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Optimization of the Consumption Function Under the North American Free Trade Agreement

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ABSTRACT

In the last 40 years, the country has turned to developing the primary and tertiary sectors with a tax policy heavily taxing goods outside the basic basket and generalizing others. On the other hand, Government implemented support programs for vulnerable sectors. The imbalance between what the government receives and grants created greater poverty, affecting mainly households in the first three income deciles. This work shows this imbalance in different scenarios using an optimization model.

Keywords: Consumption functions; social programms; government incomes.

INTRODUCTION

After NAFTA was signed, Mexico contained inflation, built a solid macroeconomic framework, and showed a major opening to world markets. Many modern companies employ highly skilled and well-educated workers, particularly in the aerospace, automotive, food and beverage industries [1]. However, there are sectors of the economy that continue to be characterized by high levels of informality, low-skilled work, low productivity, and obsolete technologies. About 54% of workers have informal jobs, while non-formal businesses employ millions of people who lack access to stable income, good education, comprehensive health care and affordable financial services, which impedes formation of human capital [1,2].

Government companies and monopoly firms have been protected against competition for decades, especially the dominant companies in the energy and telecommunications sectors. For this reason, these companies have earned large incomes from consumers and have not had sufficient incentives to invest in or improve productivity. From the 1980s onwards, previous governments tried to solve these problems by implementing a series of reforms, but many of

them were not completed, or were reversed during their implementation, so they did not produce expected results [2].

In 1994 Mexico had undertaken a bold package of structural reforms with which it tried to stop the slow growth, low productivity, generalized informality in the labor market and a high-income inequality. Mexico was unable to take full advantage of these reforms, as it had to strengthen its institutional and governance capacity to ensure that they were implemented effectively. Between the reforms was the opening of its energy industry, key sector [1-5].

This paper measures the shocks of consumption functions of the Mexican economy for the year 2012 from a matrix of social accounting (SAM-MX12) based on the system of national accounts (SCNM)[3,4,5]. The income distribution was obtained from the National Household Income-Expenditure Survey (ENIGH *in spanish*) in terms of minimum salaries and deciles of household income. From the analysis of accounting multipliers[5], the most valued branch of economic activity is the manufacture of products derived from oil and coal (key activity). The calculations and results of the direct, crossed and cyclical multipliers and their net impact and production fuctions can be consulted in Ledesma-Carrión DE & Hernández-Hernández L [5].

Among the Organisation for Economic Co-operation and Development's recommendations for sharing the fruits of economic growth is "Maximizing the new *Prosper* (Education, Health and Food Program) cash transfer program to help its beneficiaries expand their skills, complete their studies, join the formal sector and get good jobs Paid"[6].

Mexico has undertaken a bold package of structural reforms with which it tries to stop the slow growth, low productivity, generalized informality in the labor market and a high-income inequality. Mexico wishes to make the most of these reforms, it must strengthen its institutional and governance capacity to ensure that it is effectively implemented. And one item was release of the price of gasolines.

Economic branch of the manufacture of petroleum and coal products is related to the extraction of crude oil and gas, which occupies place 74 in the list of direct multipliers of the economy. There is a large difference in the direct multiplier values of 31.3% between the next economic activity which is again the manufacture of petroleum and coal products. The successive branches already show greater differences of 89%, for example, the manufacture of basic chemical products (89.9%), wholesale grocery and food (96.1%), multiple banking (99.4%), among others. With regard to cross-multipliers, the difference between the tenth and the first decile of income of the beneficiary households by this economic branch is enormous, at least 1750%. And between the first two deciles of about 43%. The trajectory closes with the cyclical multipliers, the most striking economic branch is the wholesale grocery and food trade, where the difference between income levels of households is minimal ~ 2.4%. It is followed by the rental without real estate brokerage with a difference in impact of 12.7%, manufacture of petroleum and coal products (56.7%) and the differences increase rapidly. Therefore, Mexico became a merchant and service provider and not in a productive country that explored its inputs and optimized its production processes through technological innovations.

In the other hand, for optimization model, the factors that are taken into account to establish prices and taxes on gasoline are as follows:

Gasoline Pemex Magna
Special tax on production and services (IEPS) fee for Federative Entities (FE).
Weighted retail price without IEPS (FE).
Loss of the weighted public Price.
Price to the public without IEPS (FE) and without loss
Value-added tax of the weighted price without IEPS (FE) and without loss.
IEPS Fossil fuel quota.
Freight from Storage and Distribution Terminal (TAR) to service station.
Commercial margin to Pemex clients.
Special tax on production and services (TASA, this is the IEPS amount reported by Pemex-Refining) of the weighted public Price.
Weighted price of admission to Pemex considering national production.

