

MPIA Network Session Paper

Fiscal Adjustment, Income Distribution and Poverty in Colombia: Value-Added Tax Reform and Public Transfers

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Fiscal Adjustment, Income Distribution and Poverty in Colombia: Value-Added Tax Reform and Public Transfers*

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Abstract

Value added taxes constitute a significant efficient instrument for raising revenues within the highly distortionary Colombian tax system. In the light of a forthcoming tax reform, it is analyzed a VAT reform proposed by the 2003 National Mission of Public Income, that is based on a two-level differential rate system, compensated with an increase on subsidies. Through various simulations, the available public transfers mechanisms reduce the effects of the tax policy while improving significantly income distribution when focused to households with the lowest standards of living. Equal-distributed lump-sum transfers do correct and improve welfare indicators though marginally.

Keywords: Value-added taxes, tax incidence analysis, income distribution, CGE models

JEL: D58,H20,H22

Introduction

The socioeconomic changes that occurred during the last decade, beginning with the 1991 Political Constitution and including a decentralization process, reforms to the social security system, a deterioration of the internal conflict and an economic recession during 1998-99, *inter alia*, prompted significant imbalances of the public finances, characterized by increases in mandatory transfers to social sectors, operating expenses and the augment of public debt level. Triggered by these events, the government started a series of fiscal adjustments that included yearly tax reforms, reduction of personnel, liquidation of public companies, fusion of ministries and the issue of laws, such as the Fiscal Responsibility Law in 2000 and the ones related to the system of public transfers from the National level to the local governments. In 2001, the government created the National Mission of Public Income in order to give advices of the possible elements for a structural reform of the taxation system. Within its recommendations, it was suggested increasing tax revenues at the national and local levels by more than 2% of the GDP and reducing expenses in a similar magnitude, which would give the public sector a required stability to undermine the current debt pressure and improve the investment for economic development.

In this continual process of fiscal adjustment and social development, two policies have been in its core. The first is the constant modification of the VAT rate as a central issue of the tax reforms, either by extending

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its base or by increasing its level. The second is the creation of programs and projects than directly affect the social welfare of low income households, hence, improve the income distribution situation. In the forthcoming 2006 tax reform, it is planned to extend the VAT tax base to commodities that mainly belong to the basic consumption bundle, simplify its rate structure, eliminate most of the tax benefits not related to production activities and to raise the rate on exempted goods. At the same time, it is also proposed that part of the raised resources should be used in direct transfers (subsidies) to the poorest households.

Although value added taxes constitute one of the main instruments to raise tax revenues, there are just few studies that analyze their distributional effects in Colombia. Avila et al. (2001) and Sánchez (2001) found that the VAT scheme is progressive in the aggregate of goods. Ramírez and Molina (2003) estimated various tax reforms and found that the VAT structure is neutral in the aggregate, though regressive for food commodities and progressive for non food commodities. Rutherford, Light and Barrera (2003), as the only general equilibrium approach to the issue, used a standard model with households differentiated by income deciles¹, and found that any VAT reform that keeps the current structure is progressive. However, given their goal of looking for tax instruments that help raising government revenues, they recommended an increase in the VAT rate of the excluded items in light of a more uniform scheme, hence, only taking into account cost of funding arguments.

Even though there is a clear need to reduce the fiscal gap, thus, the importance of the fiscal adjustment through raising revenues and reducing and rationalizing expenditures, the socioeconomic situation of Colombia requires the generation of public policies to improve the income distribution, reduce poverty and generate labor opportunities. During the last years, most of these policies have taken form in programs that directly benefit the population of lower level income in rural (e.g. Familias en Acción) and urban areas or both (e.g. Jóvenes en Acción, subsidies on health and education). Evaluation of these policies is already taking place, as well as, new tax reforms have been developed, although, separately.

In consequence, the growing need of analyzing both elements of the current fiscal policy into one framework, hence, allowing the assessment of their distributional and poverty effects in presence of the significant public imbalances motivates this study. Therefore, it is proposed to evaluate tax reforms, specifically, the modification of the VAT scheme into a simpler but more general structure, compensated with the allocation of resources through the current subsidy system, using a computable general equilibrium model (CGEM) that fully describes the Colombian tax system and accounts the effects of providing this kind of public transfers.

In this sense, the analyzed value added tax reform considers two differential rates as proposed by the 2003 National Mission of Public Income. The results demonstrate the significant role of subsidies to reduce the effects and even improve the income distribution. The actual public subsidy system, which focuses resources to households with lower standards of living, conveyed better results compared to an equally-distributed lump-sum transfer system.

This document is divided as follows: section 1 present a succinct overview of the recent economic and social trends as preamble of a description of the current tax system, particularly emphasizing in the VAT (section 2). Then a brief revision of literature on the use of CGE models for tax policy analysis is given in section 3, followed by the description of the model (section 4) and the analysis of policy simulations (section 6) Final remarks are given at section 7.

1 Overview of the Recent Colombian Economic Social Trends

1.1 Basic Economic Indicators

The end of the eighties witnessed ambitious economic and institutional reform programs in most Latin American countries. In Colombia, those programs were complemented, and in some way deepened, by the new Constitution in 1991. The reforming agenda was related to trade liberalization, state modernization, political and administrative decentralization, local social service provision and privatization of some public

¹This model, described in detail by Rutherford and Light (2002), depicts more than sixty tax instruments and three types of labor, based on the 1996 social accounting matrix, the 1996 national household survey and the 1994 income and expenditure survey for urban households.

utilities.

Much of these reforms exposed the economy to international market fluctuations and therefore, to unexpected external shocks, which configured, along with an intensification of violence, the evolution of the main economic indicators. While the first five years after the reforms showed an impressive performance in terms of GDP growth and poverty reduction, this pace could not be maintained after the second half of nineties. GDP growth stagnated in 1997 and a growing fiscal and current account imbalances alerted about the increasing weakness of the economy. The Asian and regional crises and the worsening of Colombian conflict along with the lack of an appropriate economic policies, produced a plunge in the GDP of 4.3% by 1999 (figure 1). As a consequence, unemployment reached levels around 20% and inequality worsened, reversing all the improvements obtained in poverty reduction and public services provision during the first part of nineties (figure 2).

Figure 1: GDP Annual Growth

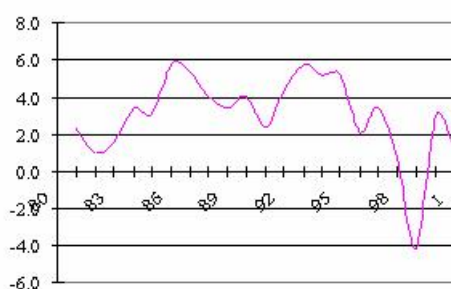
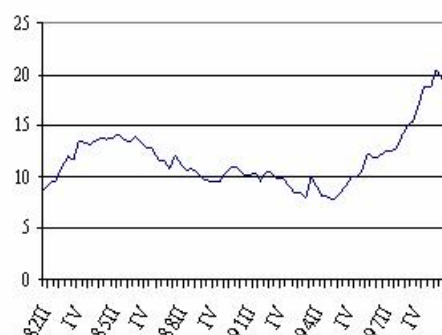


Figure 2: Unemployment Rate



The crisis made clear that Colombian public finances were not sustainable. After starting the early 1990s with a rough balance in public finances, the Colombian fiscal situation deteriorated swiftly. During the period of 1991-1993, total government revenue, composed by the national, departmental and municipal administrations, was nearly equal to total expenditures. In 1999 and 2000, however, the combined fiscal deficit of all governmental levels was 3.5% of GDP (figure 3).

The emergence of large deficits in the late 1990s led to an increase in the gross public debt, which went from 16.6% of GDP in 1994, to 64.5% of GDP in 2001 (figure 4). Consequently, decreasing the growth of the debt and bringing income and expenditure closer, are important long term goals for the fiscal reform.

Figure 3: Fiscal Deficit

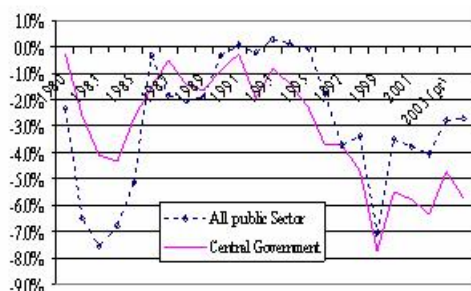
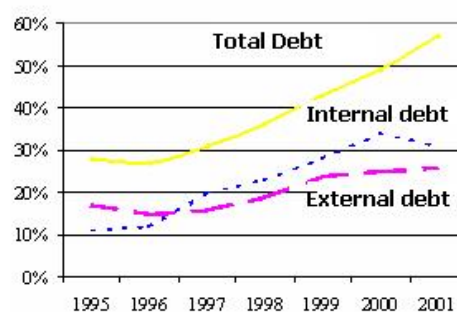


Figure 4: Public Debt (% of GDP)



Moving closer to fiscal balance will not be easy. A substantial fraction of the recent augment in outlays was designed to meet pressing needs for health and education, as well as pension and national security concerns. These expenses are not likely to diminish in the near future, and some of them may increase.

