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DOCUMENTO DE TRABAJO

Núm. III - 1994

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July 1994.

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The author wants to thank John Whalley for very helpful guidance and comments. Financing by the International Development Research Centre of Canada is greatfully agknowledged. The author is the only responsible for any errors or omissions.

1 INTRODUCTION

Applied general equilibrium models (AGEM) have become a widely used instrument to evaluate the resource allocation effects of different policy options. In particular, these models have been used to evaluate the resource allocation effects produced by tax reform and trade liberalization (see Shoven and Whalley [1984]). More recently, some applied work has also been developed in the areas of environmental and regional economics (see Shoven and Whalley [1992]).

It has been a common practice that these models focus their attention on a single issue. Models designed to analyze tax reform often do not emphasize foreign trade whereas, at the opposite extreme, models built to evaluate trade liberalization do not explore in detail the interactions with the domestic tax structure. Thus, there has been relatively little analysis on the interactions between tax reform and the structure and composition of trade. This is the purpose of the present model and, indeed, exploring this aspect constitutes the first motivation of the exercise presented here.

The second motivation arises from the lack of studies of this type for the Mexican economy. Although there has been some recent work on AGEM for Mexico to evaluate the effects of trade liberalization and more particularly, the effects of a North

American Free Trade Agreement (NAFTA) (see USITC [1992]), in the fiscal area nothing has been done to evaluate the tax reform process that took place in Mexico after 1985.[1] While the present model says something about tax reform, its purpose is not to evaluate the whole process but to look at the interactions (or lack of) between some aspects of tax reform and trade performance.[2] Therefore, the model built here has two important features: a) the tax structure is incorporated and most taxes are explicitly identified, and b) the model is trade oriented.

The general conclusion that emerges from the study is that the changes in VAT and public pricing policy do not have strong effects on trade performance and more generally, on reallocation of resources. Government revenue increases, however, mainly as a result of increasing tax compliance.

The document is organized as follows. Section 2 contains a brief description of the data base of the model. Section 3 describes the structure of the model. Section 4 looks at the parameters used and provides an analysis of the main results. Finally, Section 5 contains some concluding remarks and comments on some limitations.

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[1] The work by Kehoe and Serra [1983] looks at the introduction of VAT in Mexico in 1980.

[2] Urzúa [1994] provides a detailed description of the recent tax reform process in Mexico.

2 THE DATA BASE

This section presents a very brief description of the data base for the year 1985. The data was organized in a social accounting matrix (SAM) framework, and therefore the discussion refers to the main components of the SAM.

2.1 Supply Side

The SAM identifies 27 sectors of production, 21 of which are tradable whereas the remaining 6 are non tradable. Of these 27 sectors, petroleum and electricity are essentially operated by the government as public monopolies and, therefore, for modeling purposes, they will be treated differently (see Section 3).

Within the cost structure of production activities, three main components are identified: a) intermediate costs, which consist of purchases of domestic and imported commodities, b) production taxes and subsidies, whenever they exist, and c) payments to factors of production, which consist of capital and three types of labor, unskilled, skilled and highly skilled.[3]

[3] The criteria for this three way labor classification was based on degree of scholarity, as given in the 1989 income and expenditure survey.

Each activity is assumed to produce only one commodity; part of the production is sold to domestic markets while the remaining production is exported to the rest of the world.

The total supply of commodities is obtained by adding imports (after import taxes have been levied) to the production sold to domestic markets. The total supply of commodities is divided into intermediate and final demand, in order to charge consumption taxes (VAT) on the supply devoted to final demand. This ensures that consumers face market prices. Thus, VAT is modeled as a sales tax. This is due to the complexities of modelling the crediting mechanism of the tax by producers.[4]

The part of production that is not sold to domestic markets is exported to the rest of the world. Before exported, however, export taxes must be charged, whenever they exist.

2.2 Income Generation and Institutions

All production activities pay to three types of labor. Payments to capital, however, are divided into private and public. Petroleum and electricity pay to public capital while the remaining 25 of the 27 sectors make payments to private capital.

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[4] In a model in which factors of production are freely mobile (as we do here), sales taxes to final consumers is equivalent to VAT.

The income from private capital is disbursed across formal and informal sectors. The formal sector divides its capital income between companies and households

The income received by companies is split into payments of dividends to domestic shareholders, corporate taxes, and savings.

Household capital income is distributed across three household income levels. These income levels are referred to as poor, medium and rich.[5] Each household category has several sources of income: income from labor, income from the ownership of capital, dividends, transfers from the government, and transfers from abroad (on a net basis). Household income is in turn spent on consumption, payment of taxes[6] and savings.