Gasoline Pemex Premium
Special tax on production and services (IEPS) fee for Federative Entities (FE).
Weighted retail price without IEPS (FE).
Loss of the weighted public Price.
Price to the public without IEPS (FE) and without loss
Value-added tax of the weighted price without IEPS (FE) and without loss.
IEPS Fossil fuel quota.
Freight from Storage and Distribution Terminal (TAR) to service station.
Commercial margin to Pemex clients.
Special tax on production and services (TASA, this is the IEPS amount reported by Pemex-Refining) of the weighted public Price.
Weighted price of admission to Pemex considering national production.

Pemex Diesel
Special tax on production and services (IEPS) fee for Federative Entities (FE).
Weighted retail price without IEPS (FE).
Value-added tax of the weighted price without IEPS (FE).
IEPS Fossil fuel quota.
Freight from Storage and Distribution Terminal (TAR) to service station.
Commercial margin to Pemex clients.
Special tax on production and services (TASA, this is the IEPS amount reported by Pemex-Refining) of the weighted public Price.
Weighted price of admission to Pemex considering national production

Turbosine
Value-added tax of the weighted Price
IEPS Fossil fuel quota.
Freight
Weighted price of admission to Pemex

Heavy fuel oil
Value-added tax of the weighted Price
IEPS Fossil fuel quota.
Freight
Commercial margin to distributors
Producer Price

This speaks of the complexity to build a database and to be able to determine the income fractions that are assigned to each tax per household income decile. Fortunately, the Secretaría de Hacienda y Crédito Público (Secretariat of Finance and Public Credit, SHCP) has done this work and published it in percentage distributions regarding what it enters by taxes to the government as well as what it spends in social programs [7]. The work here consisted in making it consistent with the matrix of social accounting[1,2,5] and the breakdown that is handled by institutional sectors and branches of economic activity [8,9].

BRIEF STATE OF THE ART

Taxes are a vehicle in the distribution of benefits from high-income to low-income citizens. Taxes are directly related to the perception of an efficient government, since it allows responding and being accountable for national objectives. Global Financial Integrity has estimated that developing countries' financial losses through illicit financial flows between regions range from $ 859 billion to $ 1.06 trillion per year [12].

Sytnyk & Sych propose the construction of an effective fiscal strategy in the collection of taxes. Some indicators were defined (according to the characteristics of the companies) and their statistical relationship. In addition, they studied the evolution between profit-income and/or consumption-income elasticities. Among its results, the VAT decreased to support consumption [13]. They do not consider special taxes (special tax on products and services (IEPS) and new cars tax (ISAN)) and optimize from the point of view of the company. For the Government to solve its collection problem and at the same time encourage domestic and foreign investment, it is more complex to incorporate other economic agents. The way to solve it is by applying the optimization technique, as Sytnyk & Sych did. This leads to formulating a model that reflects the interactions between the agents. Note: IEPS is a indirect tax charged to the final consumer (gasolines, diesel, tabacco, etc.). ISAN tax in new cars. For luxury cars it has a maximum percentage on the value of the vehicle; minimum percentage on low-cost cars; and intermediate percentage on the rest of markes and models.

On the other hand, Suresh & Arul study the effects of the tax on goods and services in the financial system [14]. The multistage model they studied follows the route that begins with the purchase of raw materials - production or manufacturing - storage of finished products - sale of products to retail trade - sale to the final consumer. Their results show that it should be a priority for the government to create a differentiated payment system based on the capacities of the agents. Especially for small manufacturers and traders implement low-tax and widespread incentives in such a way as to reduce the overall cost of compliance.

Ortega & Medlock [15] used ordinary least squares and calculated the price elasticity of fuel demand, which was inelastic, concluded that households do not tend to alter consumption when

prices increase, since energy goods are a necessity to cover and consumers readjust their budget to cover them.

Gillman [16] made a general equilibrium model for income tax evasion. By keeping the relationship between income from income taxes and output constant, Gillman proved that increasing productivity of the goods sector induces less evasion and therefore allows the reduction of the tax rate.