Even though fiscal reforms have been in the agenda over the last four presidential administrations,

most of these efforts have not been enough to close government deficit and even had introduced increasing distortions for private consumption (i.e. variation in households' consumption patterns)², investment and growth. Colombian legislators have discussed almost one tax reform per year since 1998, without reaching the structure that was advised by the academia and some think tanks.

Table 1: Colombian Main Economic Indicators

	1980	1988	1995	1999	2003
Population (Millions)	28.4	33.6	38.6	41.5	44.5
Population growth rate	2.2%	2.0%	2.0%	1.8%	1.7%
GDP growth rate	4.1%	4.1%	5.2%	-4.3%	3.1%
Unemployment					
Urban	7.71%*	10.3%	8.7%	19.7%	15.8%
Rural	1.46%*	4.6%	5.0%	10.9%	9.3%
Inflation Rate	26.4%	28.1%	19.5%	9.2%	6.0%
Real Effective exchange rate	146.68	87.34	100.00	102.68	136.3
Goods & Services (%of GDP) Exports	11.0%	12.0%	14.8%	18.2%	4.9%
Imports	12.3%	10.2%	21.3%	19.2%	7.9%

*DATA for 1978. Source: World Bank, Colombia Poverty Report (2002).

1.2 Trends in Social Development

Most of the social indicators in education, health, and infrastructure show substantial and persistent long term improvements during the last two decades. Primary and secondary schooling show significant improvements, especially in completion rates (Table 2). Basic infrastructure in electricity, water and sewerage show progressive extension of coverage. Life expectancy has improved by approximately one year every two calendar years. Only recently -probably due to the economic recession- education coverage has declined. The simultaneous escalation of violence reveals a considerable deterioration of living conditions and has become a substantial economic burden in urban Colombia (World Bank 2002).

As pointed out, the nineties witnessed a substantial growth in the level of Public Social Expenditure (PSE), accompanied by profound structural reforms in the way in which services were organized and delivered. The decentralization process conveyed an increase of the national government transfers to the municipalities in order to provide focalized social and public services. This process augmented the proportion of public sector resources allocated to departmental and municipal governments from 35 to 40 percent point of the GDP.

In the 1990s, social public expenditure increased more than 4.5 points as percentage of the GDP with respect to the average reached in the 1980s. This expenditure -mainly oriented towards education, health, social security, housing and water and sanitation services-, went from a yearly average of 7% of GDP in the 1980s to a yearly average of 11.6% of the GDP in the 1990s. During this decade, PSE showed annual real growth rates of 12% and went from representing 31% of total public expenditure in the 1980s to 34.6% in the 1990s. However, the economic crisis and fiscal adjustments have stopped this trend (Acosta, 2001).

Poverty, measured by the index of Basic Unfulfilled Needs, has been decreasing as a result of better access to public services in education, health, water provision and sanitation services, guaranteed by the increase in social expenditure through transfers to local governments. Almost all social programs increased their coverage rates during 1992-97, (excluding childcare and health treatments, whose coverage fell somewhat). By far, the largest expansions in services came from health insurance, secondary and tertiary education sectors. In all cases, the growth in coverage was pro-poor. Perhaps the most dramatic change has been the provision of health insurance, which doubled over the nineties. Moreover, the expansion in coverage has shown to be strongly progressive, particularly under the subsidized regime. These results provide a strong endorsement for the structural reforms undertaken in the health sector. Notwithstanding these substantial achievements, the health system does not include 40 percent of the population, mostly poor people without stable employment that has been badly hit by the economic downturn.

²Ramírez and Molina (2003).

Table 2: Colombian Main Social Indicators

Social Indicator	1978	1988	1995	1999	2003
Average education > 18 years	6.2	7.7	8.4	8.9	8.5
Illiteracy rate > 12 years	5.3%	3.3%	2.8%	2.6%	2.2%
School enrollment					
Ages 7 to 11	91.8%	94.8%	96.5%	95.3%	97.3%
Ages 12 to 17	76.9%	80.5%	84.4%	82.2%	84.8%
Ages 18 to 22	31.2%	35.8%	41.0%	36.3%	33.8%
Complete primary school (ages 12 to 17)	67.0%	78.7%	77.7%	89.8%	86.2%
Complete high school (ages 18 to 22)	21.6%	35.3%	48.7%	59.2%	55.8%
Health					
Insured population as share of total	NA	NA	24%*	57%**	62.0%
Share of poor population covered by insurance	NA	NA	0%*	60%**	NA
Access to public utilities					
Electricity	0	99.3%	99.6%	99.4%	99.8%
Water	0	97.4%	97.7%	99.0%	97.6%
Telephone	0	62.2%	71.0%	84.2%	87.7%
Sewerage	0	94.8%	96.0%	97.3%	90.5%

* Before the reform to the Social Security (1993).

** 6 years later (1999).

Sources: 1978 - 1999, World Bank, "Colombia Poverty Report", 2002.

2003, Authors' calculations based on 2003 Living Standard Measurement Survey.

Economic welfare -measured by income per capita- almost doubled from 1978 to 1995 (table 3), but deteriorated thereafter. Following robust gains in all welfare measures during the 1980s and the first half of the 1990s, the negative impact of the recessive period pushed welfare levels back to late eighties levels.

Table 3: Colombian Poverty and Inequality Indicators

Indicator	1978	1988	1995	1999	2003
National					
Poverty Headcount	80%	65%	60%	64%	67%
Extreme Poverty Headcount	45%	29%	21%	23%	26%
Per Capita Average Income ¹	131	213	251	245	230
Gini Coefficient	0.53	0.54	0.56	0.57	0.58
Urban					
Poverty Headcount	70%	55%	48%	55%	59%
Rural					
Poverty Headcount	94%	80%	79%	79%	80%

¹ Monthly income at 2001 current prices (thousand pesos).

Source: DANE, National household surveys; World Bank, "Colombia Poverty Report", 2002.

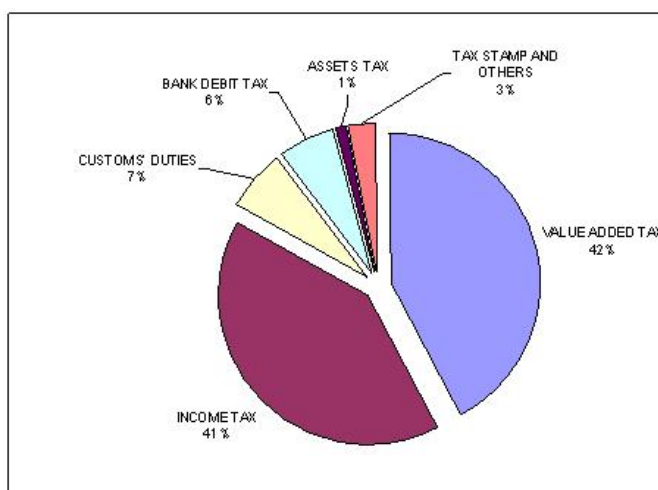
Summarizing, Colombian advances in poverty reduction and public services provision have been impressive but the pressure to cut or to reallocate social public expenditure will be higher as the fiscal restrictions increase (e.g. pension obligations and defense outlays). This new burden will make less probable to maintain the expenditure levels in education, health, housing, drinking water and other services experienced in the 1990s. A complete evaluation of the policy options and the effects of the current proposed reforms are urgent to be able to make recommendations.

2 Value Added Tax in Colombia

2.1 Key Features of the Tax System

The most recent studies about the Colombian tax structure agree in three main features: (i) In spite of an accelerated process of decentralization, Colombian Central Government collects more than 80% of total taxes. (ii) In 2004, value-added tax contributed near 42% of total tax collections and 75% of indirect tax collections, reflecting its significance. As a matter of fact, VAT has increased its contribution to total tax receipts in more than 10 percentage points since 1990³. (iii) The social security contributions and other payroll taxes had been increased significantly during the last ten years and today represent more than 4% of GDP. Figure 5 shows the 2004 composition of central government tax collections (See table 20 in appendix A).

Figure 5: Central Government Tax Structure, 2004



Regional and local taxes contribute in average, with 15% of total tax collection. The regional (or state) government has ten tax instruments, based on complex legal structures, which are inelastic and regressive, and are linked to the monopoly over the production of alcoholic beverages and gambling (excise taxes). At the municipality level, there are 15 taxes with disperse regimes, that in some cases, lack of legal definitions for substantial elements (i.e. taxing ranks) and present significant lags in their tax base collections (Acosta et al. 2003). Actually, only three of these local instruments (land taxes, the industrial and commercial tax, and gasoline surcharge) collect 85% of their total tax revenues, hence, depicting a low degree of tax autonomy and high dependency on national transfers, facts that not differ for the state level.