2.3 Demand Side

It only remains to mention explicitly the different sources of demand for commodities, which should match with the supply side of commodities already described in Section 2.1.

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[5] This classification was also based on the 1989 income and expenditure survey.

[6] Regarding payment of personal income taxes, a simplifying assumption of proportionality was adopted, given the lack of information. Thus, the amount of tax revenue from personal income taxes was distributed between the three households according to their income level. While there is no empirical support for doing this, the only rationale is that one can think that tax evasion grows with income levels.

There are three components of demand: intermediate demand, final domestic demand and demand for exports. Intermediate demand comes from the 27 sectors of production. Final domestic demand consists of consumption demand from the three households, government consumption, demand for investment goods from the 27 sectors, and changes in inventories. The sum of all these different demands match total supply sold in the domestic market, at market prices. The last source of demand is demand for exports, which originate from the rest of the world.

3 A DESCRIPTION OF THE MODEL

3.1 Production Functions.

With the exception of petroleum and electricity, all production sectors are modeled with nested production functions. First, they combine intermediate inputs (made of composite goods) in fixed proportions (Leontief technology). In the factor markets we have capital and three kinds of labor. The three different types of labor combine themselves through a Cobb-Douglas function. In turn, the resulting aggregate of labor combines in a Cobb-Douglas manner with capital. It is important to mention that all factors of production are perfectly mobile between sectors and fixed in quantity.[7] Therefore, their price

[7] Except for petroleum and electricity. In these two sectors capital (public) is sector specific.

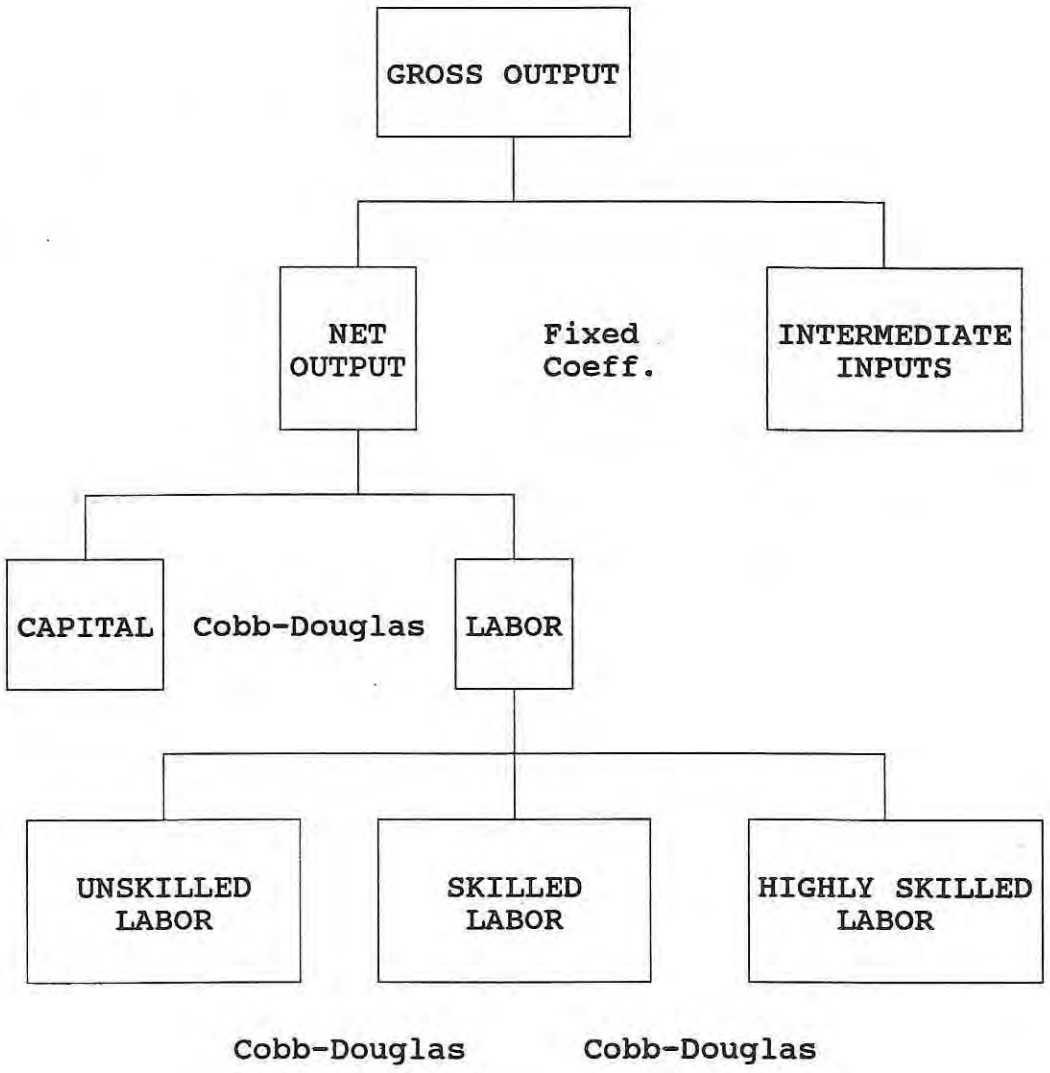
adjust to clear factor markets. Finally, the resulting value added combines in fixed proportions with the aggregate of raw materials. (See Figure 1)