A practical aspect about the risks of audit in companies was explored by Guo *et al*. [17]. Among the aspects studied, they recommended improving communication with tax agencies to reduce tax risks and avoid economic losses to companies as much as possible. This supports the idea of promoting tax reforms taking into account the characteristics of the companies [13,14]. In the present work, financial institutions (SF), non-financial (SnF) and Nonprofit Institutions Serving Homes (nPIsSH) were differentiated.

Dombou [18] concluded that the Cameroonian government should establish a tax rate of 16.19% on production. He obtained this result by applying the shadow effect technique. In our case, the VAT is 16% and other taxes related to consumption were studied.

Koatsaa *et al*. [19] investigated the impact of tax revenues as a percentage of Gross Domestic Product (GDP) on economic growth in a country with a wage bill considered one of the highest in the world. Their relationship is believed to be positive up to a certain optimum level, which is the point at which the rate of economic growth is maximized. They applied a log-linearized model of the adapted Scully fiscal optimization model. Their results showed the insignificance of fiscal policy in influencing economic activity and could not determine the optimal tax burden.

In works on tax burdens and company investment, for example that of Arin *et al*. [20], showed that for small companies the corporate tax multipliers are negative while the personal tax multipliers are positive in a state of high unemployment by large companies. In our case, the NPIsSH are the most impacted compared to the SF and SnF.

Taxes play an important role in the politics and economy of the state. For Shaidurova N. & Homokyová [21], the objective of the economic policy of each country is to help the economic growth of the country, the growth of the standard of living of households and individuals and a more favorable business environment. Taxes are the vehicle for achieving these goals, but they are detrimental to households and businesses. Small and medium-sized industrial companies occupy an irreplaceable place in the economic system of each country [21].

METODOLOGY

It is structured an optimization problem differentiating between households and companies given that the basic information required [7,8,9,10,11] is available. Consumptions by branch of economic activity and institutional sectors are obtained from the System of national accounts of Mexico (SCNM) [8]. In order to break down national and foreign goods and services, the data with the SCIAN code [9] are reconciled with the data with the tariff code [10].

Utility function or preferences for households [11] and firms:

$$Max\ U(C_1^h, \dots, C_n^h, C_1^e, \dots C_n^e) = \sum_{i=1}^{n} \alpha_i^h lnC_i^h \alpha_i^e lnC_i^e; h = 1, \dots, 10;\ e = SnF, SF, NPIsSH;\ n - branches\ of\ economic\ activities$$

$$s.a. \sum_{i=1}^{n} P_i C_i^h + P_i C_i^e = (1 - S^h) I_d^h + (1 - S^e) I_d^e$$

$$I_d^{h,e} = \sum_{j}^{3} \left(1 - \tau_j^{h,e}\right) fraccI^{h,e} + T_{G,h,e} + T_{SF,h,e} + T_{SnF,h,e} + T_{ISFLSH,h,e} + T_{RM,h,e}; j = VAT, ISR, IEPS.$$

$$I_d^h = w\bar{L}^h + r\bar{K}^h + R_{G,h} + R_{SF,h} + R_{SnF,h} + R_{ISFLSH,h} + R_{RM,h};\ h\text{-decile household income}$$

$$I_d^e = w\bar{L}^e + r\bar{K}^e + R_{G,e} + R_{SF,e} + R_{SnF,e} + R_{ISFLSH,e} + R_{RoW,e}; e = SF, SnF, NPIsSH$$

SF financial companies, *SnF* non-financial companies, *NPIsSH* Nonprofit Institutions Serving Homes

C consumption of good *i* by institutional sector *j= household, firms (SnF, SF, NPIsSH,G Government in their capacity as companies)*

P_i domestic price of good *i*

S saving of institutional sector *j*

I income

τ taxes: *VAT* (Value-added tax), *ISR* (income tax), *IEPS* (special tax on production and services). Exogenous variables.

IEPS: Taxes on tobacco, new cars (*ISAN*), alcoholic beverages, energy, telecommunications, games and sweepstakes.

w work income

r capital income

R rent of property, exogenous.

T current transfers, exogenous.

H ó *h*, household; *SF* financial corporations, *SnF* non-financial corporations, *G* government, *NPIsSH* non-profit institutions serving households, *RW* rest of world; *w* labor price, *r* capital price.

C, consumption of the *n*-branch of economic activity for households with income in the *h*-decile.