The contributions to social security are classified based on the three subsystems: pensions, health and occupational hazards. Since 1993 when the social security system was reformed by introducing a capitalization system for pension and a health system based in assurance, its contributions have rose to the point to represent a burden greater than 27% (of payrolls) and to amount more than 3% of GDP. Other payroll taxes (called *parafiscal*⁴) are training, familiar welfare and other allowances. They represent 9% of payrolls (or 1.2% of GDP) and constitute a significant burden for job creation.

³Tax reforms conducted over the past decade and these years have resulted in broadening the VAT base to 54% of the total universe of goods and services, and to a general rate of 16%.

⁴Parafiscal contributions are "mandatory taxes established by law, which affect a certain and unique social or economic group and are used for the benefit of that same sector. Management and execution of those resources are done in the way dictated by law which created them and are only destined to the objective foreseen by the law as well as the interests and financial surpluses resulting at the end of countable exercise" (Law 225/95, authors' translation). This type of State revenues has the same mandatory characteristics than taxes, and as taxes they are not the result of a retribution for an individual and direct service supplied by the State. Parafiscal contributions are different from taxes in the fact that they are not part of the rents that are incorporated to the Public Treasury and are created for financing specific sectors. Currently, employers that have at least one permanent worker, must contribute with 4% of workers wage for the family subsidy system managed by the *Cajas*

Colombia had a very active tax policy during the nineties, partially due to the need to compensate the excess of expenditures. In the last 15 years, 7 tax reforms has been passed, increasing the country tax burden from 15% of GDP in 1990 to more than 23% of GDP in 2004. (table 19 in appendix A). This result placed Colombia, within a group of countries (formed by Brazil, Argentina and Chile) characterized with highest tax burden in Latin America (Gómez, 2005)⁵.

All these reforms were the response to pressing fiscal problems. They had the aim of increasing collections, but using isolated and short run regulation instead of permanent and structural improvements. Shome et. al. (1999) concluded that such strategy has converted the tax structure in complex and distorted.

2.2 Value Added Tax, VAT

The most important issue in Latin American tax systems was the introduction of the VAT (Gómez, 2005). In Colombia, a sales tax was established in 1965, which used the value-added technique but taxed only the industrial activities and imports, leaving aside the distribution activities. This tax had a differential rate structure that made difficult its administration and control (Steiner and Soto 1999).

In 1983 the tax was extended to retail trade and it was converted into a value-added tax (VAT). A simplified system for small traders was created in order to facilitate its fulfillment and administration. New services were included in the tributary base and rates of 6% and 15% were unified in a 10% rate, maintaining tariffs of 20% and 35% for luxury goods (Acosta et al, 2002).

2.2.1 Tax Reforms in the Nineties and VAT

After 1990 seven reforms of the national tax structure were undertaken, in addition to other minor tributary regulatory modifications as the exemptions established in cases of natural disasters or the special treatment given for certain sectors. Table 4 shows the evolution of tax burden after these reforms.

Table 4: Main Tax Reforms in Colombia 1990 - 2003

Year	Law No.	Tax Burden		Reform effect
		Before	After	
1990	49	8.4%	9.1%	0.7%
1992	6	9.1%	10.1%	1.0%
1995	223	9.7%	10.9%	1.2%
1998	488	10.7%	11.1%	0.4%
2000	633	11.1%	12.9%	1.8%
2002	788	12.9%	13.7%	0.8%
2003	863	13.7%	14.8%	1.1%
1990-2003 Cumulative		8,4%	14,8%	6,4%

Sources: Oficina de Estudios Económicos - DIAN, CONFIS y DANE; Avila J. (2005).

Tax reforms of 1990 and 1992 were part of the structural reforms done within a context of an accelerated external trade liberalization process and new expenditure generation caused by the 1991 Political Constitution. Contrary to other reforms, the tax policy changes made during these years did not arise from fiscal crisis but from the need for updating and adapting the available policy instruments to the new changing economic environment (Acosta et al., 2002).

The 1990 reform (i.e. Law 49) had two basic objectives: to compensate for the effects of tariff reductions implemented in that same year and to incentive savings for financing the investment. In order to reach the first objective, the VAT base was broadened and its rate was increased from 10 percent to 12 percent.

de Compensación, 3% for the *Instituto Colombiano de Bienestar Familiar* (Colombian Institute for Family Welfare) and 2% for the *Servicio Nacional de Aprendizaje* -SENA (National Training Service).

⁵Comparisons have methodological problems, because of different levels of government in the countries, diverse local tax systems, and new social security systems with a different participation of private capital.

Similarly, tributary exemptions for capital gains obtained in stocks sales through the stock exchange were given in order to reach the second objective. Those policies had a strong impact on collections: VAT and income taxes revenues increased almost 2 percent of GDP during that period, widely compensating the decrease in the tariff revenues.

The second reform of the nineties (Law 6 of 1992) tried to get resources to support new constitutional obligations and to continue compensating the expected reduction in import tax collections due to the accelerated trade liberalization. This reform broadened the VAT base and increased temporarily its general rate from 12 percent to 14 percent. It also broadened the income tax base by including public industrial and commercial firms. With this reform, VAT collections reached 5% of GDP.

By 1995, the government engaged in a new tax reform, enacted in Law 233, in which the Value Added Tax structure was modified to include the following changes: (i) a permanent general rate of 14%; (ii) a 60% rate over certain vehicles; (iii) enhance of the tax base by including new goods and services; (iv) define the group of exempted goods; and (v) a 50% VAT withholding (at the source) on total tax paid at the moment of the purchase. This latter was raised in other to reduce the increasing tax evasion.

In 1996 the general VAT rate was increased to 16 percent and extended for some additional goods that were taxed with differential rates. In 1998, the Law 488 reduced it in one percentage point, starting in November of 1999, while establishing a 10 percent rate for some goods and services and kept with some adjustments, the differential rates of 20 percent, 35 percent and 45 percent in some commodities. It also modified the fiscal treatment given for the VAT paid in purchases of capital goods, substituting a discount on income tax with a deduction from this tax. Lists of goods and services excluded from VAT payment were enlarged.

In the reform approved in December of 2000 (Law 633), the VAT general rate was increased again to 16%. Since this enactment, the main objectives of the last reforms were to enhance the taxable base and to improve evasion controls. In 2002, the Law 788 introduced two new differential rates (2% and 7%) for some commodities previously exempted. Table 5 shows the recent performance of VAT.

Table 5: VAT Performance

	2000	2001	2002	2003	2004
General rate	16%	16%	16%	16%	16%
Collection in % GDP	4.8	5.3	5.4	5.7	6.1
Evasion rate	26.7	26.6	25.0	23.7	21.0
Taxable Base*	42.5	43.1	42.4	54.8	54.3
VAT productivity	0.30%	0.33%	0.34%	0.36%	0.38%

Sources: Oficina de Estudios Económicos - DIAN, CONFIS y DANE. Avila J., 2005.

2.2.2 VAT Tax Base and Rates

Currently, the VAT base is around 50% of the commodity universe. The key problems are the exempted transactions and the excess of differential rates, including zero rates for some operations, excluding exports, such as material for elementary schools, books and magazines. According to the VAT legislation, there are three types of goods: taxed, excluded and exempted. Excluded commodities are those than can be destined to the domestic market or exports (i.e. tradable goods). Exempted goods are traditionally those for the foreign markets (i.e. exports) and printing industries⁶.

In general, there is high multiplicity of VAT rates. Taxed goods and services have VAT rates between 2% (for livestock for meat industries) and 38% (for luxury goods). Table 6 shows the current VAT rates for the various commodities.

⁶The last reforms included in this list meat, fish and daily products.

Table 6: VAT Rates

Rate	Description
2%	Livestock
5%	Lotteries and gambling
10%	Oat, corn, paddy rice, (palm) vegetal oil, cocoa, chocolate, mill products, agricultural machinery, food and beverage machinery, original art works, matches
11%	Beer (8% as a sale tax and 3% as VAT)
16%	General rate for all taxable commodities, excluding those with differential tariffs
20%	Cellular communications
25%	Domestic produced vehicles with less than 1,400 c.c., boats, motorcycles with less than 185 c.c., land freight of less than 10,000 U.S. pounds
35%	Domestic produced vehicles with more than 1,400 c.c., imported trucks valued more than US\$30,000, imported motorcycles
38%	Private vehicles valued more than US\$40,000

Source: OEE - DIAN.

2.2.3 VAT Progressiveness

Many authors have studied VAT progressiveness: Steiner and Soto (1999), Avila et al. (2001), Sánchez et al. (2002), Ramírez and Molina (2003) and Rutherford et al. (2003) .

