tariffs.

$$\begin{aligned} Zg &= \sum_{h=1}^{H} t_h^{isr}\left(w_L \widehat{L_h^s}\right) + \sum_{h=1}^{H} t_h^{cap}\left(w_K \widehat{K_h^s}\right) + \sum_{i=1}^{n} tm_i \widehat{P_i^*}\, TC\, M_i + \\ &+ \sum_{i=1}^{n} t_i^{iva}\left(w_L L_i + w_K K_i\right) - \sum_{i=1}^{n} s_i P_i^{we} TC\, E_i \end{aligned} \tag{14}$$

Additionally, government saving (Sg) corresponds to the income not used for consumption.

$$S^g = Zg - \sum_{i=1}^{n} \widehat{Y_i^g} P_i \tag{15}$$

2.5. Demand

Private consumption demand is represented by "H" family groups with different income levels so each group "h" will have a determined level of factors (capital and labor), that is, its budget constraint (Zp_h).

$$Zp_h = w_L \widehat{L_h^s}\left(1 - t_h^{isr}\right) + w_K \widehat{K_h^s}\left(1 - t_h^{cap}\right) \tag{16}$$

w_L = Labor wages.

w_K = Capital retribution.

L_h^s = Labor supply for group h.

K_h^s = Capital supply for group h.

It is considered that each group's "h" demand (Yihc) for final goods in the economy h responds to a maximization process of its Cobb-Douglas type utility function subject to its respective budget constraint.

$$Y_{ih}^c = \frac{\beta_i^h g_h Zp_h}{P_i} \tag{17}$$

Income not used for consumption is used for saving (S_h^p)

$$S_h^p = (1 - g_h)\, Zp_h \tag{18}$$

Total private consumption for good *i* (Y_i^c) will be represented by the sum of demands for the "H" groups of consumers. In the same token, total private saving (S^p) will be the sum of savings of the "H" groups of consumers.

$$Y_i^c = \sum_{h=1}^{H} Y_{ih}^c \tag{19}$$

$$S^p = \sum_{h=1}^{H} S_h^p \tag{20}$$

2.6. Investment

For the investment side a new system was used, which was not found in other general equilibrium problems in the revised literature[7]. Total investment is considered not only to be the sum of public, private and foreign savings, but also equal to the fixed gross investment (I^{BF}) plus inventory variation (Y_i^{VE}).

$$I = S^p + S^g + \widehat{F} TC \tag{21}$$

The value of fixed gross investment made in the economy (I^{BF}) responds to a Tobin's "q" process, by which the amount of fixed gross investment is proportional to the difference between return on capital in the domestic economy (ρ) and the real interest rate of foreign financial assets (r^*).

$$I^{BF} = \delta\left(\rho - \widehat{r^*}\right) \tag{22}$$

Return on capital (ρ) refers to the rent price of capital pieces or the price of productive services of capital earned by its owners (w_K), relative to its price (P_k).

$$\rho = \frac{w_K}{P_k} \tag{23}$$

See: Serra (1979), Cordova (1991), Balzarotti and Cicowiez (2004) and Cicowiez (2004)

Due to prices of construction goods (P_{ic}) and to prices of machinery and equipment (P_{imq}), and considering that the marginal cost of producing new capital pieces in the economy must match capital price, and applying Shepard's theory, we obtain:

$$P_k = \left(\frac{P_{ic}}{\theta_c}\right)^{\theta_c} \left(\frac{P_{imq}}{\theta_{mq}}\right)^{\theta_{mq}} \tag{24}$$

where:

θ_c = Preference parameter for construction good.

θ_{mq} = Preference parameter for machinery and equipment.

Consequently, price for new capital pieces (P_k) in the economy will be a weighted average of the prices of its two inputs: construction price and that of machinery and equipment. This price and the rent price of capital services allows to determine the return on capital (ρ) and the value of fixed gross investment (I^{BF}).

The vector of demand for goods that fixed gross investment generates is the following:

$$Y_i^{IBF} = \frac{\theta_i I^{BF}}{P_i} \tag{25}$$

Where θ_i represents the preference parameter of sector *i* for fixed gross investment goods.

The vector of demand for total investment will correspond to a percentage "ϕ_i" of total investment amount (I/P_i) for each investment good *i*.

$$Y_i^I = \phi_i \frac{I}{P_i} \tag{26}$$

Therefore, demand for inventory variations will correspond to the difference between the demand of total investment and the demand for fixed gross investment goods, allowing demand for inventory variations to adjust to changes in demand of total investment and in demand for fixed gross investment goods.

$$Y_i^{VE} = Y_i^I - Y_i^{IBF} \tag{27}$$

2.7. Foreign Sector

Demand for exports was obtained through an exponential function where the quantity demanded of exports of good *i* (E_i) is determined by the foreign price of exports of good *i* ($\widehat{P_i^*}$), by the international price of exports of good *i* (P_i^{we}) and by the price elasticity of exports (η_i).

$$E_i = \widehat{E_i} \left(\frac{\widehat{P_i^*}}{P_i^{we}}\right)^{\eta_i} \tag{28}$$

Demand for imports responds to a minimization process that aggregates domestic and imported goods in a CES-type function. Quantity demanded of imports of good i depends on the domestic price of good *i* (P_i^d), on the quantity demanded of domestic good *i* (D_i) and on the substitution elasticity between domestic and imported goods of sector *i* (σ_i).

$$M_i = \left(\frac{(1-\mu_i)\, P_i^d}{\mu_i P_i^m}\right)^{\sigma_i} D_i \tag{29}$$

Balance of payments is made up by the current account and foreign savings considering that the exchange rate is flexible and it adjusts to maintain equilibrium in the balance of payments.

$$BP = \sum_{i=1}^{n} \widehat{P_i^*} M_i - \sum_{i=1}^{n} P_i^{we} E_i - \widehat{F} = 0 \tag{30}$$

2.8. Intermediate Demand

Intermediate demand for each productive sector (V_i) is equal to the sum of sales in each of the "*n*" sectors of the economy for the production of all compounded goods.