$\alpha^{h,e}$, elasticity of the *n*-branch of economic activity for households with income in the *h*-decile.

P, price associated with branch *n* of economic activity.

S, saving households with income in the *h*-decile.

$I^h{}_d$, total income.

$fraccI^{h,e}$, consumer taxable income (for payment of factors and property rents)

$\tau^{h,e}{}_j$, consumer tax rate.

$R_{G,h}$, $R_{SF,h}$, $R_{SnF,h}$, $R_{ISFLSH,h}$ and $R_{RW,h}$, income from property income from institutional sectors and the rest of the world.

RoW, rest of world.

Coefficients α_i^h y α_i^e were calculated based on information from ENIGH (Survey of income and expenditure of households [11]), SCNM and SHCP (Secretariat of Finance and Public Credit), it was separated between households and companies.

T transfers: Received from RW, Procampo (Field Support), Oportunidades (Opportunities), 70 y más (Support in old age), Apoyo alimentario (Food support), Empleo temporal (Temporary employment) y Otros programas sociales (Other social programs).

Increases in salaries, wages and contributions of 10% and 100% were worked together with increases in taxes according to the following table 1 and increasing in profits of social programs of 5%:
Note. ISAN varies between taxes on cheap to luxury cars from 2% to 17% on the value of the motor vehicle. So that the maximum, minimum and average values of taxes were considered.

Table 1. Taxes: Income tax, value-added, IEPS. Original data and shocks [%].

Original data (%)	Taxes	Shock (%)
30	Income tax	45
16	VAT	17
29.4	Gasolines	28
24.3	Diesel	23
25	Energy drinks	26
26.5	Beers	27.5
53	Alcoholic beverages	54
160	Tobaccos	161
3	Public telecommunications networks	4
30	Games and sweepstakes	31
17	ISAN maximun	18
9.8	ISAN average	10.8
2	ISAN minimum	3

RESULTS AND DISCUSSION

The following tables summarize the changes in consumption due to increases in income, taxpayer base and taxes, table 1.

From table 2, considering a salary increase of 5%, it has a greater impact on the consumption of households located in deciles 7 to 9 followed by household in deciles 2, 3 and 5.

In the case of the government, it is the most favored followed by the NPIsSH. The least favored are the SnF. Property income received from Canada are the highest compared to the US and for deciles 4 and 5. Households with incomes located in the first decile are more benefited than those in deciles 2 and 3, with transfers received from RoW .

The government programs *Procampo* and *Empleo temporal* were the most affected in this scenario for households with incomes in the first decile. *Procampo* is a program to support farmers and *Empleo temporal* is a program for the unemployed.

For a population that is aging, without a pension or with very low pensions, the *70 y más* program was one of the least favored.

The *Apoyo alimentario* program, focused on households in the first income decile, was the least favored, in a society with a large number of people living in extreme poverty.

Transfers received from RoW to NPIsSH and G are increased. Those from Canada are 26% higher than those from the USA.

New car taxes, ISAN, decrease in all income deciles as a way to discourage car purchases by transferring revenue capture to the government through taxes on diesel and gasoline.

From tables 3 and 4, from the third income decile, the percentages are negative, which indicates that consumption and payment of taxes decreased despite the increase in wages of 10 and 100%, while it increased for the first decile. This is an indication of a mismanagement of tax policy that affects the most vulnerable households. The above seems a contradiction, implementing programs to support vulnerable groups while affecting them through taxes. In terms of remittances, it is the households in the fifth decile that receive the most support, contrary to what is thought, which are the households in the first to the third decile.

Table 2. Optimal consumption by household and firms break down for decil of household income and institutional sectors (Percentages). Increase in income of 5%. Including social programs. Change in income (increase) of Δ = +5%.