3.2 Pricing Behavior

Essentially, we assume two types of industries, perfectly competitive and regulated. Perfectly competitive industries (25 sectors) follow the marginal cost pricing rule. In the case of regulated industries we have two different behaviors.

First, in the petroleum sector, we shall assume that the government controls both the level of production as well as the price. Since the level of production is exogenous, we need to assume that there is enough capacity to produce this exogenous level. That explains why capital in this sector is not treated as a factor but, instead, as a residual account that receives a rent (difference between income and expenditures). The quantity consumed domestically is determined by domestic demand. Once this demand has been satisfied, the residual is sold to foreign markets as exports. Notice, however, that the price fixed by the government would normally be different from the world market price. Therefore, the difference between the domestic price and the world market price constitutes a rent that goes to the government as revenue.

FIGURE 1
Nesting Structure of Production Functions



Second, we model electricity as a typical public utility. That is, it will be assumed that the price is fixed by the government and the level of output will always adjust to satisfy demand. In this context, the marginal cost curve will not determine the level of production. Nonetheless it will determine production costs. Therefore, the difference between production costs (which are determined by marginal cost and the level of demand) and revenues (which are determined by the fixed price), will constitute a subsidy to domestic consumers. This subsidy is in fact modeled as a rent going from the government to consumers.

3.3 Supply of Commodities

The total supply of commodities include domestic production and imports from the rest of the world. After tariffs and production taxes directed to domestic consumers have been added, we assume that these two commodities aggregate themselves in a CES manner to form a composite good. In other words, we adopt the Armington assumption (see Armington [1969]).[8]

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[8] It should be noticed that, on the import side, we adopt the small country assumption, that is, we assume that the supply of imports from the rest of the world is perfectly elastic so that demand for imports will not influence world commodity prices.

In the case of four commodities (agriculture, petroleum, wearing apparel, and transport equipment), it is assumed that there is a quantity restriction or quota on imports.

3.4 Income Generation

Factors of production collect their income from various activities and then distribute their income in fixed shares in the following manner.

Private capital disburses its income across formal and informal sectors in fixed shares. The formal sector, in turn, divides its income in fixed shares between companies and households.

Public capital is one source of government income; the other sources include existing income and commodity taxes. These three sources of government income are disbursed in fixed shares between consumption, savings and transfers to households.

The three types of labor distribute their income in fixed shares among the three household income levels.

The amount of savings collected in the system is disbursed across investment and changes in inventories. In turn, investment is allocated across sectors in fixed value shares.

3.5 Demand for Commodities

The three components of demand include intermediate demand, final domestic demand, and demand for exports.

Intermediate demand is modeled in fixed proportions (Leontief technology).

Final domestic demand consists of private consumption from the three types of households, government consumption, investment, and changes in inventories. Households and the government demand composite commodities according to a Cobb-Douglas specification. Investment, already allocated to the sectors of production, translates into demand for commodities in fixed quantity ratios. Changes in inventories are modeled as a consumption system in which the quantity is prespecified. That is, the quantity is independent of the price of the good.

The last component of final demand is demand for exports. Here, we will assume that the rest of the world demands domestically produced commodities according to a demand function of the form

$$E_i = E_0 \ (¶_i/PWE_i)^n$$

where n is the price elasticity of demand, $¶_i$ is a world price of

an aggregation of commodities of type i, E_0 is a constant that reflects the level of demand when $\P_i$ equals the world price, PWE_i. In turn, the world price of commodity i is defined as

$$PWE_i = (PD_i/[1+te_i]ER)$$

where PD_i is the domestic price of commodity i, te_i is the rate of tax or subsidy on exports of commodity i, and ER is the exchange rate (price of a "dollar" in local currency).

Notice that the country is small in the sense that changes in PWE_i will not affect $\P_i$. Nonetheless, changes in PWE_i will affect the rest of the world's demand for our exports.

Our *numeraire* is the domestic consumer price index, given by the consumption basket of "poor" households.