$$V_i = \sum_{j=1}^{n} a_{i,j} X_j^s \tag{31}$$

2.9. Equilibrium in Market of goods

To calculate total demand of domestic produced goods (X_i^d), it is necessary to calculate the demand of domestic goods (D_i) and the demand for export goods (E_i). To compute the first one, we need to find the ratio of domestic use (UD_i) through a minimization problem to

determine the quantity of domestic and imported goods needed by companies to produce compounded goods.

$$UD_i = \frac{1}{b_i \left(\mu_i + (1-\mu_i) \left(\frac{(1-\mu_i) P_i^d}{\mu_i P_i^m} \right)^{\sigma_i - 1} \right)^{\frac{\sigma_i}{\sigma_i - 1}}} \quad (32)$$

With this, the internal demand for domestic goods i (D_i) will correspond to a fraction UD_i of the total investment demand, private consumption, government consumption and of intermediate demand.

$$D_i = UD_i \left(Y_i^I + Y_i^c + \widehat{Y_i^g} + V_i \right) \quad (33)$$

Total demand of good i produced domestically (X_i^d) is equal to the sum of internal demands for domestic produced goods (D_i) and of the demand for exports of good i.

$$X_i^d = D_i + E_i \quad (34)$$

Equilibrium in the market of goods will be reached when no excess of supply or of demand for good i exists.

$$X_i^d - X_i^s = 0 \quad (35)$$

2.10. Rules for closure

In order to maintain consistency in the model, the number of variables must match the number of equations. The following table describes the endogenous variables of the model and the corresponding equation.

Table 1. Rules for Closure

Endogenous Variables	Equations	Endogenous Variables	Equations
TC	BP	P_i^{pd}	P_i^{pd}
P_i^m	P_i^m	P_i	P_i
VA_i	VA_i	$II_{j,i}$	$II_{j,i}$
X_i^s	X_i^s	L_i	L_i
K_i	K_i	w_L	$L^d = \widehat{L_0^s}$
w_K	$K^d = \widehat{K_0^s}$	P_i^{we}	P_i^{we}
D_i	D_i	M_i	M_i
E_i	E_i	ρ	ρ
P_k	P_k	I^{BF}	I^{BF}
Y_i^{IBF}	Y_i^{IBF}	Y_i^{VE}	Y_i^{VE}
Y_i^I	Y_i^I	I	I
S^p	S^p	S^g	S^g
Zp_h	Zp_h	$Y_{i_h}^c$	$Y_{i_h}^c$
S_h^p	S_h^p	Zg	Zg
UD_i	UD_i	Y_i^c	Y_i^c
V_i	V_i	L^d	L^d
K^d	K^d	X_i^d	$X_i^d - X_i^s = 0$

3. Calibration

We selected year 2000 as the base year to obtain the value of parameters in the equation system, because that is the period where we could find the best data for the original general equilibrium calculations.

Information sources are the input-product matrix elaborated by Hernández Laos (2004)[8], the Encuesta Nacional Ingreso Gasto de los Hogares 2000 (ENIGH 2000) and the estimation of substitution elasticities between domestic and imported good, as well as the price elasticities of exports for the 63 productive branches with commercial goods[9].

Calibration is made for 23 productive sectors of the Mexican economy with a special disaggregation of food, medicines, education and press/editorial sectors. These 23 productive sectors are shown in Table 2.

Table 2. Productive Sectors

Sector	Reference
Agriculture, Foresty and Fishing	sec1
Mining	sec2
Food	sec3
Alcoholic Beverages	sec4
Non Alcoholic Beverages	sec5
Tobacco and their Products	sec6
Textiles, Clothing and Leather Industrie	sec7
Wood Industrie and Wood Products	sec8
Paper and Cardboard	sec9
Press and Editorials	sec10
Chemical Substances, Petroleum by-products, Ruber and Plastic	sec11
Medicines	sec12
Non-Metallic Minerals, except Petroleum by-products and Coal	sec13
Basic Metals Industrie	sec14
Metals Products, Machinery and Equipment	sec15
Other Manufacture Industries	sec16
Construction and Installation	sec17
Electricity, Gas and Water	sec18
Commercial, Restaurants and Hotels	sec19
Transport, Storage and Communications	sec20
Financial Services, Insurance and Real Estate	sec21
Communal, Social and Personal Services	sec22
Education Services	sec23

4. General Equilibrium Calculation

Calculation of the original equilibrium is done by resolving the equation system of the model. The software used for the solution calculation is General Algebraic Modeling System (GAMS), which is specifically design to model linear, non-linear and multiple integration optimization problems[10].

[8] According to the handbook of the MIP 2000, information was updated from the Mexican domestic transaction matrix, base year 1980, in its version of 93 sector made by INEGI. From the matrix, three concepts of the gross domestic product were divided in four parts according to the methodology developed by Adriaan Ten Kate and Sergio Escamilla Sánchez. "Actualización de Matrices de Insumo Producto con el Método RAS". Revista Estadística, Vol. III, No. 5, México, 1989

[9] Márquez(2006)

At the same time, the general equilibrium for the base year must comply with the following assumptions:

a. Offer equals demand in all markets,

b. No sector has positive benefits,

c. All agents fulfill their corresponding budget constraints,

d. External sector is in equilibrium, and

e. All prices are equal to one.

5. Simulation of Fiscal Policy

The simulation of the fiscal policy takes into consideration a decrease from 30% to 25% in the income tax rate and a flat IVA rate of 12% in all productive sectors, except on food and medicines sectors which are only taxed with IVA at 12% for deciles ninth and tenth.

Results of the simulation are described below with figures expressed in hundred of billion.

5.1. Effects in Price System

Results in the price system suggest that domestic good prices are altered as a consequence of the change of factors' prices and those of compounded goods. Table 3 shows that domestic price of education services is increased in 10.8%, from the original equilibrium, followed by an increase of 6% in the domestic prices of press & editorials, 1.2% increase in the domestic prices of construction & installation sector, 0.5% in the domestic prices of medicines, and 0.4% increase in the domestic price of food.

Furthermore, the decrease in IVA in sectors different to food and medicines causes a decrease of domestic prices between 0.1% and 0.3%.