C_iH^*						
[%]	D1	D2	D3	D4	D5	D6
INCOMES	3.1220	3.3502	3.3609	3.3453	3.3570	3.3630
Gos+CfcGos	1.3103	1.4061	1.4106	1.4040	1.4090	1.4115
Wages						
REMUNERATIONES received from RoW	0.0008	0.0006	0.0006	0.0015	0.0015	0.0013
Canada	0.0039	0.0027	0.0030	0.0072	0.0074	0.0064
USA	0.0032	0.0022	0.0025	0.0059	0.0060	0.0052
RoW2						
PROPERTY INCOME received from RoW	0.0543	0.0226	0.0209	0.0199	0.0181	0.0180
Canada	0.2637	0.1097	0.1014	0.0965	0.0877	0.0871
USA	0.2154	0.0896	0.0828	0.0788	0.0717	0.0712
RoW2						
TRANSFERS received from RoW	0.0023	0.0016	0.0017	0.0042	0.0043	0.0037
Canada	0.0109	0.0077	0.0085	0.0203	0.0208	0.0181
USA	0.0089	0.0063	0.0069	0.0166	0.0170	0.0148
RoW2	4.9956	4.9993	4.9998	5.0001	5.0003	5.0004
ALL						
Monetary Transfers to household**	0.0004047	0.0001105	0.0000816	0.0000627	0.0000321	0.0000197
Procampo	0.0031963	0.0006175	0.0003152	0.0002087	0.0000826	0.0000466
Oportunidades	0.0004968	0.0001610	0.0000754	0.0000554	0.0000346	0.0000183
70 y más	0.0002296	0.0000369	0.0000331	0.0000060	0.0000033	0.0000025
Apoyo alimentario	0.0001475	0.0000308	0.0000099	0.0000045	0.0000033	0.0000032
Empleo temporal	0.0044749	0.0009567	0.0005152	0.0003373	0.0001559	0.0000903
ALL	3.1220	3.3502	3.3609	3.3453	3.3570	3.3630

Gos.- Gross operating surplus; CfcGos.- Consumption of fixed capital over the gross operating surplus; CiH* Optimal consumption of household; CiE* Optimal consumption of firms ;**Government social programs; ISAN: New car tax; VAT: Value added tax.

Table 2 (continuation). Optimal consumption by household and firms break down for decil of household income and institutional sectors (Percentages). Increase in income of 5%. Including social programs. Change in income (increase) of Δ = +5%.

C_iH^*				
[%]	D7	D8	D9	D10
INCOMES	3.3790	3.3796	3.3900	3.3433
Gos+CfcGos	1.4182	1.4184	1.4228	1.4032
Wages				
REMUNERATIONES received from RoW	0.0009	0.0007	0.0005	0.0022
Canada	0.0046	0.0036	0.0024	0.0108
USA	0.0037	0.0029	0.0019	0.0088
RoW2				
PROPERTY INCOME received from RoW	0.0171	0.0179	0.0173	0.0175
Canada	0.0831	0.0866	0.0841	0.0848
USA	0.0679	0.0708	0.0687	0.0693
RoW2				
TRANSFERS received from RoW	0.0026	0.0021	0.0014	0.0063
Canada	0.0128	0.0101	0.0067	0.0305
USA	0.0105	0.0082	0.0055	0.0249
RoW2	5.0006	5.0008	5.0012	5.0016
ALL				
Monetary Transfers to household**	0.0000252	0.0000076	0.0000061	0.0000047
Procampo	0.0000232	0.000010	0.0000019	0.0000007
Oportunidades	0.0000245	0.0000090	0.0000045	0.0000011
70 y más	0.0000045	0.0000011	0.0000002	0.0000000
Apoyo alimentario	0.0000093	0.0000000	0.0000002	0.0000000
Empleo temporal	0.0000868	0.0000285	0.0000129	0.0000065
ALL	3.3790	3.3796	3.3900	3.3433

Gos.- Gross operating surplus; CfcGos.- Consumption of fixed capital over the gross operating surplus; C_iH^* Optimal consumption of household; C_iE^* Optimal consumption of firms ;**Government social programs; ISAN: New car tax; VAT: Value added tax.

Table 2 (continuation). Optimal consumption by household and firms break down for decil of household income and institutional sectors (Percentages). Increase in income of 5%. Including social programs. Change in income (increase) of Δ = +5%.

C_iE^*				
[%]	SnF	SF	H + NPIsSH	G
INCOMES	0.9593	1.3410	1.5420	4.3328
Gos+CfcGos	4.0412	3.6595	1.2265	0.0443
Wages				
REMUNERATIONES received from RoW	0	0	0	0
Canada	0	0	0	0
USA	0	0	0	0
RoW2				
PROPERTY INCOME received from RoW	0	0	0	0
Canada	0	0	0	0
USA	0	0	0	0
RoW2				
TRANSFERS received from RoW	0	0	0.0519	0.0993
Canada	0	0	0.2520	0.4817
USA	0	0	1.9314	0.0419
RoW2	5.0005	5.0005	5.0038	5.0000
ALL				
Monetary Transfers to household**	0	0	0	0
Procampo	0	0	0	0
Oportunidades	0	0	0	0
70 y más	0	0	0	0
Apoyo alimentario	0	0	0	0
Empleo temporal	0	0	0	0
ALL	0.9593	1.3410	1.5420	4.3328

Gos.- Gross operating surplus; CfcGos.- Consumption of fixed capital over the gross operating surplus; CiH* Optimal consumption of household; CiE* Optimal consumption of firms ;**Government social programs; ISAN: New car tax; VAT: Value added tax.