3.6 Closure of the System

Choosing a closure rule is a strategic issue that, to a great extent, will determine the results. We adopt the so-called neoclassical closure rule, also known as the savings driven rule. Thus, we assume that the current account is exogenous and therefore investment adjusts to the available savings. In other words, we have chosen a scenario in which the economy is constrained in its foreign borrowing.

4 SOME RESULTS

The main results of several policy experiments are presented in this section. Before defining these policy experiments, however, something needs to be said about the value of the parameters as well as the level of effective VAT rates of the benchmark equilibrium.

4.1 Parameter Values and Effective VAT Rates

Many of the parameters, as is the case of share parameters in the CES functions, are defined in the calibration process of the SAM. Some of them, however, need to be exogenously specified. All the CES aggregators used in the labor market were specified as Cobb-Douglas. However, export demand and elasticities of substitution between domestic and imported commodities have different values. Table 1 reports the elasticity values used in the policy experiments.

Table 1 also reports the level of effective VAT rates as they appear in the benchmark equilibrium. This is important since, as we shall see, some simulations move VAT rates from their effective to their statutory level.

TABLE 1
Elasticity Values

Commodities	σ	β	Effective* VAT rate (%)
Agriculture	3.0	2.0	
Mining	0.5	2.0	
Petroleum	0.5	2.0	
Food	1.125	2.0	
Beverages	1.125	2.0	0.8
Tobacco	-	2.0	
Textiles	1.125	2.0	8.2
Wearing apparel	1.125	3.0	0.9
Leather	1.125	3.0	2.3
Wood	0.5	3.0	7.9
Paper	0.5	3.0	7.7
Chemicals	0.5	3.0	4.5
Rubber	0.5	3.0	10.0
Non-metallic products	0.5	3.0	6.7
Iron & steel	0.5	3.0	
Non-ferrous metals	0.5	3.0	5.0
Metallic products	0.5	3.0	9.6
Non-electrical machinery	0.375	3.0	9.3
Electrical machinery	0.375	3.0	8.5
Transport equipment	0.375	3.0	9.2
Other manufactures	0.375	3.0	5.1
Commerce			7.0
Transport & communications			0.5
Financial services			4.0
Other services			3.7

σ = Elasticity of substitution (domestic-imported)
β = Export demand elasticity
Note: There are no imports of tobacco
* It refers to benchmark equilibrium VAT rates

4.2 Policy Experiments

Several simulations were carried out, all concerning changes in indirect taxes and prices of energy (petroleum and electricity). We report three of them, and make some comments on others. The three reported scenarios are described as follows.

Scenario A: Move from effective to statutory 10 percent VAT rates.

Scenario B: Increase in prices of energy (petroleum and electricity).

Scenario C: A and B simultaneously.

4.2.1 Scenario A

This simulation attempts to provide a measure of tax evasion and the potential effects of increasing tax compliance. Column one of Table 2 describes the main aggregate effects. Aggregate welfare shows a reduction of 3.0 percent.[9] By income groups, welfare effects decomposes as follows: (-2.7%) for the group classified as poor whereas the other two groups (medium and rich) register a welfare reduction of 3.3 percent. Imports increase by

[9] We use the so called equivalent variation as a measure of welfare.

2.7 percent, which is a result of substitution away from domestic consumer goods in favor of imported ones. Exports also increase by 1.9 percent.

TABLE 2
MAIN AGGREGATE EFFECTS
(Percent change)

	Scenario A	Scenario B	Scenario C
Welfare (total)	-3.0	-1.4	-4.5
Welfare of poor	-2.7	-1.4	-4.1
Welfare of medium	-3.3	-1.7	-5.0
Welfare of rich	-3.3	-1.2	-4.5
Imports	2.7	3.6	6.4
Exports	1.9	1.5	3.5

TABLE 3
GOVERNMENT REVENUE
(Percent change)

	Scenario A	Scenario B	Scenario C
Indirect taxes	20.9	9.0	30.4
Direct taxes	-0.2	-0.6	-0.9
Production subsidies	-2.4	0.4	-1.9
Government revenue	13.4	7.2	20.9

The effects on government revenue are of significant magnitude (see Table 3). Indirect taxes rise 20.9 percent and, in aggregate, government revenue increase by 13.4 percent

The sectorial effects are described in Table 4. As can be seen, although the global effect on exports is not very large, the effect on individual exports are in the range of 3 to 6 percent. The exception is petroleum, whose drop contributes to explain the difference between sectorial and global export performance. Commodity imports, on the other hand, show differing results; some of them fall whereas some others rise. In general, however, with the exceptions of metallic products and non-electrical machinery, the effects do not seem to be very significant.