Table 3. Domestic Prices

Ref	Original Equilibrium	Simulation	% Change
sec1	1	0.998	-0.20%
sec2	1	0.998	-0.20%
sec3	1	1.003	0.30%
sec4	1	0.998	-0.20%
sec5	1	1.004	0.40%
sec6	1	0.997	-0.30%
sec7	1	0.997	-0.30%
sec8	1	0.998	-0.20%
sec9	1	0.998	-0.20%
sec10	1	1.06	6.00%
sec11	1	0.998	-0.20%
sec12	1	1.005	0.50%
sec13	1	0.998	-0.20%
sec14	1	0.998	-0.20%
sec15	1	0.997	-0.30%
sec16	1	0.998	-0.20%
sec17	1	1.012	1.20%
sec18	1	0.998	-0.20%
sec19	1	0.999	-0.10%
sec20	1	0.998	-0.20%
sec21	1	1.001	0.10%
sec22	1	0.998	-0.20%
sec23	1	1.108	10.80%

Regarding compounded goods prices, results point out that the prices are increased by 10.8% in education, 5.9% increase in the price of press & editorials, 1.2% increase in the price of construction & installation sector, 0.4% in the prices of medicines, and 0.2% increase in the price of food.

We also expect that prices of goods and services of all other sectors are reduced between 0.1% and 0.3%.

Table 4. Compounded goods prices

Ref	Original Equilibrium	Simulation	% Change
sec1	1	0.998	-0.20%
sec2	1	0.998	-0.20%
sec3	1	1.002	0.20%
sec4	1	0.998	-0.20%
sec5	1	1.004	0.40%
sec6	1	0.997	-0.30%
sec7	1	0.997	-0.30%
sec8	1	0.998	-0.20%
sec9	1	0.998	-0.20%
sec10	1	1.059	5.90%
sec11	1	0.998	-0.20%
sec12	1	1.004	0.40%
sec13	1	0.998	-0.20%
sec14	1	0.998	-0.20%
sec15	1	0.998	-0.20%
sec16	1	0.998	-0.20%
sec17	1	1.012	1.20%
sec18	1	0.998	-0.20%
sec19	1	0.999	-0.10%
sec20	1	0.998	-0.20%
sec21	1	1.001	0.10%
sec22	1	0.998	-0.20%
sec23	1	1.108	10.80%

Import prices result in a decrease of 0.2% due to the exchange rate appreciation caused by an expected increase in the interest rate.

[10]The system is commonly used in large and complex problems, allowing for model programming to solve for different values of a specific element while generating a report of the outcome for each solution. The model program must be entered in algebraic form and we must select a specific solver for the problem. For this work we used the CONOPT solver. Results are generated after the solver performs several iterations to find the solution that satisfies the equilibrium in all markets. Please refer to the webpage: http://www.gams.com/docs/intro.htm

Table 5. Import Prices

Ref	Original Equilibrium	Simulation	% Change
sec1	1	0.998	-0.20%
sec2	1	0.998	-0.20%
sec3	1	0.998	-0.20%
sec4	1	0.998	-0.20%
sec5	1	0.998	-0.20%
sec6	1	0.998	-0.20%
sec7	1	0.998	-0.20%
sec8	1	0.998	-0.20%
sec9	1	0.998	-0.20%
sec10	1	0.998	-0.20%
sec11	1	0.998	-0.20%
sec12	1	0.998	-0.20%
sec13	1	0.998	-0.20%
sec14	1	0.998	-0.20%
sec15	1	0.998	-0.20%
sec16	1	0.998	-0.20%
sec17	1	1	0.00%
sec18	1	0.998	-0.20%
sec19	1	0.998	-0.20%
sec20	1	0.998	-0.20%
sec21	1	0.998	-0.20%
sec22	1	0.998	-0.20%
sec23	1	1	0.00%

Domestic prices changes and the appreciation of the exchange rate of 0.2% will cause that some goods and services to increase their prices in the external market. Goods from medicine, food and press & editorial sectors, will exhibit the greater increase in their international prices for exports.

International prices for exports of goods and services in the tobacco sector would be more competitive in just 0.1%.

Table 6. International Prices for Exports

Ref	Original Equilibrium	Simulation	% Change
sec1	1	1	0.00%
sec2	1	1	0.00%
sec3	1	1.005	0.50%
sec4	1	1.001	0.10%
sec5	1	1.006	0.60%
sec6	1	0.999	-0.10%
sec7	1	1	0.00%
sec8	1	1	0.00%
sec9	1	1	0.00%
sec10	1	1.062	6.20%
sec11	1	1	0.00%
sec12	1	1.007	0.70%
sec13	1	1	0.00%
sec14	1	1	0.00%
sec15	1	1	0.00%
sec16	1	1	0.00%
sec17	1	1	0.00%
sec18	1	1	0.00%
sec19	1	1.001	0.10%
sec20	1	1	0.00%
sec21	1	1.003	0.30%
sec22	1	1	0.00%
sec23	1	1	0.00%

5.2. Effects on Production Sector

Simulation results, suggests an increase in the return of capital of 0.8%, with respect to the original equilibrium, and no changes in the labor wage since it is considered equal to one for the estimation of the new equilibrium.