Table 3. Optimal consumption by household and firms break down for decil of household income and institutional sectors. Increase in taxpayer base of 10%.

C_iH^*						
[%]	D1	D2	D3	D4	D5	D6
Income tax	0.000321	0.0000000	-0.0001549	-0.0003885	-0.0005179	-0.0006098
VAT	0.000321	0.0000000	-0.0001549	-0.0003885	-0.0005179	-0.0006098
gasolines	-0.000341	-0.0003657	-0.0003669	-0.0003652	-0.0003664	-0.0003671
diesel	-0.000236	-0.0002537	-0.0002546	-0.0002534	-0.0002543	-0.0002547
gasolines y diesel	-0.000577	-0.0006194	-0.0006214	-0.0006185	-0.0006207	-0.0006218
Energy drinks	-0.000027	-0.0000290	-0.0000291	-0.0000290	-0.0000291	-0.0000292
Beers	-0.000047	-0.0000507	-0.0000509	-0.0000507	-0.0000508	-0.0000509
Alcoholic beverages	-0.000019	-0.0000203	-0.0000204	-0.0000203	-0.0000204	-0.0000204
Tobaccos	-0.000049	-0.0000521	-0.0000522	-0.0000520	-0.0000522	-0.0000523
Public telecommunications networks	-0.000051	-0.0000552	-0.0000553	-0.0000551	-0.0000553	-0.0000554
Games and Sweepstakes	-0.000014	-0.0000152	-0.0000152	-0.0000152	-0.0000152	-0.0000152
ISAN	0.000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
ISAN	0.000000	0.0000000	0.0000000	0.0000000	0.0000000	-0.0000986
ISAN	-0.000092	-0.0000982	-0.0000986	-0.0000981	-0.0000984	0.0000000
ALL	-0.000235	-0.0009402	-0.0012529	-0.0017158	-0.0019780	-0.0021633

CiH* Optimal consumption of household; CiE* Optimal consumption of firms ;**Government social programs; ISAN: New car tax; VAT: Value added tax.

Table 3 (continuation). Optimal consumption by household and firms break down for decil of household income and institutional sectors. Increase in taxpayer base of 10%.

C_iH^*				
[%]	D7	D8	D9	D10
Income tax	-0.0010102	-0.0012821	-0.0020026	-0.0028999
VAT	-0.0010102	-0.0012821	-0.0020026	-0.0028999
gasolines	-0.0003688	-0.0003689	-0.0003700	-0.0003649
diesel	-0.0002559	-0.0002560	-0.0002568	-0.0002532
gasolines y diesel	-0.0006248	-0.0006249	-0.0006268	-0.0006182
Energy drinks	-0.0000293	-0.0000293	-0.0000294	-0.0000290
Beers	-0.0000512	-0.0000512	-0.0000513	-0.0000506
Alcoholic beverages	-0.0000205	-0.0000205	-0.0000206	-0.0000203
Tobaccos	-0.0000525	-0.0000525	-0.0000527	-0.0000520
Public telecommunications networks	-0.0000556	-0.0000557	-0.0000558	-0.0000551
Games and Sweepstakes	-0.0000153	-0.0000153	-0.0000154	-0.0000151
ISAN	0.0000000	0.0000000	-0.0000994	-0.0000980
ISAN	-0.0000991	-0.0000991	0.0000000	0.0000000
ISAN	0.0000000	0.0000000	0.0000000	0.0000000
ALL	-0.0029687	-0.0035127	-0.004956	-0.006738

CiH* Optimal consumption of household; CiE* Optimal consumption of firms ;**Government social programs; ISAN: New car tax; VAT: Value added tax.

Table 3 (continuation). Optimal consumption by household and firms break down for decil of household income and institutional sectors. Increase in taxpayer base of 10%.