Turning now to the effects on commodity prices it remains true that the effects are not very large, especially in the case of producer prices. Consumer prices, however, perform rather different; some of them decrease while some others increase. This is obviously explained by the experiment itself since consumer prices rose.

The last thing to note about sectorial effects concerns factor reallocations. It can be seen that, with the exception of metallic products and non-electrical machinery, both labor and capital register moderate changes.[10]

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[10] The details of reallocation of the different categories of labor are available on request.

TABLE 4
Scenario A. Sectorial Effects
Change from Effective to 10% Statutory VAT Rates
(Percent changes)

Sectors	Expor	Impor	Prod Prices	Consum Prices	Capital	Labor
Agriculture	3.8		-2.9	-2.9	0.6	-0.06
Mining	3.6	2.8	-2.8	-2.6	3.8	3.3
Petroleum	-0.3		0.0	0.03	0.0	0.0
Food	3.9	-2.0	-2.9	-2.9	0.4	-0.04
Beverages	3.9	-5.2	-2.9	0.5	-2.8	-3.3
Tobacco	3.9		-2.9	-2.9	0.5	0.0
Textiles	3.5	-2.7	-2.8	-2.0	-0.3	-0.9
Wearing app.	5.6		-2.8	0.4	-2.3	-2.9
Leather	5.7	-5.4	-2.9	1.2	-2.9	-3.5
Wood	5.9	-0.5	-2.9	-1.7	2.0	1.4
Paper	5.5	-0.4	-2.8	-1.5	0.6	0.1
Chemicals	3.9	-1.6	-2.3	3.1	-0.6	-1.1
Rubber	5.1	-0.8	-2.7	-2.6	0.2	-0.2
Non-met. prod	5.4	1.4	-2.8	-0.1	2.7	2.1
Iron & steel	4.7	4.2	-2.6	-2.3	5.3	4.8
Non-ferr. met	5.1	2.8	-2.7	3.1	3.9	3.3
Metallic prod	5.4	10.0	-2.8	-19.9	11.0	10.5
Non-elect mach	5.0	12.3	-2.6	-1.7	12.3	11.8
Elect. mach	5.5	5.3	-2.8	-0.7	6.1	5.6
Transp equip	3.4		-2.1	0.2	3.2	2.7
Other manuf.	4.9	-1.9	-2.6	-0.3	0.6	0.2
Construction			-2.7	-2.7	5.5	4.8
Electricity			0.0	0.0	0.0	1.4
Commerce			-3.0	0.2	-0.5	-1.0
Transp & comm			-2.8	7.0	-4.2	-4.7
Financial serv			-3.1	2.1	-2.5	-2.9
Other services			-2.9	2.8	0.0	-0.4

TABLE 5
Scenario B. Sectorial Effects
Increase in Energy Prices
(Percent changes)

Sectors	Expor	Impor	Prod Prices	Consum Prices	Capital	Labor
Agriculture	-6.9		-0.8	-0.8	-0.7	-1.2
Mining	-7.5	2.5	-0.8	-0.9	-1.2	-1.8
Petroleum	13.0		40.0	38.1	0.0	0.0
Food	-6.6	3.3	-0.9	-1.1	-0.6	-1.1
Beverages	-6.6	3.5	-0.9	-1.0	-0.3	-0.8
Tobacco	-7.2		-0.6	-0.6	-0.6	-1.1
Textiles	-8.7	3.9	0.1	0.0	-1.4	-1.9
Wearing app.	-11.4		-0.3	-0.4	-0.9	-1.4
Leather	-10.5	3.7	-0.7	-0.7	-0.4	-0.9
Wood	-9.7	5.0	-1.0	-1.0	0.8	0.4
Paper	-11.1	1.5	-0.4	-0.9	-0.3	-1.0
Chemicals	-27.0	2.6	6.2	4.8	-3.6	-4.2
Rubber	-15.1	1.8	1.0	0.6	-0.8	-1.3
Non-met. prod	-12.2	3.8	-0.08	-0.2	0.9	0.3
Iron & steel	-10.3	4.1	-0.8	-1.5	2.1	1.4
Non-ferr. met	-11.3	3.0	-0.4	-1.3	0.8	0.2
Metallic prod	-9.6	8.9	-1.0	-1.5	6.8	6.2
Non-elect mach	-8.9	10.4	-1.2	-3.0	7.4	6.8
Elect. mach	-9.6	6.1	-1.0	-1.8	2.2	1.7
Transp equip	-10.7		-0.6	0.7	-0.6	-1.2
Other manuf.	-15.6	1.7	1.2	-1.3	-4.5	-5.1
Construction			-0.6	-0.6	4.2	3.6
Electricity			15.0	14.9	0.0	-9.5
Commerce			-1.1	-1.2	-0.5	-1.0
Transp & comm			0.7	0.3	-1.5	-2.0
Financial serv			-1.3	-1.4	0.6	-0.05
Other services			-0.9	-0.9	2.2	1.6