Table 7. Capital Demand (Hundred of Billions)

Ref	Original Equilibrium	Simulation	% Change
sec1	1.669	1.667	-0.12%
sec2	1.203	1.253	4.16%
sec3	2.247	2.245	-0.09%
sec4	0.23	0.23	0.00%
sec5	0.279	0.279	0.00%
sec6	0.038	0.038	0.00%
sec7	0.631	0.629	-0.32%
sec8	0.238	0.238	0.00%
sec9	0.182	0.181	-0.55%
sec10	0.174	0.173	-0.57%
sec11	0.963	0.96	-0.31%
sec12	0.315	0.315	0.00%
sec13	0.634	0.683	7.73%
sec14	0.513	0.512	-0.19%
sec15	3.246	3.239	-0.22%
sec16	0.263	0.262	-0.38%
sec17	1.118	1.101	-1.52%
sec18	0.207	0.206	-0.48%
sec19	7.808	7.792	-0.20%
sec20	3.939	3.93	-0.23%
sec21	4.918	4.913	-0.10%
sec22	4.496	4.482	-0.31%
sec23	0.458	0.441	-3.71%

Table 7 points out, as consequence of the grow in return of capital, some productive sectors decrease the quantity demanded for capital. Reduction in demand for capital among sectors is explained by the different utilization intensities of this factor. In this sense, education service sector, decrease the quantity demanded for this factor in 3.71%, with respect to the original equilibrium, due to the utilization intensity value ($1-\alpha$) for the capital in this sector is 0.157, an due to, as will see forward, the diminishing in the offer quantity of their services that provide to the economy. To this decrease, follows the drop in 1.52% of the quantity demanded for capital of construction & installation sector, the fall in 0.57% in the quantity demanded of press & editorials sector, the diminishing in 0.55% in the quantity demanded of paper and cardboard sector and the decrease in 0.48% in the quantity demanded for capital of electricity, gas and water sector.

Due to the assumption of labor market closure, the quantity of capital freed up will be absorbed by other sectors; in this way, non-metallic minerals, except petroleum by-products and coal and mining sectors, will increase their quantity demanded for capital in 7.73% and 4.16%, respectively.

Table 8. Labor Demand (Hundred of Billions)

Ref	Original Equilibrium	Simulation	% Change
sec1	0.356	0.358	0.56%
sec2	0.155	0.163	5.16%
sec3	0.345	0.347	0.58%
sec4	0.045	0.046	2.22%
sec5	0.083	0.084	1.20%
sec6	0.01	0.01	0.00%
sec7	0.343	0.345	0.58%
sec8	0.07	0.071	1.43%
sec9	0.061	0.061	0.00%
sec10	0.088	0.088	0.00%
sec11	0.431	0.433	0.46%
sec12	0.097	0.098	1.03%
sec13	0.125	0.135	8.00%
sec14	0.072	0.073	1.39%
sec15	1.227	1.234	0.57%
sec16	0.116	0.116	0.00%
sec17	1.476	1.465	-0.75%
sec18	0.253	0.254	0.40%
sec19	2.634	2.651	0.65%
sec20	1.518	1.527	0.59%
sec21	0.616	0.621	0.81%
sec22	2.681	2.695	0.52%
sec23	2.465	2.392	-2.96%

At the same time, there are reassignments in the quantity demanded for labor among production sectors. Results showed in Table 8, suggests an increase in the quantity demanded for this productive factor mainly in non-metallic minerals, except petroleum by-products and coal and mining sectors. Likewise, education services and construction & installation sector reduce their quantity demanded for this factor in 2.96% and 0.75%, respectively.

The closure in labor and capital markets, indicate us that the quantities demanded and offered are equal. The results are exhibited in the following table.

Table 9. Labor and Capital Market Equilibrium

Variables	Quantities
Ld	15.267
Ls	15.267
Kd	35.77
Ks	35.77

With respect to the generation of value added, the reallocation of productive factors causes distinct changes in this concept. As table 10 points out, non-metallic minerals, except petroleum by-products sector increase their generation in value added in 7.77%, whereas, mining sector increment their generation of value added in 4.19%. The above, as consequence of both sector surpluses their quantity demanded for labor and capital.

In addition, sectors as construction & installation and educative services, exhibited a fall in the generation of value added in 1.09% and 3.09%, respectively.

Table 10. Value Added Generation (Hundred of Billions)

Ref	Original Equilibrium	Simulation	% Change
sec1	2.025	2.025	0.00%
sec2	1.359	1.416	4.19%
sec3	2.592	2.592	0.00%
sec4	0.275	0.275	0.00%
sec5	0.362	0.362	0.00%
sec6	0.048	0.048	0.00%
sec7	0.975	0.975	0.00%
sec8	0.309	0.309	0.00%
sec9	0.243	0.243	0.00%
sec10	0.261	0.261	0.00%
sec11	1.393	1.393	0.00%
sec12	0.413	0.413	0.00%
sec13	0.759	0.818	7.77%
sec14	0.585	0.585	0.00%
sec15	4.473	4.473	0.00%
sec16	0.378	0.378	0.00%
sec17	2.594	2.566	-1.08%
sec18	0.46	0.46	0.00%
sec19	10.443	10.443	0.00%
sec20	5.457	5.457	0.00%
sec21	5.534	5.534	0.00%
sec22	7.177	7.177	0.00%
sec23	2.923	2.832	-3.11%

With regard to the quantity offered of goods and services produced in the economy, the results suggests substantial changes in educational services, with a drop of 3.09%, with respect to the original equilibrium, and construction & installation sector, with a decrease of 1.09%.

Table 11. Production of Compounded Goods (Hundred of Billions)

Ref	Original Equilibrium	Simulation	% Change
sec1	3.207	3.207	0.00%
sec2	1.75	1.75	0.00%
sec3	6.106	6.106	0.00%
sec4	0.546	0.546	0.00%
sec5	0.789	0.789	0.00%
sec6	0.082	0.082	0.00%
sec7	2.638	2.638	0.00%
sec8	0.765	0.765	0.00%
sec9	0.689	0.689	0.00%
sec10	0.571	0.571	0.00%
sec11	3.718	3.718	0.00%
sec12	0.738	0.738	0.00%
sec13	1.393	1.393	0.00%
sec14	1.527	1.527	0.00%
sec15	14.498	14.498	0.00%
sec16	1.009	1.009	0.00%
sec17	5.705	5.643	-1.09%
sec18	1.28	1.28	0.00%
sec19	14.427	14.427	0.00%
sec20	8.303	8.303	0.00%
sec21	7.54	7.54	0.00%
sec22	10.311	10.311	0.00%
sec23	3.272	3.171	-3.09%

5.3. Effects on Foreign Sector

The changes experimented in the prices of factors, price of domestic goods, price of imported goods, price

of compounded goods and exchange rate; influence the decisions of productive sectors, in the sense of how much quantity of domestic goods and imported goods will demand to produce their own compounded goods. Tables 12 and 13 summarize these changes.