Steiner and Soto (1999) found by analyzing the relationship between VAT collections, rates and productivity, that there are signs of a “Laffer Curve” since 1993: the higher the rate, the lower tax productivity, which is explained by a reduction in the taxable base and/or increases in evasion. Similarly, VAT exemptions have been growing along rate increases, with a clear intention to attack the “regressiveness” of the tax. In this sense, they found that given the expenditure structure in Colombia and taking into account the exemptions, VAT is slightly progressive, though its progressiveness is not strictly monotonic.

Avila et al. (2001) analyzed the proportion of household income assigned to pay VAT taxes, based on a general rate of 12 percent and using the 1994 Household Income and Expenditure Survey. According to a 20 minimum wage percentile classification, they concluded that the VAT incidence is progressive for the first 18 percentiles, while for the richest 2 percentiles is regressive.

Notwithstanding, Sánchez and Espinosa (2002) found that Avila et. al (2001) methodology was flawless given the fact that they considered assets and securities as expenditure items. By correcting this methodology, Sánchez and Espinosa established that the value-added tax is progressive in all 20 percentiles: while the poorest first percentile pays 3.7 percent of their income in VAT, the richest one pays 7.15 percent.

Ramírez and Molina (2003) estimated the effects on household consumption levels of eight VAT reforms -including some that occurred during the nineties-, and found that while the tax structure is neutral in the aggregate, it is regressive on food consumption despite the rate, and progressive for the rest of commodities.

2.2.4 Proposals for Future Reforms

Accordingly with the conclusions of recent Mission of Public Income (*Misión del Ingreso Público*, 2003) the Colombia value added tax collects less income as proportion of the GDP than the VAT structures in other Latin American countries. To a great extent this is due to the proportion of goods and services that are excluded, or exempted, from the tax (zero rate).

The VAT general collections are also characterized by a high rate of evasion, which, according to DIAN, is 21% in 2004. The management of the VAT is complex and evasion is promoted by the various rates, more than any other VAT in the world. Both, the regulations and evasion, create significant differences in the effective tax charges on the economic activities in several sectors, therefore increasing the tax burden with respect to its collection.

The expansion of the VAT base, by eliminating exclusions and keeping the current rate structure, could generate an increase in tax collections by 0,4 percent of GDP (Avila, 2005). The Mission proposed that a system with the least possible amount of differential rates should be established. If the dispersion of rates is reduced to only two levels, the general rate (16 percent) and other preferential rate (6 percent), the tax collections would increase by 0,2 percent of GDP (Avila, 2005). Therefore, the possibility of establishing adequate credits for investment commodities, and rationalizing the use of the VAT should be considered.

In conclusion, as the VAT progressiveness depends on the use of collected taxes, it should be recommended to include distributional considerations when new tax reforms are proposed.

3 Tax Analysis Using Computable General Equilibrium Models

While computable general equilibrium models have been used for various purposes in Colombia⁷, only until the mid nineties they were used explicitly for tax policy analysis.

Lora and Herrera (1994) built the first model for this purpose, mainly characterized by (i) the distinction of labor factors between skilled and unskilled, (ii) rural and urban households, and (iii) the introduction of rigidities in urban wages, factorial mobility and production constraints based on the establishment of markups on various activities. Their analysis was focused on the welfare effects caused by changes in the import tariff structure, flattening the value-added tax rates and increasing the tax rate on capital. For each experiment, different rigidities and macroeconomic closures were determined. However, they found that, in general, VAT reforms mainly affect urban households by reducing their returns from capital, and either improving or keeping unchanged rural households' welfare. Conversely, import tariff reforms (e.g. reducing or flattening the rates) conveyed negative consequences for the rural households, while producing mixed changes in urban areas. Simulations on taxation over capital (i.e. increasing the tax rates) showed that the distortionary effects increased in presence of several rigidities, such as, sector-specific capital and production constraints.

Contrary to Lora and Herrera's (1994) experience and considerations, Hernández et al. (2000) and Rutherford and Light (2002)⁸ built standard general equilibrium models for tax incidence analysis. In particular, the objective of the study by Hernández et al. (2003) was to evaluate the fiscal costs of tax exemptions and incentives on commodities and capital earnings in light of the fiscal disequilibria at that time. Their results pointed out that, while there is no a general consensus on the progressiveness of these two tax structures, the elimination of the benefits related to them, either partially or completely, improved the performance of the economy reflected in the augment of total investment and the reduction of public deficit, though affecting negatively private consumption in the short run.

Hired by the Departamento Nacional de Planeación (DNP) and Ministerio de Hacienda, and under the supervision of the National Public Income Mission, Rutherford and Light (2002) built the general CGE model for tax modeling analysis currently used by these institutions. The MEGATAX model is a representation of a small open, perfectly competitive economy, with several households and labor factors, and a complete set of tax instruments, excluding those on assets, therefore, depicting the complexity of the Colombian tax system.

This model was used by Rutherford, Light and Barrera (2003) to analyze the welfare costs of raising tax revenues in Colombia. In specific, they simulated several tax reforms, including uniform value-added tax rates and increasing capital taxes, which consequences were evaluated according to the average and marginal costs of funding. They concluded that capital taxes were the best instrument to raise taxes in the short run, while affecting significantly the economy in the long-run. Conversely, value-added tax revenues proved to be a sustainable source of income in the short and long-run as the reform shocks decrease over time, but its base was three times bigger than for other taxes. Notwithstanding, its distortionary effects vary significantly, depending on the tax base size⁹, the degree of heterogeneity of the households (*via* factorial returns) and the use of the raised additional resources¹⁰. These results were also obtained by Escobar et al. (2003), although

⁷See López, Ripoll and Cepeda (1994).

⁸Rutherford and Light's model, MEGATAX, was used as instrument for posterior analysis done by Escobar et al. (2003) and Rutherford, Light and Barrera (2003). Karl (2004) extended this model for income distribution analysis.

⁹Given the current VAT base, Rutherford and Light (2002) argued that increasing tax revenues by 1% of the GDP implied raising the rate from 16% to 20.4%.

¹⁰They assumed that additional tax revenues are used to be obligations with the rest of the world.

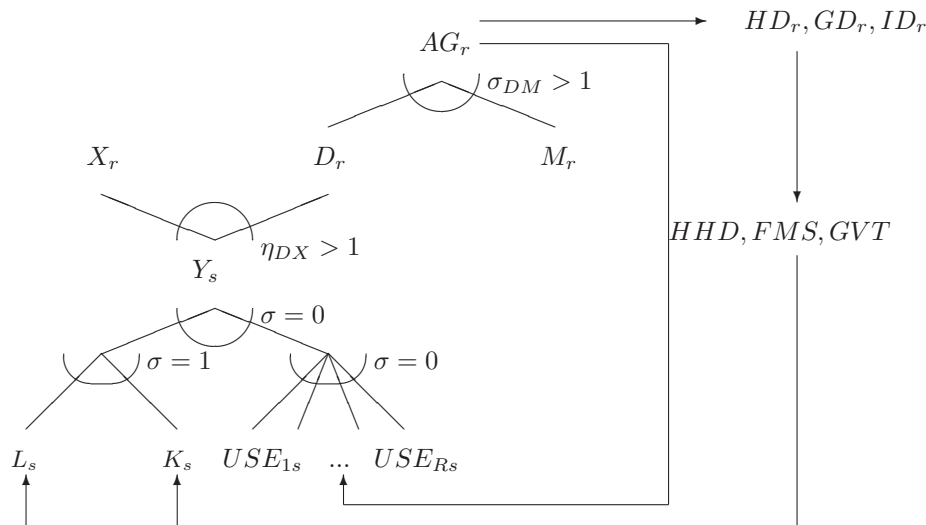
the marginal cost of funding increases in presence of market imperfections, such as, labor unemployment.

Finally, Karl (2004) extended the original standard MEGATAX to consider more than eight thousand households. He found that increasing or even establishing a uniform value-added tax rate will affect significantly households' welfare in the short run, especially of those located under the poverty line.

4 Model

The instrument for the VAT analysis in Colombia is considered as a standard static computable general equilibrium (CGE) model for a small open economy with perfect competitive agents and markets, excluding the labor as unemployment existence is considered. In this sense, the model is neoclassical in spirit, which is reflected by the price-responding behavior of the institutions considered within it. All prices in the model (i.e. product prices, factor prices and the exchange rate) respond to the various shocks relative to the consumer price index, which is the price numeraire. Figure 6 depicts the structure of the economy represented by the instrument.

Figure 6: Economic Flow Diagram



Firms produce goods and services by demanding intermediate inputs and value added factors. While the technology used to this end is assumed to be Leontief, value added inputs (i.e. labor and capital) are combined based on a Cobb-Douglas technology. Final goods are either destined to fulfill the domestic and foreign demands, assuming that are imperfectly exchangeable between these two markets.