TABLE 6
Scenario C. Sectorial Effects
Change from Effective to 10% Statutory VAT Rates and Increase in Energy Prices
(Percent changes)

Sectors	Expor	Impor	Prod Prices	Consum Prices	Capital	Labor
Agriculture	-3.2		-3.7	-3.7	-0.08	-1.2
Mining	-4.0	5.3	-3.5	-3.5	2.6	1.4
Petroleum	12.9		38.1	38.1	0.0	0.0
Food	-2.8	1.1	-4.0	-4.0	-0.2	-1.2
Beverages	-2.8	-1.9	-3.9	-0.4	-3.2	-4.1
Tobacco	-3.4		-3.6	-3.6	-0.2	-1.2
Textiles	-5.4	1.0	-2.7	-2.0	-1.8	-2.8
Wearing app.	-6.2		-3.3	-0.01	-3.3	-4.3
Leather	-5.1	-1.9	-3.6	0.4	-3.4	-4.4
Wood	-4.1	4.4	-3.9	-2.8	2.9	1.8
Paper	-6.0	1.0	-3.5	-2.4	0.3	-0.8
Chemicals	-24.4	0.9	2.6	8.3	-4.3	-5.3
Rubber	-10.6	0.9	-1.9	-1.9	-0.6	-1.6
Non-met. prod	-7.3	5.3	-2.9	-0.4	3.7	2.5
Iron & steel	-5.8	8.5	-3.7	-3.7	7.4	6.3
Non-ferr. met	-6.5	5.8	-3.6	1.8	4.7	3.5
Metallic prod	-4.4	19.1	-4.0	-21.1	18.0	16.9
Non-elect mach	-4.1	22.9	-4.7	-4.7	19.9	18.7
Elect. mach	-4.4	11.5	-4.2	-2.6	8.5	7.4
Transp equip	-7.5		0.9	1.0	2.5	1.5
Other manuf.	-11.4	-0.3	-3.1	-1.5	-4.0	-5.1
Construction			-3.3	-3.3	9.8	8.5
Electricity			14.9	14.9	0.0	-8.2
Commerce			-4.1	-1.0	-1.1	-2.1
Transp & comm			-2.3	7.4	-5.7	-6.7
Financial serv			-4.5	0.6	-2.0	-3.0
Other services			-3.8	1.8	2.2	1.1

In summary, this first scenario suggests that increasing tax compliance was successful in raising government revenues whereas, the effects on the structure and composition of trade as well as resource reallocation, were less important.

4.2.2 Scenario B

The purpose of the second experiment was to simulate a 40 percent increase in the price of petroleum together with a 15 percent increase in the price of electricity.[11] The aggregate effects are presented in column two of Table 2. As can be seen, welfare registers a 1.4 percent reduction and, unlike the previous experiment in which the group referred to as poor was relatively less affected, in this second experiment the relatively less affected was the high income group (rich). Imports grow 3.6 percent whereas exports increase 1.5 percent. In general, it can be said that the adjustment of public prices have also a strong impact in the main aggregates of the economy.

The impact on government revenue is shown in column two of Table 3. Government revenue increases by 7.2 percent, which, although not as strong as in the previous experiment, it is nevertheless significant. It would thus appear that public pricing policy plays a relatively important role in the tax

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[11] As it actually occurred with the so-called solidarity pact (PECE).

reform process.

Moving now to the sectorial effects, and focusing in particular on trade performance, two aspects deserve to be mentioned (see Table 5). First, on the import side, it can be seen that for all commodities imports grow, although not in a very significant magnitude. Second, in examining exports, with the exception of petroleum, all of them fall, and the reductions are in several cases relatively important. Therefore, compared to Scenario A it would appear that the adjustment of public prices tends to reverse the effects on exports.

Prices behave differently: some of them rise while others fall. This behavior obeys two main effects: on the one hand, the increases in petroleum and electricity generate a pressure for prices to rise; on the other hand, the fall in the level of economic activity press prices downwards.

It is also interesting to note that the effects on factor reallocations, although higher than in the previous experiment, are still relatively small.

Summarizing, this second experiment suggests that the adjustment of public prices was also a relatively important instrument for raising revenue. In terms of trade performance and allocation of resources, however, with the exception of exports,

the magnitudes involved were, to some extent, less important, specially if we keep in mind the magnitudes involved in the simulation itself.