Table 12. Demand for Domestic Goods (Hundred of Billions)

Ref	Original Equilibrium	Simulation	% Change
sec1	2.919	2.919	0.00%
sec2	1.504	1.504	0.00%
sec3	5.811	5.811	0.00%
sec4	0.422	0.422	0.00%
sec5	0.782	0.782	0.00%
sec6	0.067	0.067	0.00%
sec7	2.062	2.062	0.00%
sec8	0.683	0.683	0.00%
sec9	0.653	0.653	0.00%
sec10	0.52	0.52	0.00%
sec11	3.096	3.096	0.00%
sec12	0.66	0.66	0.00%
sec13	1.231	1.231	0.00%
sec14	1.289	1.289	0.00%
sec15	9.611	9.611	0.00%
sec16	0.703	0.703	0.00%
sec17	5.705	5.643	-1.09%
sec18	1.275	1.275	0.00%
sec19	12.235	12.236	0.01%
sec20	7.783	7.784	0.01%
sec21	7.54	7.54	0.00%
sec22	10.13	10.13	0.00%
sec23	3.272	3.171	-3.09%

Table 13. Demand of Imported Goods (Hundred of Billions)

Ref	Original Equilibrium	Simulation	% Change
sec1	0.311	0.311	0.00%
sec2	0.063	0.063	0.00%
sec3	0.247	0.247	0.00%
sec4	0.005	0.005	0.00%
sec5	0	0	0.00%
sec6	0	0	0.00%
sec7	0.36	0.36	0.00%
sec8	0.056	0.056	0.00%
sec9	0.219	0.219	0.00%
sec10	0.006	0.006	0.00%
sec11	1.453	1.453	0.00%
sec12	0.132	0.133	0.76%
sec13	0.092	0.092	0.00%
sec14	0.509	0.509	0.00%
sec15	3.126	3.126	0.00%
sec16	0.442	0.442	0.00%
sec17	0	0	0.00%
sec18	0.041	0.041	0.00%
sec19	0.007	0.007	0.00%
sec20	0.234	0.234	0.00%
sec21	0.031	0.031	0.00%
sec22	0.007	0.007	0.00%
sec23	0	0	0.00%

For the case of services and goods produced by construction & installation sector and education services, which are not tradable, we observed that their demand for domestic goods decreases in 1.09% and 3.09%, respectively, as consequence of the falling in their quantity offered for the economy.

In like manner, due to the price elasticity substitution between domestic and imported goods and to the increase in domestic prices of medicines, this sector will increase their demand for importable goods in 0.76%.

The distortion in domestic prices and the appreciation of exchange rate in 0.2%, causes changes in the international price of exportable goods.

Table 14. Demand for Exportable Goods (Hundred of Billions)

Ref	Original Equilibrium	Simulation	% Change
sec1	0.288	0.288	0.00%
sec2	0.246	0.246	0.00%
sec3	0.295	0.295	0.00%
sec4	0.124	0.124	0.00%
sec5	0.007	0.007	0.00%
sec6	0.015	0.015	0.00%
sec7	0.576	0.576	0.00%
sec8	0.082	0.082	0.00%
sec9	0.036	0.036	0.00%
sec10	0.051	0.048	-5.88%
sec11	0.623	0.623	0.00%
sec12	0.078	0.078	0.00%
sec13	0.163	0.163	0.00%
sec14	0.238	0.238	0.00%
sec15	4.887	4.887	0.00%
sec16	0.307	0.307	0.00%
sec17	0	0	0.00%
sec18	0.005	0.005	0.00%
sec19	2.193	2.192	-0.05%
sec20	0.52	0.52	0.00%
sec21	0	0	0.00%
sec22	0.181	0.181	0.00%
sec23	0	0	0.00%

As table 14 shows, press & editorials and commercial, restaurant & hotels sectors, faces a fall in the quantity demanded from overseas in 5.88% and 0.05%, respectively. This is explained by the increment in their international prices of export, which make their products less competitive in foreign market.

5.4. Effects in Private Consumption

Income of population deciles changes due to the grow in return on capital and prices of factors and to the reassignment of production factors among productive sectors.

Table 15. Income of Population Deciles (Hundred of Billions)

Ref	Original Equilibrium	Simulation	% Change
dec1	1.005	1.011	0.60%
dec2	1.584	1.592	0.51%
dec3	1.946	1.955	0.46%
dec4	2.356	2.367	0.47%
dec5	2.808	2.82	0.43%
dec6	3.31	3.325	0.45%
dec7	4.152	4.173	0.51%
dec8	5.241	5.269	0.53%
dec9	6.515	6.583	1.04%
dec10	18.459	19.205	4.04%

As result of changes mentioned above, the income of the first eight deciles, exhibit an increase around 0.43% and 0.6%, with respect to the original equilibrium. Also, income tax reduction, benefits ninth and tenth deciles more than other deciles of populations.

To continue with the analysis of consumption by deciles of population, is necessarily to mention, that the fiscal policy modeled in this document, consider to impose a tax, with a rate of 12% in IVA, in all services and goods produced in the economy, except food and medicines. For the case of those goods and services produced by press & editorials and educational sectors, they pass from an exemption regime to 12% in IVA rate. Likewise, exclusively for ninth and tenth deciles of population, food products pass from zero tax regime to 12% in IVA rate, and for medicines, they pass from an exemption regime to also 12% in IVA rate.

A table 16, 17 and 18, summarizes changes in consumption by deciles.