The commodities destined to the domestic market are combined with imports into an Armington composite that will be demanded by households, government and firms (for investment purposes). Notwithstanding, while households depicts Stone-Geary preferences, public expenditures and investment purchases are treated in an accounting way (i.e. fixed shares).

Household consumption is financed with factor returns and transfers received from other institutions. In particular, households receive from government and firms' consumption subsidies, which are used to increase their expenditure in the related commodities and others¹¹.

Public sector's expenses (in goods, subsidies and other transfers), in addition to its balance, are financed with taxes on productive activities, consumption of goods and services and the income of households and

¹¹Households have a set of public subsidies, but mainly, for education, health and housing services, which are the ones included in the formulation. From firms, households get contingent payments for health (i.e. commodity transfer) and pensions, based on their contribution to the social security system. The approximation taken here is therefore, one based on the concept of full income.

firms.

Given the assumption of a small economy, the rest of the world behavior is taken exogenously, therefore, responding based on keeping in equilibrium the balance of payment. Notwithstanding, in order to include the effects of terms of trade within the model, an export demand equation was incorporated within the model.

The instrument includes several closure rules, which basically refer to the macroeconomic accounts that have to be in balance. First, the labor markets clear based the relation between real wages and the unemployment rate (i.e. wage curve). Second, capital factor is fully employed and either is sector-specific (short-run analysis) or mobile (long-run analysis). Third, current account balance can be obtained either by varying the foreign savings or the exchange rate. Fourth, savings-investment account balances either by keeping real investment fixed and varying agents marginal propensities to save, or otherwise. And fifth, government balance can be in equilibrium by (i) adjusting total public expenses, (ii) varying public deficit, and (iii) endogenizing a one the tax instruments.

A complete technical description of the model can be found in appendix B.

5 Data

In order to implement the above-mentioned instrument, a commodity-commodity social accounting matrix (SAM) was built for the year 2002, based on data from the System of National Accounting elaborated by the *Departamento Administrativo Nacional de Estadísticas* (DANE). Additional work was done in decomposing the following accounts, using estimated shares and patterns processed from the 2003 Quality of Life (LSM) survey:

- Supply and demand of education services were disaggregated between elementary, secondary and higher levels.
- Supply and demand of health decomposed between ambulatory, hospital and promotion and prevention services.
- Labor flows opened between wages and social security contributions to health, pension, professional illness and unemployment funding system; at the same time, all of them classified between public, private, independent and unprotected workers¹².
- Households' accounts decomposed according into four categories using the national beneficiary identification system, SISBEN¹³.

Even though the SAM considers a total 66 sectors/commodities (all based on the SNA system), the analysis is focused on the following aggregations:

- **Food (FOD)**: coffee, other crops, fishing, processed meat and fish, vegetable and cooking oils, dairy products, grains, sugar, coffee threshing, chocolate and similar goods, other manufactured foodstuff;
- **Beverages and Tobacco (BVT)**;
- **Textiles (CLT)**: textile fibers, apparel, clothing, leather products;
- **Housing Commodities (HSV)**: forestry, coal and lignite, oil, ferrous / non ferrous minerals, refined oil products (e.g. kerosene), electricity and gas services, water and sanitation services, building and civil construction, real estate services, domestic services;

¹²An unprotected worker is defined as a working individual which is not cover by none of the mentioned social security subsystems.

¹³SISBEN classifies all individuals according to their social characteristics (e.g. age, gender, education, access to public services, quality of the house). As a result, people with significant "lacks" in their living standards will be categorized in strata one; conversely, those with a high quality of living are classified in strata six. Given the smaller sizes of the two highest levels (each less than 3% of the total population), they are aggregated within the fourth strata.

- **Furniture and Related (FUR)**: plastics, glass products, furniture, basic metal products, machinery, energy supply machines and related;
- **Transportation and Communication (TRC)**: transportation equipment, land transportation, water transportation, air transportation, other transportation services and related, telecommunications;
- **Social and Cultural Commodities (SOC)**: Paper products, book printing and publishing, market and non market social services (i.e. amusement parks), tourist services;
- **Education (EDU)**: Elementary, secondary and higher education services;
- **Health (HTH)**: pharmaceutical products, orthopedic and surgical products, ambulatory and hospital services and promotion and prevention services; and,
- **Personal Commodities (PSV)**: Livestock, wood products, basic chemicals, commercial services, auto and personal product repairs, hotel and restaurant services, financial intermediation and related, public administration services.

Similarly, in order to include in the analysis the effects of subsidies on household behavior, secondary information was taken into account to adjust their consumption patterns. In particular, the methodology taken was based on Lasso (2005), which input to each consumed commodity (i.e. housing, health and education), the respective transfer, either made by the government or firms¹⁴.

In the following section, a complete description of the social accounting matrix data is given in order to provide a point of reference for the analysis in section 6.

5.1 Benchmark Analysis

The gross domestic product (GDP) of Colombia was 204.8 billions of pesos in 2002. As usual, private and public consumptions had significant shares of the economy, that is, 71.3% and 16.2% of the GDP, respectively (table 7).

Table 7: Macroeconomic Aggregates

(Million pesos)

	Level	%
Consumption	145,228,972	71.3
Expenditure	32,922,389	16.2
Investment	31,017,690	15.2
X - M	-5,340,350	-2.6
GDP	203,828,701	100.0
Imports	44,365,661	21.8
Exports	39,025,311	19.1

At the production level, personal, housing and food commodities were the biggest activities. A simple inspection of the data shows the importance of value-added relative to the demand for the intermediate inputs. In particular, it can be seen that only beverages and tobacco, textiles, furniture, transportation and communications had, as expected, a higher share for intermediate consumption (table 8). This fact is supported by the composition of the value added.

¹⁴Transfers are estimated as the unit cost of providing the commodity. A household (or person) is eligible to that transfer if it consumes that type commodity and based on other socioeconomic characteristics (e.g. the head of the household sends his/her children to public schools).

Table 8: Benchmark Production

	Y/SUM(Y)%	VA/Y%	L/VA%	K/L
FOD	20.7	45.7	68.7	0.5
BVT	1.3	19.4	31.9	2.1
CLT	3.5	33.5	64.5	0.5
HSV	26.1	53.0	38.9	1.6
FUR	7.1	29.1	42.1	1.4
HTH	3.4	65.1	66.0	0.5
TRC	7.5	37.1	68.1	0.5
SOC	4.2	64.1	80.1	0.2
EDU	4.8	89.2	69.5	0.4
PSV	21.4	79.9	63.8	0.6
Total	100.0	55.8	59.1	0.7
Value*	334,378,375	186,732,638	110,285,805	

Production (Y), value added (VA), labor (L), capital (K)

* Millions of pesos at 2002 prices.

Although labor force is mainly unprotected, that is, 7.2 millions of workers (table 9), wage-workers returns represents more than 83% of the total as a result of the wage differentiation, particularly, the social security contributions structures (table 10).

Table 9: Occupied Labor Force

	Freq.	%
Unprotected workers	7,234,882	38.6
Wage-workers	6,645,013	35.4
Independent workers	4,855,888	26.0
Total	18,735,783	100.0

Source: 2003 LSM Survey, DANE. Authors' calculations.

Table 10: Benchmark Labor Demand

	Unprotected	Wage-worker	Independent
FOD	46.8	16.0	22.2
BVT	0.2	0.2	0.1
CLT	1.0	2.5	1.9
HSV	13.2	16.6	17.9
FUR	1.6	2.9	0.6
HTH	0.6	5.0	4.0
TRC	4.5	5.6	10.2
SOC	3.0	7.0	6.7
EDU	0.9	10.5	2.0
PSV	28.1	33.7	34.5
Total	100.0	100.0	100.0
Value*	11,706,946	91,160,903	7,417,955

* Million pesos at 2002 prices.

Table 11 shows that production activities are mainly dedicated to supply the domestic needs. Exports in all sectors participated less than twenty percent of the whole production, excluding textiles, which depicted a 24.8% share. Similarly, imports did not share a significant part of the market¹⁵: as a matter of fact,

¹⁵It is important to note, that the commodity/sector aggregation is misleading. Mineral exports, such as coal and oil, represent 70% of the domestic production. By the same token, imported manufactures share 25% of the supply.

only food, housing, furniture and transportation and communications show imported/domestic-produced commodity ratios higher than 10%.