4.2.3 Scenario C

The last simulation performs experiments A and B simultaneously. The aggregate effects are shown in column three of Table 2.

As expected, the compound effects of the two previous scenarios in terms of welfare is now stronger (-4.5%). The same can be said in terms of foreign trade aggregates, which almost duplicate. Notice that in this last scenario is the medium income level group the relatively most affected group in terms of welfare.

The impact on public finances is also significant. Government revenue increases 20.9 percent whereas revenue from indirect taxes grows 30.4 percent. As expected, this scenario registers the largest increase in government revenue.

The sectorial effects are described in Table 6. It can be seen that with the exception of wearing apparel, leather, non-metallic products, iron and steel, non ferrous metals, metallic products and non-electrical machinery, the effects on resource

allocation do not change much if compared with scenarios A and B.

Perhaps the most interesting point to note about this last experiment concerns the effect on trade performance, as described by Table 6. On the import side, all categories increase by relatively small amounts, with three exceptions. On the export side, it would appear that, with the exception of petroleum, the additional effect of adjusting public prices is to reverse the trend in exports. This is explained by the fact that the adjustment of public prices has the effect of rising producers prices with the consequent fall in exports whereas in the experiment of rising VAT rates the impact on prices affects mainly consumer prices.

This point is reinforced if we consider an additional simulation (Scenario D) that consists of calibrating the model to a 15 percent VAT rate and then performing a reduction of this rate to a 10 percent level together with a increase in energy prices, as it actually happened in the 1991 reform.[12] The results of this experiment are shown in Tables A.1 and A.3 in the Appendix. These results suggest that, to some extent, public pricing policy adjustments swamped changes in VAT rates both in terms of revenue, which shows a reduction of only 5.8 percent[13]

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[12] See Urzua [1994].

[13] This reduction (5.8%) is indeed not large, considering that the simulation consisted of reducing VAT rates from 15% to 10% level, accompanied by an increase of energy prices.

as well as price adjustments, and therefore also in terms of exports.

Furthermore, in addition to scenario C, we simulated a simultaneous removal of tariffs (Scenario E). The additional effect, particularly in terms of reallocation of resources were very small (see Tables A.2 and A.4 in the Appendix).

Overall, considering the magnitudes involved in scenario C, it seems that tax reform, meaning by that VAT modifications, did not have important effects on trade performance.

5 CONCLUDING REMARKS

Several conclusions can be drawn from the previous analysis. They can be outlined as follows.

a) Although we did not explicitly model tax evasion, our estimates suggest that increasing tax compliance was successful in raising additional revenue. In terms of the structure and composition of trade, however, the effects were relatively less significant.

b) Pricing policy of energy also seemed to play an important role in raising revenue. Taken together, VAT changes and pricing policy of energy, it would appear that the latter tends to swamp

the former, at least in their price and export effects. This last point emerges very clearly in the experiment in which VAT rates moved from 15 to 10 percent and energy prices increased, and is less evident when VAT rates moved from their effective to their statutory levels.

c) The resource allocation implications of trade liberalization are relatively unimportant.

The general conclusion emerging from the results of the model is that the most important part of the reform, in terms of revenue, came from increasing tax compliance. In terms of trade structure and allocation of resources, however, the effects were not very important.

These conclusions, however, have to be interpreted within the limitations of the model. Three of them deserve to be mentioned.

First, we did not model changes in direct taxes nor in government expenditures. They both were important instruments of fiscal reform.

Second, the data on the composition of value added as reported in the Mexican National Accounts (and therefore in our model), is heavily in favor of capital; in principle, this is not

evident in an economy like the Mexican. While this could be a data problem arising from a wrong classification of self-employed labor, it nevertheless raises the question of whether or not market structure is playing some important role. If this is so, we would require to incorporate market imperfections within the model, and the conclusions might be different.

Third, we did not carry sensitivity analysis with the parameters, and therefore, the question of the extent to which these values are driving the results remains open.