C_iE^*				
[%]	SnF	SF	H + NPIsSH	G
Income tax	-0.0009904	-0.0009171	-0.0070314	-0.0000115
VAT	-0.0009904	-0.0009171	-0.0070314	-0.0000115
gasolines	-0.0000958	-0.0000887	-0.0006800	-0.0000011
diesel	-0.0000665	-0.0000615	-0.0004718	-0.0000008
gasolines y diesel	-0.0001622	-0.0001502	-0.0011518	-0.0000019
Energy drinks	-0.0000076	-0.0000070	-0.0000540	-0.0000001
Beers	-0.0000133	-0.0000123	-0.0000943	-0.0000002
Alcoholic beverages	-0.0000053	-0.0000049	-0.0000378	-0.0000001
Tobaccos	-0.0000136	-0.0000126	-0.0000968	-0.0000002
Public telecommunications networks	-0.0000145	-0.0000134	-0.0001026	-0.0000002
Games and Sweepstakes	-0.0000040	-0.0000037	-0.0000282	0.0000000
ISAN	-0.0000257	0.0000000	0.0000000	0.0000000
ISAN	0.0000000	0.0000000	-0.0001827	0.0000000
ISAN	0.0000000	-0.0000238	0.0000000	-0.0000003
ALL	-0.0022271	-0.0020621	-0.0158110	-0.0000258

CiH* Optimal consumption of household; CiE* Optimal consumption of firms ;**Government social programs; ISAN: New car tax; VAT: Value added tax.

Table 4. Optimal consumption by household and firms break down for decil of household income and institutional sectors. Increase in taxpayer base of 100%.

C_iH^*						
[%]	D1	D2	D3	D4	D5	D6
Income tax	0.004580	0.0000000	-0.0022122	-0.0055495	-0.0073991	-0.0087108
VAT	0.004580	0.0000000	-0.0022122	-0.0055495	-0.0073991	-0.0087108
gasolines	-0.004868	-0.0052241	-0.0052408	-0.0052165	-0.0052347	-0.0052441
diesel	-0.003378	-0.0036250	-0.0036365	-0.0036197	-0.0036324	-0.0036389
gasolines y diesel	-0.008246	-0.0088490	-0.0088773	-0.0088362	-0.0088671	-0.0088830
Energy drinks	-0.000387	-0.0004150	-0.0004163	-0.0004144	-0.0004158	-0.0004166
Beers	-0.000675	-0.0007246	-0.0007270	-0.0007236	-0.0007261	-0.0007274
Alcoholic beverages	-0.000271	-0.0002904	-0.0002914	-0.0002900	-0.0002910	-0.0002916
Tobaccos	-0.000693	-0.0007438	-0.0007462	-0.0007427	-0.0007453	-0.0007467
Public telecommunications networks	-0.000734	-0.0007882	-0.0007907	-0.0007870	-0.0007898	-0.0007912
Games and Sweepstakes	-0.000202	-0.0002168	-0.0002175	-0.0002165	-0.0002172	-0.0002176
ISAN	0.000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
ISAN	0.000000	0.0000000	0.0000000	0.0000000	0.0000000	-0.0014088
ISAN	-0.001308	-0.0014034	-0.0014079	-0.0014014	-0.0014063	0.0000000
ALL	-0.003357	-0.0134312	-0.0178984	-0.0245108	-0.0282569	-0.0309044

CiH* Optimal consumption of household; CiE* Optimal consumption of firms ;**Government social programs; ISAN: New car tax; VAT: Value added tax.

Table 4 (continuation). Optimal consumption by household and firms break down for decil of household income and institutional sectors. Increase in taxpayer base of 100%.

C_iH^*				
[%]	D7	D8	D9	D10
Income tax	-0.0144313	-0.0183161	-0.0286084	-0.0414277
VAT	-0.0144313	-0.0183161	-0.0286084	-0.0414277
gasolines	-0.0052691	-0.0052699	-0.0052861	-0.0052134
diesel	-0.0036562	-0.0036568	-0.0036680	-0.0036175
gasolines y diesel	-0.0089252	-0.0089267	-0.0089540	-0.0088309
Energy drinks	-0.0004185	-0.0004186	-0.0004199	-0.0004141
Beers	-0.0007309	-0.0007310	-0.0007332	-0.0007232
Alcoholic beverages	-0.0002929	-0.0002930	-0.0002939	-0.0002898
Tobaccos	-0.0007502	-0.0007503	-0.0007526	-0.0007423
Public telecommunications networks	-0.0007950	-0.0007951	-0.0007975	-0.0007866
Games and Sweepstakes	-0.0002186	-0.0002187	-0.0002193	-0.0002163
ISAN	0.0000000	0.0000000	-0.0014201	-0.0014005
ISAN	-0.0014155	-0.0014157	0.0000000	0.0000000
ISAN	0.0000000	0.0000000	0.0000000	0.0000000
ALL	-0.0424095	-0.0501814	-0.0708074	-0.0962592