Table 11: Commodity Supply

	Y/SUM(Y)%	X/Y%	X/SUM(X)%	M/D%	X/D%	M/(X+M)%
FOD	20.7	13.4	23.7	9.6	15.3	38.6
BVT	1.3	5.2	0.6	5.7	5.4	51.5
CLT	3.5	24.8	7.5	26.4	32.4	44.9
HSV	26.1	18.0	40.2	11.9	21.8	35.3
FUR	7.1	16.6	10.1	64.2	19.7	76.5
HTH	3.4	6.3	1.8	12.8	6.6	65.8
TRC	7.5	18.7	12.1	54.2	22.9	70.3
SOC	4.2	0.5	0.2	0.4	0.5	47.9
EDU	4.8	0.0	0.0	2.7	2.1	56.4
PSV	21.4	2.1	3.8	0.0	0.0	0.0
Total	100.0	11.7	100.0	14.9	13.1	53.2
Value*	334,378,375	0.0	39,025,311	297,900,155	297,900,155	83,390,972

Production for the domestic market(D), imports (M), Armington composite (AG), exports (X)

* Million pesos at 2002 prices.

Most of the final demand was composed by the households' needs (table 12). Their aggregate consumption flows show that most of the expenses are in food (33.8%), housing (16.2%), education (10.7%) and personal commodities (10.0%). Public expenditure is mainly focused in two sectors such that 76.8% is in its own activities (i.e. public administration). Investment activity was majorly dedicated in civil and building construction, both included in the housing aggregate (50.3%).

Table 12: Final Demand

	H	G	I
FOD	33.8	0.0	3.2
BVT	2.4	0.0	0.2
CLT	6.3	0.0	0.7
HSV	16.2	0.0	50.5
FUR	3.2	0.0	29.6
HTH	4.3	1.0	1.5
TRC	9.0	0.0	11.0
SOC	3.6	22.3	1.3
EDU	10.7	0.0	0.0
PSV	10.6	76.8	2.1
Total	100.0	100.0	100.0
Value*	145,228,972	32,922,389	31,017,690

Household consumption (H), public expenses (G), investment (I)

* Million pesos at 2002 prices.

Table 13 shows in detail the average consumption structure by the various types of households. In particular, these institutions depict similar patterns, though, food and education shares are higher for those with low living standards than those on the other side of the scale.

Households finance these expenditures using factor returns and transfers from other institutions. In general, labor returns (net of social contributions) are the main source of income, concentrated significantly in households with the highest quality of life (table 14).

Table 13: Average Household Demand Shares (%)

	HH01	HH02	HH03	HH04
FOD	42.7	39.6	34.5	23.4
BVT	3.5	2.3	2.3	2.2
CLT	6.6	6.9	6.8	4.9
HSV	11.3	14.6	17.1	18.5
FUR	2.5	3.2	3.4	3.3
HTH	5.7	3.9	3.6	4.9
TRC	6.2	9.2	8.4	10.7
SOC	2.3	2.4	3.6	5.3
EDU	14.9	11.3	10.2	8.9
PSV	4.3	6.5	10.1	17.9
Total	100.0	100.0	100.0	100.0
Value*	7.1	9.3	14.5	60.9
# Households	2,224,722	3,952,632	3,791,201	617,489

* Household yearly expenditure, valued in million pesos at 2002 prices.

Table 14: Household Average Income Structure

	Labor	Capital	Public	Private	Other	Total
<i>Million pesos at 2002 prices*</i>						
HH01	3.3	0.7	1.2	0.0	2.0	7.1
HH02	5.5	0.8	0.9	0.0	2.2	9.3
HH03	9.1	1.2	0.8	0.0	3.6	14.8
HH04	44.4	6.3	1.1	0.1	17.0	68.9
<i>Share of Total %</i>						
HH01	45.8	9.9	16.1	0.3	27.8	100
HH02	58.4	8.3	9.5	0.3	23.5	100
HH03	61.3	8.1	5.7	0.3	24.6	100
HH04	64.4	9.2	1.6	0.1	24.7	100

* Yearly values

Government net tax revenues were 26.7 billions pesos or 12.8% of GDP in 2002 (table 15). From that amount, value-added taxes contributed 40.4% or 5.2% of GDP, reflecting their significant impact on the economy. Similarly, firms' behaviors are highly determined by the distortions of direct taxes (e.g. income and property), which summed 46.4 billions pesos or 5.9% of GDP. Household behaviors are also affected directly by incomes taxes (2 percent rate in average), though insignificant compared to the effects of commodity-specific subsidies. These can be seen from the progressive subsidy structure exposed in table 16: households with lower standards of living benefit greatly from the education and health subsidies relative to those in the opposite situation. Notwithstanding, housing subsidies are mainly located in the middle of the household stratification, depicting focalization problems due to the financial selection process.

Table 15: Tax Structure

	Description	Value ⁺	%	%GDP	Rate*
payt	Pay-roll taxes	1,351,305	0.7	0.0	1.8
txa	Production taxes	2,547,091	9.8	1.2	0.8
txc	Commodity taxes	4,058,285	15.5	2.0	1.1
sbc	Commodity subsidies	-71,286	-0.3	0.0	0.0
vat	Value-Added taxes	10,561,973	40.4	5.2	3.0
mtx	Import Tariffs	2,662,430	10.2	1.3	6.0
psub	HHD commodity subsidy	-9,942,714	-38.1	-4.9	-7.4
itx	HHD direct taxes	2,829,354	10.8	1.4	1.9
ftx	Firms direct taxes	12,117,663	46.4	5.9	22.1
Total		26,114,102	100.0	12.8	

⁺ Million pesos at 2002 prices

* Weighted average

Table 16: Household Consumption Subsidy Structure

(Million pesos at 2002 prices)

	HH01	HH02	HH03	HH04
HSV	0	34,968	31,868	6,999
HTH	269,769	174,844	159,342	13,999
EDU	2,289,240	3,287,074	2,995,646	678,959

Net tax collections, in addition to factor returns and other transfers, summed 26.1% of GDP, which compared to the size of the expenditure, gross of institutional transfers, conveyed to a fiscal deficit of 4.3% of GDP (table 17).

Table 17: Government Balance

(Million pesos at 2002 prices)

	Value	%GDP
Expenditure	53,186,900	26.1
Income	44,366,867	21.8
Balance	-8,820,033	-4.3

6 Policy Simulations

As stated in section 2, value-added taxes constitute a significant instrument for raising revenues within the actual distortionary Colombian tax system. Therefore, it is imperative to evaluate the economic effects of their possible modifications, specially when a forthcoming tax reform is at sight.

The analysis departs from a simple experiment: the establishment of a two-differential VAT rate structure, as recommended by the 2003 National Mission of Public Income. In specific, the tax rates are imposed in the following way for each type of commodity¹⁶:

- A 6% preferential rate for expenditures in food, beverages, housing services, health, social services, education and other personal services.
- A 16% general rate for clothing, furniture, transportation and communication.

¹⁶It is important to remember that the model considers a classification based on types of expenditure rather than a commodity decomposition. Hence, any tax experiment on commodities is biased by the categorization itself.

These “legal” tax rates take the following effective rate values¹⁷:

Table 18: Implicit Value Added Rates

	Benchmark	Simulation
FOD	0.55	3.47
BVT	5.65	3.47
CLT	9.26	9.26
HSV	2.04	3.47
FUR	8.09	9.26
HTH	0.40	3.47
TRC	6.64	9.26
SOC	0.50	3.47
EDU	0.00	3.47
PSV	2.30	3.47

The evaluation of this experiment is presented, first, without considering the possible and evident income distribution effects. That is, no reallocation of resources by the government is taken into account. Then, two counterfactual simulations are developed: (i) a compensated scenario that distribute the new resources to households with the lowest standard of living (i.e. SISBEN 1 or HH01, and SISBEN 2 or HH02) using the current subsidy system. In specific, the simulation departs from the identification of possible subsidy receptors using the 2003 Standard of Living Survey, which allowed to “calibrate” the total transfers received by each type of households, hence, generating a coherent macro/micro analysis.

In the second counterfactual scenario it is considered the introduction of a lump-sum transfer system for all households, which basically allocates the total new resources in equal amounts for each of the twelve million households that belong to the Colombian economy.

Given the complexity of a tax reform, an additional experiment is done by incorporating to the previous simulation, the reduction of direct taxes, that is, income and gain taxes. Technically, household income tax and firms’ gain tax rates are reduced seven and twenty percent, respectively, while considering possible public transfers to households with the lowest standards of living.

All four experiments suppose that total investment and total public expenditure are fixed in real term and sector-specific capital. A budget-yield closure is imposed in the counterfactual scenarios (i.e. public savings are also fixed), hence, allowing to use one of the instruments (i.e. public subsidies) to adjust endogenously. Results are presented in detail in appendix C.

6.1 Base Scenario (BASE)

In general, the VAT reform has the expected effects through the economy: those sectors in which the tax rate increased, the demand for intermediate and final commodities decreased; those sectors in which the rate varied negatively, the opposite behavior was evidenced (table 23). Notwithstanding, personal services composite and education sectors depicted different movements; while the former increased its final demand, given a positive variation of the public and investment (volume) demand¹⁸, the latter did not evidenced any change¹⁹.