APPENDIX

TABLE A.1
MAIN AGGREGATE EFFECTS
(Percent change)

	Scenario D	Scenario E
Welfare (total)	-1.9	-2.7
Welfare of poor	-1.2	-2.7
Welfare of medium	-1.7	-3.4
Welfare of rich	-2.9	-2.2
Imports	1.2	7.1
Exports	-0.1	4.6

TABLE A.2
GOVERNMENT REVENUE
(Percent change)

	Scenario D	Scenario E
Indirect taxes	-9.6	15.5
Direct taxes	-0.4	-0.9
Production subsidies	1.6	-1.6
Government revenue	-5.8	11.8

TABLE A.3
Scenario D. Sectorial Effects
Change from 15% to 10% VAT Rates and
Increase in Energy Prices
(Percent changes)

Sectors	Expor	Impor	Prod Prices	Consum Prices	Capital	Labor
Agriculture	-10.2		2.1	2.1	-1.3	-1.1
Mining	-10.6	0.02	2.4	1.8	-4.6	-4.6
Petroleum	13.3		40.0	38.1	0.0	0.0
Food	-10.0	5.3	2.0	1.8	-1.1	-1.1
Beverages	-9.9	9.9	2.0	-2.5	3.3	3.3
Tobacco	-10.4		2.3	2.3	-1.2	-1.2
Textiles	-11.6	9.2	2.9	-1.6	1.1	1.2
Wearing app.	-15.8		2.5	-1.8	2.5	2.5
Leather	-15.1	9.7	2.2	-2.2	2.7	2.8
Wood	-14.5	7.3	2.0	-2.5	0.6	0.7
Paper	-15.5	3.1	2.3	-2.6	0.06	-0.04
Chemicals	-29.2	4.3	8.6	2.3	-2.8	-2.9
Rubber	-18.9	3.5	3.8	-1.1	-0.1	-0.2
Non-met. prod	-16.4	2.8	2.7	-1.8	-1.2	-1.2
Iron & steel	-14.1	0.1	1.8	0.8	-2.7	-2.8
Non-ferr. met	-15.4	0.7	2.3	-3.3	-2.4	-2.4
Metallic prod	-14.0	-0.03	1.8	-3.2	-2.8	-2.8
Non-elect mach	-13.1	-1.5	1.4	-5.4	-4.3	-4.3
Elect. mach	-14.1	1.7	1.8	-3.7	-2.7	-2.8
Transp equip	-14.2		1.8	-2.6	-2.9	-3.0
Other manuf.	-19.1	5.8	3.9	-3.7	-3.1	-3.2
Construction			2.1	2.1	-1.1	-1.0
Electricity			15.0	14.9	0.0	-10.1
Commerce			1.9	-2.6	0.8	0.8
Transp & comm			3.6	-1.3	0.1	0.2
Financial serv			1.8	-2.6	2.7	2.5
Other services			1.9	-2.5	1.2	1.1

TABLE A.4
Scenario D. Sectorial Effects
Change from Effective to 10% Statutory VAT Rates, Increase in Energy Prices and Removal of Tariffs.
(Percent changes)

Sectors	Expor	Impor	Prod Prices	Consum Prices	Capital	Labor
Agriculture	-1.8		-2.3	-2.3	-0.2	-0.9
Mining	-2.4	5.4	-2.0	-2.6	1.5	0.8
Petroleum	13.2		40.0	38.1	0.0	0.0
Food	-1.4	9.7	-2.5	-2.9	-0.3	-0.9
Beverages	-1.3	21.5	-2.6	0.2	-2.9	-3.5
Tobacco	-1.9		-2.3	-2.3	-0.1	-0.8
Textiles	-3.4	12.9	-1.5	-1.9	-1.3	-2.0
Wearing app.	-3.5		-2.1	0.9	-3.0	-3.6
Leather	-2.8	10.1	-2.3	1.2	-3.1	-3.7
Wood	-2.0	15.3	-2.6	-2.8	2.2	1.5
Paper	-3.2	3.8	-2.2	-4.8	0.6	0.0
Chemicals	-21.4	5.0	4.8	6.3	-3.9	-4.6
Rubber	-7.6	9.2	-0.6	-14.1	2.8	2.1
Non-met. prod	-4.8	9.4	-1.6	-3.9	3.1	2.3
Iron & steel	-1.8	7.6	-2.6	-3.8	4.5	3.8
Non-ferr. met	-3.4	6.7	-2.1	-0.9	2.8	2.0
Metallic prod	-1.2	18.7	-2.8	-31.1	12.7	12.0
Non-elect mach	-0.1	17.3	-3.2	-8.2	12.7	12.0
Elect. mach	-1.1	12.2	-2.9	-5.3	6.4	5.7
Transp equip	-4.1		-1.9	-0.1	2.2	1.5
Other manuf.	-7.9	7.6	-0.5	-6.2	-1.9	-2.5
Construction			-2.3	-2.3	6.6	5.8
Electricity			15.0	14.9	0.0	-8.3
Commerce			-2.7	-2.0	0.2	-0.4
Transp & comm			-0.7	6.9	-4.9	-5.5
Financial serv			-3.0	0.9	-1.6	-2.2
Other services			-2.5	1.5	0.9	0.2

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