Table 16. Consumption of Population Deciles. Original Equilibrium (Hundred of Billions)

Sector	Decil									
	I	II	III	IV	V	VI	VII	VIII	IX	X
sec1	0.064	0.082	0.083	0.093	0.102	0.103	0.106	0.125	0.134	0.185
sec2	4.00E-05	8.00E-05	5.00E-05	6.00E-05	4.00E-05	4.00E-05	4.00E-05	1.00E-04	9.00E-05	7.00E-05
sec3	0.328	0.348	0.393	0.408	0.455	0.46	0.458	0.485	0.479	0.574
sec4	0.02	0.024	0.031	0.035	0.042	0.044	0.046	0.05	0.048	0.053
sec5	0.029	0.04	0.02	0.043	0.072	0.046	0.081	0.069	0.077	0.286
sec6	0.003	0.002	0.004	0.005	0.005	0.004	0.007	0.009	0.008	0.016
sec7	0.014	0.024	0.027	0.038	0.046	0.06	0.067	0.094	0.13	0.249
sec8	0.001	0.002	0.004	0.005	0.007	0.012	0.013	0.017	0.03	0.05
sec9	1.00E-04	1.50E-04	3.90E-04	0.002	0.007	0.006	0.008	0.014	0.025	0.053
sec10	0.009	0.01	0.012	0.012	0.015	0.016	0.019	0.023	0.03	0.059
sec11	0.012	0.026	0.036	0.043	0.057	0.069	0.082	0.107	0.144	0.304
sec12	0.026	0.024	0.032	0.035	0.033	0.036	0.045	0.048	0.062	0.128
sec13	0.002	0.007	0.004	0.01	0.011	0.014	0.034	0.029	0.029	0.088
sec14	5.90E-04	5.90E-04	5.90E-04	5.90E-04	5.90E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04	6.00E-04
sec15	0.005	0.01	0.012	0.014	0.029	0.071	0.049	0.072	0.164	0.67
sec16	7.60E-04	9.80E-04	0.001	0.002	0.003	0.003	0.004	0.006	0.009	0.022
sec17	0	0	0	0	0	0	0	0	0	0
sec18	0.006	0.014	0.022	0.03	0.033	0.039	0.045	0.053	0.073	0.13
sec19	0.029	0.087	0.109	0.187	0.294	0.458	0.617	0.922	1.4	3.598
sec20	0.064	0.144	0.195	0.293	0.361	0.496	0.567	0.738	0.921	1.558
sec21	0.018	0.033	0.063	0.149	0.173	0.253	0.379	0.567	0.834	3.106
sec22	0.007	0.012	0.05	0.059	0.096	0.146	0.077	0.131	0.154	3.777
sec23	0.013	0.027	0.03	0.041	0.044	0.049	0.105	0.134	0.307	0.343
TOTAL	**0.6515**	**0.9178**	**1.1290**	**1.5047**	**1.8856**	**2.3856**	**2.8096**	**3.6937**	**5.0587**	**15.2497**

Table 17. Consumption of Population Deciles. Simulation (Hundred of Billions)

Sector	Decil									
	I	II	III	IV	V	VI	VII	VIII	IX	X
sec1	0.065	0.083	0.083	0.094	0.103	0.103	0.107	0.126	0.135	0.186
sec2	4.03E-05	8.06E-05	5.03E-05	6.04E-05	4.03E-05	4.03E-05	4.03E-05	1.01E-04	9.07E-05	7.07E-05
sec3	0.329	0.349	0.394	0.409	0.455	0.461	0.459	0.487	0.48	0.576
sec4	0.021	0.024	0.031	0.036	0.043	0.044	0.047	0.05	0.048	0.053
sec5	0.029	0.04	0.02	0.043	0.072	0.046	0.081	0.069	0.077	0.288
sec6	0.003	0.002	0.004	0.005	0.006	0.004	0.007	0.009	0.008	0.016
sec7	0.014	0.024	0.028	0.039	0.046	0.061	0.068	0.094	0.131	0.252
sec8	0.001	0.002	0.004	0.005	0.007	0.013	0.013	0.017	0.03	0.051
sec9	1.01E-04	1.51E-04	3.93E-04	0.002	0.007	0.006	0.008	0.015	0.025	0.054
sec10	0.009	0.009	0.011	0.011	0.014	0.016	0.018	0.022	0.028	0.057
sec11	0.012	0.026	0.037	0.044	0.057	0.07	0.082	0.108	0.145	0.307
sec12	0.026	0.024	0.032	0.035	0.033	0.036	0.045	0.049	0.062	0.129
sec13	0.002	0.007	0.004	0.01	0.011	0.014	0.035	0.03	0.029	0.089
sec14	5.95E-04	5.94E-04	5.94E-04	5.94E-04	5.94E-04	6.04E-04	6.04E-04	6.05E-04	6.05E-04	6.06E-04
sec15	0.005	0.01	0.012	0.014	0.029	0.072	0.05	0.073	0.165	0.677
sec16	7.66E-04	9.87E-04	0.001	0.002	0.003	0.003	0.004	0.006	0.009	0.022
sec17	0	0	0	0	0	0	0	0	0	0
sec18	0.007	0.014	0.022	0.03	0.033	0.039	0.045	0.054	0.073	0.132
sec19	0.029	0.087	0.11	0.188	0.295	0.461	0.621	0.928	1.41	3.63
sec20	0.065	0.145	0.196	0.295	0.364	0.499	0.571	0.743	0.928	1.573
sec21	0.018	0.033	0.064	0.15	0.173	0.253	0.38	0.569	0.838	3.126
sec22	0.007	0.012	0.05	0.06	0.097	0.147	0.077	0.132	0.155	3.814
sec23	0.012	0.025	0.027	0.037	0.04	0.044	0.095	0.122	0.278	0.312
TOTAL	**0.6555**	**0.9178**	**1.1310**	**1.5097**	**1.8886**	**2.3926**	**2.8136**	**3.7037**	**5.0547**	**15.3447**

Tabla 18. % Change in Consumption of Population Deciles (Hundred of Billions)