CiH* Optimal consumption of household; CiE* Optimal consumption of firms ;**Government social programs; ISAN: New car tax; VAT: Value added tax.

Table 4 (continuation). Optimal consumption by household and firms break down for decil of household income and institutional sectors. Increase in taxpayer base of 100%.

C_iE^*				
[%]	SnF	SF	H + NPIsSH	G
Income tax	-0.0141489	-0.0131009	-0.1004481	-0.0001639
VAT	-0.0141489	-0.0131009	-0.1004481	-0.0001639
gasolines	-0.0013683	-0.0012669	-0.0097139	-0.0000158
diesel	-0.0009494	-0.0008791	-0.0067404	-0.0000110
gasolines y diesel	-0.0023177	-0.0021460	-0.0164543	-0.0000268
Energy drinks	-0.0001087	-0.0001006	-0.0007716	-0.0000013
Beers	-0.0001898	-0.0001757	-0.0013474	-0.0000022
Alcoholic beverages	-0.0000761	-0.0000704	-0.0005401	-0.0000009
Tobaccos	-0.0001948	-0.0001804	-0.0013831	-0.0000023
Public telecommunications networks	-0.0002064	-0.0001911	-0.0014656	-0.0000024
Games and Sweepstakes	-0.0000568	-0.0000526	-0.0004031	-0.0000007
ISAN	-0.0003676	0.0000000	0.0000000	0.0000000
ISAN	0.0000000	0.0000000	-0.0026096	0.0000000
ISAN	0.0000000	-0.0003404	0.0000000	-0.0000043
ALL	-0.0318157	-0.0294591	-0.2258709	-0.0003685

CiH* Optimal consumption of household; CiE* Optimal consumption of firms ;**Government social programs; ISAN: New car tax; VAT: Value added tax

The results of the simulations are in agreement with the general perception that when taxes are increased consumption is not encouraged and declined. It only increases if the tax base increases, that is, there are more people paying taxes. The taxes that most contribute to the federation are gasolines y diesel, ISR and VAT. Results of the simulations show a clear bad tax policy and support programs for vulnerable groups.

Other scenarios can be studied, but with these it was enough to notice the contradictions in the decision makers in the government.

Unlike Ortega & Medlock [15], there are differences in the households of the first income decile and NPIsSH regarding the consumption of gasoline and diesel. And there is agreement in their arguments regarding households from the second to the tenth deciles.

The taxpayer base must be increased by more than 100% to improve collection. Taxes should increase as the population that pays taxes grows. For households in the first three income deciles, there should be exceptions in order to improve their situation in the medium term and gradually reduce social programs so that they are finally replaced with well-paid employment and a robust pension system (according to the Gillman study [16]).
Fiscal policy should be planned taking into account the characteristics of small and medium-sized companies according to the study of Sytnyk & Sych, Suresh & Arul, Guo *et al*., Arin *et al*. , Shaidurova N. & Homokyová [13-14, 17, 20-21].

The different study techniques reinforce the results obtained within the limits of this work. They are not contradictory [13-21].

CONCLUSION

Imbalance in the support programs and the government's tax policy was shown.A priority is expanding the captive taxpayer base of the tax system and reforming policies so that they actually lift households in the three income deciles out of poverty.

Government support programs must be thoroughly studied to advance technologically and commercially for the benefit of vulnerable groups and households in the first five income deciles.
It is not enough to increase taxes or tax new goods and/or services, it is necessary to reactivate production chains, jobs and domestic value added so that households optimize their consumption based on their income in the medium term.

The optimization models methodology complements the models fitted by ordinary least squares, multistage and multiregressive.

Tax policy should be planned taking into account the characteristics of small and medium-sized enterprises in such a way that employment, income and technological innovation are reconciled. And give more impetus to financial and non-financial corporations rather than NPIsSH.

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