As a consequence of these changes, production followed demand, thus, experiencing similar behavior. Seven of the ten sectors showed negative variations, while beverages and personal services composite increased their production by 0.11% and 0.61%, respectively; education services remained constant (table 22). Aggregate production net behavior depicted a negative change, as expected, given the prevalence of the net rise of the VAT rate.

¹⁷Given that the model is build based on categories of expenses, the conversion from legal to effective rates departs from the assumption that the VAT implicit rate for clothing is equivalent to 16% legal rate

¹⁸In order to keep constant real total public and investment demand, volume has to change as prices vary.

¹⁹It was assumed that households only spend the minimum quantity necessary to fulfill their education needs.

As a direct effect of these variations in production, factors' demand varied in the same directions. Therefore, average labor prices decreased as well as sector-specific capital prices (table 25). This, in turn, affected household factorial receipts: while capital returns fell 3.05%, labor income varied between -5.24% (unprotected labor) and -2.17% (wage labor). Conversely, dividends from firms rose 6.35% as government deficit reduced significantly (-61%), hence, liberalizing resources previously destined to investment. Notwithstanding, this increase was not enough to compensate the previous losses. In fact, households' demands for commodities decreased, excluding those with the highest standard of living (HH04), which reduced their savings in order to stabilize their consumption patterns (tables 23 and 24)²⁰. Consequently, the equivalent variation (EV) for each household reflects the size of the impact of the reform.

In terms of the welfare distribution, poverty headcount measured using Foster-Green-Thorbecke (FGT) indicator, rose 1.17%; poverty gap and severity increased marginally 0.35% and 0.31%, respectively. Using Atkinson index, inequality decreased when the inequality aversion parameter takes values lower than 2, i.e., a small improvement in income distribution also captured using the Gini coefficient. When inequality aversion takes values greater than 2, inequality rise 1.88%.

Finally, government revenues from most tax instruments fell, excluding VAT whose change in its structure conveyed a rise of 61.66% in its revenues that, as mentioned, financed its deficit in 3.4 billion pesos. Table 26 presents these results.

6.2 VAT Reform Compensated with Transfers Through the Existing Subsidy System (SIM)

Although it is possible that the public administration engages in tax reforms to reduce its indebtedness, such as the one described above, it is more likely that it would be channelled to improve the existence social net. In other words, public administration will allocate these resources for either affiliating new people to the subsidized health care system (i.e. those that are not insured), enroll new students to the public system (i.e. people that are not studying but are younger than 24 years old), or to give more housing subsidies (i.e. families living in rented places), *inter alia*²¹.

Current government social expenditure policy is focused on improving families with low standards of living, i.e., that belong to lower levels of SISBEN. Consequently, VAT reform is simulated based on a budget-yield rule, which keeps real total expenditure and balance fixed by adjusting households subsidies. Departing from Lasso (2004)²², the size of total subsidies received by households classified in SISBEN 1 (HH01) is calibrated, hence releasing some resources for those that belong to SISBEN 2 (HH02).

In general, subsidy transfers reversed most of the observed trends within the base simulation due to the fact that households that belong to SISBEN 1 and 2 share a significant proportion of final demand. In this sense, public subsidies conveyed increases in the consumption levels for these types of households (table 23), which in turn, increased production in key sectors, such as food, beverages, clothing, housing services and furniture (table 22). Households categorized within the highest levels of SISBEN evidenced welfare losses, more than twice higher than in the base scenario. Consequently, poverty and inequality indicators improved significantly: poverty headcount, gap and severity decreased 1.23%, 4.86% and 6.64%, respectively; Gini coefficient fell from 0.6 to 0.585, and Atkinson indexes improved though only for inequality aversion parameters whose values are lower than 2.

Government tax receipts followed the same trends as in the base scenario. Most of the tax instrument raised less resources than the benchmark, excluding VAT, which increased its revenues in 62.25%. Public subsidies, as response of the compensated policy, augmented more than two thousand percent (table 26).

²⁰As in the case of firms, the reduction of government deficit in presence of a constant total real investment, released resources which households could use for consumption. Households with the highest standard of living (HH04) are the only one with a positive marginal propensity to save.

²¹Giving the complexity of selecting people, it is established a simple allocating rule: affiliate people that are not insured in the health subsidized system; enroll new students from people that are not studying and are younger than 24 years old; and give housing subsidies for those families that live in rented houses or apartment. This latter can also be thought as giving subsidies to families that lost their home as a result of either a natural disaster, or as a forced displacement.

²²Lasso (2004) elaborate an evaluation of the Public social expenditure incidence by measuring the additional income households receive in form of the various subsidies. His conclusions highlight the importance of the public transfers for improving the distribution of income as well as the reduction of poverty.

The rest of variables of the economy behaved as in the previous experiment.

6.3 VAT Reform Compensated with Transfers Through Lump-Sum Transfers (SIM2)

Although the previous scenario provided sufficient evidence of the goodness of the existence subsidy system, at least in terms of reducing inequality, it is necessary to provide an additional counterfactual simulation. In particular, assuming the same tax experiment, the selected allocation mechanism is assumed to be one of lump-sum transfers. Evidence of this type of programs can be found in *Familias en Acción, Jóvenes en Acción, Madres Comunitarias*²³, between others. Lump-sum transfers are based on a equal-amount allocation structure per household; that is, each of these agents receive the same quantity of resources, regardless their possible needs, which can be thought as a policy formulated by a government with a low degree of inequality aversion.

The depicted results show an intermediate scenario between the base simulation and the one provided in the above section. In particular, the aggregate demand of households classified within SISBEN 1 and 2, increased 4.4% and 1.78%, respectively, while those in SISBEN 3 (HH03) and higher decreased 0.43% and 3.85% (table 23). These changes were due to variations in their income: equivalent variation evidences an increase in welfare for those with lower standards of living, explained only for the increase in public transfers, as factorial returns declined in response to the production activity levels.

Production and supply levels improved slightly with respect to BASE scenario. In particular, food, clothing and furniture had positive variations, while the rest evidenced negative but marginally smaller behaviors (table 22).

Similarly, price indexes varied negatively in most of the commodities and activities. Commodity supply (Armington) prices for food, health, transportation, communications, education, social and personal services increased as production levels fell and final demand increased (table 25).

Poverty indicators depicted a positive behavior. In specific, headcount ratio decreased from 0.53 to 0.519, while FGT1 and FGT2 varied -2.32% and -3.06%, respectively. Gini coefficient drop marginally to 0.592, as well as Atkinson indexes, which basically kept constant. Table 27 shows these results.

6.4 VAT and Direct Tax Reform (SIM3)

Until now, the described tax reforms only considered value-added taxes as the only instrument to be modified when in reality it is most likely that others, as well, will be changed. Therefore, this experiment considers the modifications on VAT and a reduction in direct taxes distortion. That is, lowering the tax rates on household incomes and firms' gains in 7% and 20%. Additionally, new tax revenues are distributed to households with the lowest standards of living using the current subsidy allocation system.

The results obtained from the CGE model are qualitatively the same as those described in section 6.2. Aggregate supply depicted negative variations in most of the sectors, as well, as the levels of production and factorial demands (table 22). Labor unemployment rates increased around 2.5% as a consequence of the production activity reduction.

Given the negative behavior of the factorial demand, households' income diminished. Income tax reductions conveyed an increase of disposable receipts, though not enough to compensate the negative effects of the VAT reform (table 24). Notwithstanding, households with the lowest standards of living (HH01) increased their consumption demand, caused by the positive net effect on their income due to the prevalence of the public subsidy effects. Households categorized in SISBEN 2 (HH02) received the remainders of public transfers; however, their effects were not enough to compensate the direct consequences of the reform. Households with higher standards of living also depicted net negative effects, although, smaller than in the simulation SIM.

The resultant poverty and income distribution indicators depicted reductions in their levels, though in

²³This program is based on nursery schools, managed by women of a community, which receive wage payments. Attendant children receive freely social services such as, food, education and health.

less proportion as those showed in section 6.3. Poverty headcount, gap and severity diminished in 0.53%, 3.36% and 4.86%, respectively. Gini coefficient, as well as Atkinson indexes evidenced a small improvement, which implies the positive effects of the existence of the subsidy system.

7 Final Remarks

Given the socioeconomic situation of Colombia in addition to the complexities of the tax system, raising new resources for improving the public balance requires clear compensating mechanisms. This study provided evidence of this fact by first, describing in detail the Colombian economy, social situation and tax structure; and second, the relevance of public transfers systems in reducing the evidently negative effects of tax reforms.

In this sense, the study focused primarily in evaluating the economic consequences of reforming value added taxes. As expected, the tax reform has significant effects in the economy's performance and, importantly, over income distribution when any allocating resource mechanism is disregarded.