Sector	Decil									
	I	II	III	IV	V	VI	VII	VIII	IX	X
sec1	1.56%	1.22%	0.00%	1.08%	0.98%	0.00%	0.94%	0.80%	0.75%	0.54%
sec2	0.81%	0.71%	0.66%	0.69%	0.66%	0.67%	0.72%	0.76%	0.76%	0.97%
sec3	0.30%	0.29%	0.25%	0.25%	0.00%	0.22%	0.22%	0.41%	0.21%	0.35%
sec4	5.00%	0.00%	0.00%	2.86%	2.38%	0.00%	2.17%	0.00%	0.00%	0.00%
sec5	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.70%
sec6	0.00%	0.00%	0.00%	0.00%	20.00%	0.00%	0.00%	0.00%	0.00%	0.00%
sec7	0.00%	0.00%	3.70%	2.63%	0.00%	1.67%	1.49%	0.00%	0.77%	1.20%
sec8	0.00%	0.00%	0.00%	0.00%	0.00%	8.33%	0.00%	0.00%	0.00%	2.00%
sec9	0.83%	0.73%	0.68%	0.00%	0.00%	0.00%	0.00%	7.14%	0.00%	1.89%
sec10	0.00%	-10.00%	-8.33%	-8.33%	-6.67%	0.00%	-5.26%	-4.35%	-6.67%	-3.39%
sec11	0.00%	0.00%	2.78%	2.33%	0.00%	1.45%	0.00%	0.93%	0.69%	0.99%
sec12	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.08%	0.00%	0.78%
sec13	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.94%	3.45%	0.00%	1.14%
sec14	0.80%	0.71%	0.65%	0.68%	0.65%	0.66%	0.72%	0.75%	0.76%	0.97%
sec15	0.00%	0.00%	0.00%	0.00%	0.00%	1.41%	2.04%	1.39%	0.61%	1.04%
sec16	0.81%	0.72%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
sec17	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
sec18	16.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.89%	0.00%	1.54%
sec19	0.00%	0.00%	0.92%	0.53%	0.34%	0.66%	0.65%	0.65%	0.71%	0.89%
sec20	1.56%	0.69%	0.51%	0.68%	0.83%	0.60%	0.71%	0.68%	0.76%	0.96%
sec21	0.00%	0.00%	1.59%	0.67%	0.00%	0.00%	0.26%	0.35%	0.48%	0.64%
sec22	0.00%	0.00%	0.00%	1.69%	1.04%	0.68%	0.00%	0.76%	0.65%	0.98%
sec23	-7.69%	-7.41%	-10.00%	-9.76%	-9.09%	-10.20%	-9.52%	-8.96%	-9.45%	-9.04%
% Change	**0.62%**	**0.00%**	**0.18%**	**0.33%**	**0.16%**	**0.29%**	**0.14%**	**0.27%**	**-0.08%**	**0.62%**

For the case of goods produced by press & editorial sector, data reveals that substitution effect dominates income effect in eight deciles; it is, as income goes up, we can expect that the quantity demanded goes up also to, however, the increment on domestic prices for those compounded goods, suggest a drop in the quantity demanded by those products, so, at the end, the last effect dominates the first one for these deciles. Only for two deciles of population, income and substitution effect nullifies, keeping constant the consumption. The expected changes in the quantity demanded, will corresponds to a fall in 0.00%, 10.00%, 8.33%, 8.33%, 6.67%, 0.00%, 5.26%, 4.35%, 6.67%, 3.39%, respectively for every decile of population.

In the other hand, for those services produced by education sector, data points out that substitution effect dominates income effect in all deciles of population. The expected decrease in the quantity demanded by those products will be 7.69%, 7.41%, 10.00%, 9.76%, 9.09%, 10.20%, 9.52%, 8.96%, 9.45%, 9.04%, respectively for every decile of population.

Nevertheless, 12% in IVA rate in food and medicines of ninth and tenth deciles of population, quantity demanded for those goods goes up. For tenth decile, data suggest that substitution effect dominates income effect; quantity demanded for food increases 0.35%, while the quantity demanded for medicines grows 0.78%. At the same time, substitution effect dominates income effect in the consumption of food for ninth decile of population, growing the quantity demanded in 0.21%, with respect to the original equilibrium; for the case of medicines, their quantity demanded by this group keeps constant, it is, income and substitution effect nullifies.

For those products that experimented a decrease on IVA's rate, data shows that the quantity demanded for some of these goods increased and for other keeps constant. These changes will associate to each good and service price elasticity.

Overall, the quantity demanded by deciles of population grows 0.62%, 0.00%, 0.18%, 0.33%, 0.16%, 0.29%, 0.14%, 0.27%, -0.08%, 0.62%, respectively for every decile of population.

Table 19. Total Private Consumption (Hundred of Billions)

Ref	Original Equilibrium	Simulation	% Change
sec1	1.076	1.084	0.74%
sec2	0.00061	0.000614573	0.75%
sec3	4.387	4.399	0.27%
sec4	0.394	0.396	0.51%
sec5	0.762	0.764	0.26%
sec6	0.062	0.063	1.61%
sec7	0.751	0.757	0.80%
sec8	0.141	0.142	0.71%
sec9	0.116	0.117	0.86%
sec10	0.205	0.195	-4.88%
sec11	0.882	0.889	0.79%
sec12	0.469	0.47	0.21%
sec13	0.229	0.231	0.87%
sec14	0.006	0.006	0.00%
sec15	1.096	1.106	0.91%
sec16	0.051	0.052	1.96%
sec17	0	0	0.00%
sec18	0.446	0.449	0.67%
sec19	7.701	7.759	0.75%
sec20	5.339	5.379	0.75%
sec21	5.574	5.604	0.54%
sec22	4.509	4.551	0.93%
sec23	1.094	0.993	-9.23%

Table 19 reports the changes in total private consumption for the goods and services produced by the 23 productive sectors modeling in this document. As we can see, the most significant falling in the quantity demanded is for educative services, with a decrease of 9.23%, followed by the decrease of 4.88% in the quantity demanded by goods of press & editorial sector.

Also, the reduction in the income tax rate only favors population deciles ninth and tenth, and this benefit is used in a small part for the consumption and in a greater part for savings. As fiscal policy modeling in this document is expansionist, it will cause an increment of the interest rate, and then, more private savings. Table 20 indicates that tenth decil will increment their savings in 19.67%, with respect to the original equilibrium, followed by the ninth decile with an increase of 2.47%.

Table 20. Saving for Population Deciles (Hundred of Billions)

Ref	Original Equilibrium	Simulation	% Change
dec1	0.351	0.353	0.57%
dec2	0.666	0.669	0.45%
dec3	0.816	0.819	0.37%
dec4	0.85	0.854	0.47%
dec5	0.923	0.927	0.43%
dec6	0.923	0.928	0.54%
dec7	1.343	1.35	0.52%
dec8	1.546	1.554	0.52%
dec9	1.459	1.499	2.74%
dec10	3.208	3.839	19.67%

5.5. Effects on Government Sector

As it was mentioned in prior sections, for the purposes of this document, the government expenditures are considered fixed, meaning they are independent with respect to tax revenues. This is why the modeling of the fiscal policy will just modify tax revenues and governmental savings'.

The following table shows that Government revenue from taxes, resulted in a decrease of 8.48%, which translates in a reduction in income of 47 billion pesos. At the same time, government savings will drop 45.92%.

Table 21. Government Revenues and Saving (Hundred of Billions)

Ref	Original Equilibrium	Simulation	% Change
Zg	5.557	5.086	-8.48%
Sg	1.531	0.828	-45.92%

The reasons for the decrease in tax revenue are: first, a reduction in the income tax rate only favors population deciles ninth and tenth, and this benefit is used in a small part for the consumption of those goods and services whose IVA rate was reduces and in a greater part for savings; and second, the tax revenue obtained from applying IVA of 12% in food and medicines, exclusively for the ninth and tenth population deciles, is not enough to offset the drop in tax revenue caused by the reduction of IVA in other sectors and the reduction in the income tax rate.

5.6. Effects on Investment Sector

Total investment was defined as the sum of total private savings, foreign savings and governmental savings. We observed in table 21 that total investment grow 0.04%, compared to the initial equilibrium, basically driven by the increment in total private savings. Concerning fixed gross investment (IBF), is estimated to grow 0.11%, due to the increment of 0.11% in the price of rent of capital pieces (P_k), and not for an improvement in the physical performance of capital (ρ).

Table 22. Total Investment and Fixed Gross Investment (Hundred of Billions)

Ref	Original Equilibrium	Simulation	% Change
Total Investment	10.042	10.046	0.04%
IBF	8.995	9.005	0.11%
ρ	0.554	0.554	0.00%
P_k	1.806	1.819	0.72%

5.7. Effects on Gross Domestic Product

To determine GDP, the expenditure approach with constant prices was used. Data suggest that GDP will grow 0.1%, with respect to the original equilibrium, as a result to implement the fiscal policy.

6. Conclusions

The objective of this work was to know the effects on the Mexican economy caused by the implementation of a fiscal policy that, in general terms, proposes to decrease income tax rate from 30% to 25%, while establishing a value added tax (IVA) of 12% on all products and services, except on food and medicines, but including those "miracle" products of the medicine sector and "sumptuary" goods of food sector.

Because of the difficulty of to distinguish "sumptuary" products in the food sector and "miracle" products in the medicine sector, this work model a fiscal policy that incorporate a reduction in the income tax rate from 30% to 25%, apply IVA of 12% to all goods and services, except in food and medicines, and to apply IVA of 12% to food and medicine sectors only for the ninth and tenth decile.

Results suggest capital and labor reassignment among productive sectors caused by an increase of capital return. Mining and non-metallic mineral sector, without including coal and petroleum, would demand the greatest amount of capital and labor. Educational services and construction & installation sectors, would demand less quantity of these factors.

Production sector will experience notorious changes in compounded goods production especially in the educational services sector with a drop of 3.09% and in the construction & installation sector with a drop of 2.52%.

Regarding the foreign sector, medicines will increase demand for imported goods due to the increase of domestic prices, to the exchange rate appreciation and to the high substitution elasticity between domestic and imported goods for that particular sector. In time, the external market would demand less quantity of goods and services from press & editorial, commercial, restaurants and hotels caused by the increase of domestic prices and the appreciation of the exchange rate.

Decreasing the income tax rate from 30% to 25%, would benefit groups of higher income (deciles ninth and tenth) who, along with the expected increase of capital return, would increase their income in 1.04% and 4.04%, respectively. However, not all the increase will be applied to consumption, but to savings because the fiscal policy proposal is expansionist, causing interest rates to increase and thus higher private savings.

Changing from exemption regime to 12% in IVA rate in educational services and in press & editorial, would cause a decrease in the quantity demanded for these products in the majority of the deciles, being educational services the most affected.

Furthermore, applying IVA of 12% in food and medicines just for the ninth and tenth deciles, would not reduce the quantity demanded by those two deciles.

Regarding quantity demanded of the rest of goods and services for sectors experimenting a reduction in IVA to 12%, results point out that quantity demanded increases for some products across the different population deciles, and other products demand remains unaltered. These changes would respond according to each good and service price elasticity.

As a whole, data suggest that total private consumption would increase 0.33%, and that goods whose demand would increase the most are those of other manufacturing industries.

Government revenue from taxes, resulted in a decrease of 8.48%, which translates in a reduction in income of $47 billion pesos. Moreover, government savings would fall around 45.92%. The reasons for the decrease in tax revenue are: first, a reduction in the income tax rate only favors population deciles ninth and tenth, and this benefit is used in a small part for the consumption of those goods and services whose IVA rate was reduces and in a greater part for savings; and second, the tax revenue obtained from applying IVA of 12% in food and medicines, exclusively for the ninth and tenth population deciles, is not enough to offset the drop in tax revenue caused by the reduction of IVA in other sectors and the reduction in the income tax rate.

It is important to notice that, for this analysis, the assumption of applying IVA to food and medicines for population deciles ninth and tenth is too aggressive, as not all demanded goods for the food sector should be considered as "sumptuary" and not all medicines as "miracle", and at the same time, some of these "sumptuary" and "miracle" products could be substituted by similar product exempt from IVA. Thus, government revenue from taxes could be even lower in reality.

Actual tax regime, which exempts goods and services from medicines, press & editorials and educational services, along with a high percentage of demand for products from these sectors with respect to total income of population with the lowest income, would imply that any fiscal policy pretending to tax these sectors would affect these population deciles. This is why, in order to propose new fiscal policies, the Federal Government needs to establish possible compensation mechanisms that generate certainty and credibility. These mechanisms should be the first and greatest step towards implementing fiscal policies that could increase tax revenue and make public expenditure more efficient.

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