Therefore, when taking into account the feedback effect of the new resources, i.e., their use in improving households' welfare, it is possible to consider null or even positive consequences as exhibited in the previous sections. Notwithstanding, the conclusions deducted from the experiments are in light of full using tax reform receipts in this kind of activities. In reality, additional resources are used in various contexts at the same time: reducing public deficit, increasing public expenditures and investment, and enhancing the social nets. In addition, the study ignores (i) the effects of non perfect competitive markets, and (ii) the long-term effects of the reform given the static nature of the implemented instrument.

In consequence, possible extensions for this study can clear be identified in designing complex tax reforms, introducing dynamic elements to the analysis and features of strategic interacting behavior.

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A Additional Tables

Table 19: Fiscal Burden

Year	Central Government Taxes	Local Government Taxes	Oil and Gasoline Taxes	Sub-Total	Pay-Roll Taxes ¹	Total Fiscal Burden
Percent of GDP						
1990	8.0	2.0	1.4	11.4	3.7	15.1
1991	8.7	2.0	1.2	11.9	3.6	15.5
1992	8.9	2.0	1.1	12.0	3.7	15.7
1993	9.7	2.1	1.1	12.8	3.8	16.6
1994	9.6	2.3	1.0	12.8	4.0	16.8
1995	9.7	2.3	1.1	13.0	4.4	17.4
1996	10.1	2.5	1.2	13.8	4.3	18.1
1997	10.8	2.6	1.0	14.4	4.8	19.2
1998	10.6	2.7	0.9	14.2	5.8	20.0
1999	10.6	2.8	1.0	14.4	5.5	19.9
2000	11.2	2.7	1.5	15.4	4.7	20.1
2001	13.2	2.7	1.4	17.3	4.7	22.0
2002	13.3	2.8	1.5	17.6	4.2	21.8
2003	13.9	3.0	1.5	18.3	4.0	22.3
2004	14.6	3.0	1.6	19.2	4.1	23.3

¹ Includes social contributions and parafiscal taxes.

Source: Presidencia de la República, DNP (2005).

Table 20: Central Government Taxes

Year	Value Added Taxes	Income Taxes	Custom Duties	Financial Debit Taxes	Asset Taxes	Stamp Taxes and Others	Total
Percent of GDP							
1990	2.48	3.35	2.05			0.14	8.02
1991	2.77	4.48	1.34			0.13	8.72
1992	3.34	4.60	0.85			0.14	8.93
1993	4.26	4.32	1.04			0.03	9.65
1994	4.30	4.06	1.08			0.14	9.58
1995	4.27	4.01	1.03			0.37	9.68
1996	4.93	3.78	0.90			0.50	10.11
1997	4.91	4.34	1.11			0.44	10.80
1998	4.80	4.08	1.22			0.45	10.55
1999	4.53	4.18	0.93	0.58		0.38	10.60
2000	4.73	4.02	1.00	0.59		0.89	11.23
2001	5.42	5.18	1.19	0.76		0.60	13.15
2002	5.43	5.10	1.04	0.69	0.61	0.44	13.31
2003	5.98	5.17	1.01	0.72	0.53	0.45	13.86
2004	6.17	5.98	0.95	0.89	0.18	0.44	14.61
Percent of Total							
1990	30.9%	41.8%	25.6%			1.7%	100%
1991	31.8%	51.4%	15.4%			1.5%	100%
1992	37.4%	51.5%	9.5%			1.6%	100%
1993	44.1%	44.8%	10.8%			0.3%	100%
1994	44.9%	42.4%	11.3%			1.5%	100%
1995	44.1%	41.4%	10.6%			3.8%	100%
1996	48.8%	37.4%	8.9%			4.9%	100%
1997	45.5%	40.2%	10.3%			4.1%	100%
1998	45.5%	38.7%	11.6%			4.3%	100%
1999	42.7%	39.4%	8.8%	5.5%		3.6%	100%
2000	42.1%	35.8%	8.9%	5.3%		7.9%	100%
2001	41.2%	39.4%	9.0%	5.8%		4.6%	100%
2002	40.8%	38.3%	7.8%	5.2%	4.6%	3.3%	100%
2003	43.1%	37.3%	7.3%	5.2%	3.8%	3.2%	100%
2004	42.2%	40.9%	6.5%	6.1%	1.2%	0.3%	100%

Source: Oficina de Estudios Económicos- DIAN, CONFID y DANE para cifras de Cuentas Nacionales.

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B CGE Model

B.1 Production and Supply

There are S activities (or firms) indexed by s , each one producing one type of good, indexed by r . The supply of the s^{th} sector, Y_R can be either destined to fulfill the demand requirements in the domestic market (D_r) or exported to the rest of the world (X_r).

$$Y_r = ad_{CET_r} [\theta_{CET_r} X_r^{\rho_{CET_r}} + (1 - \theta_{CET_r}) D_r^{\rho_{CET_r}}]^{\frac{1}{\rho_{CET_r}}}$$

where ad_{CET_r} is the technological parameter of efficiency; θ_{CET_r} is the share of exports within the domestic production of r ; and ρ_{CET_r} is the inverse of the elasticity of substitution, η_{CET_r} .²⁴

²⁴The quantity of exported commodity is determined by defining an export demand function of the rest of the world,

In order to produce Y_s , the firms demand r intermediate inputs and value added, both combined in a nested Leontief/Cobb-Douglas production function. Hence, the optimization problem of the firms at the top level can be depicted as

$$\min_{CI_s, QV_s} PCI_s CI_s + PVA_s VA_s - ((1 + tax_s) \sum PY_s Y_s) (1 + \sum_i icd_{rs})$$

subject to

$$Y_s = \min_{CI_s, VA_s} \left[\frac{CI_s}{vci_s}, \frac{VA_s}{vf_s} \right]$$

where PY , PCI and PVA are the prices of production, intermediate composite (CI) and value added (VA), respectively; tax_s the tax rate over production (net of subsidies); icd_{rs} stand for the trade and transportation margin cost rates; and, vci_s and vf_s are the Leontief technical coefficients.

At the bottom, firms decide how much demand from the various commodities and factors of production. For the intermediate consumption, the problem is described as

$$\min_{USE_{1s}, \dots, USE_{Rs}} \sum_i (1 + vat_r + tax_r - sbc_r) PA_r USE_{rs} - PCI_s CI_s$$

subject to

$$CI_j = \min \left[\frac{USE_{1s}}{share_{CI_{1j}}}, \dots, \frac{USE_{Rs}}{share_{CI_{Rs}}} \right]$$

in which, USE_{rs} is the quantity of commodity r demanded producer s ; PA_r is the Armington composite price; vat_r , tax_r , sbc_r are in the same order, the VAT rate, commodity-specific tax and subsidy rates over good r ; and, $share_{CI_{rs}}$ are technical coefficients. Similarly, the firms' decision process for value added factors can be formulated as

$$\min_{LD_{1s}, \dots, LD_{Ls}, KD_s} \sum_l PL_{ls} (1 + lcont_{ls} + payt_{ls}) LD_{ls} + PK_s K_s - PVA_s VA_s$$

subject to

$$VA_s = ad_{CD_s} \left(\sum_l LD_{ls}^{\beta_{ls}} \right) KD_s^{\beta_{K_s}}$$

where ad_{CD_s} is the parameter of efficiency; LD_{ls} is the demand of l type of labor by firm s ; KD_s is the demand for capital; and, PL_{ls} are the average sectoral wages; $lcont_{ls}$ and $payt_{ls}$ are the social security contribution rate and payroll tax rate, respectively; and PK_s is the sector specific capital price. The sum of the share parameters, β , is equal to one.

Domestic produced goods, in conjunction with imports, are combined into a composite based on Armington (1968), which is the total supply of commodities for the domestic markets:

$$AG_r = ad_{ARM_r} \left[\theta_{ARM_r} M_r^{-\rho_{ARM_r}} + (1 - \theta_{ARM_r}) D_r^{-\rho_{ARM_r}} \right]^{\frac{-1}{\rho_{ARM_r}}} \quad \forall r$$

AG are M the Armington supply and imports, respectively; θ_{ARM_r} is the share of imports within the composite and, ρ_{ARM_r} is the inverse of the substitution elasticity, σ_{ARM_r} .

$$XD_r = XD0_r \frac{PXW_r}{PXFOB_r}$$

in which $XD0_r$ and XD_r are the export demand at the benchmark and current state, respectively; PXW_r is the international export price index; and $PXFOB_r$ is the economy's export FOB price.

B.2 Households

There are H representative households, differentiated by their initial endowments, that behaves according to Stone-Geary preferences. That is, the utility function for household h is given by

$$U_h(HD_{1h}, \dots, HD_{Rh}) = \prod_r (HD_{rh} - \gamma_{rh})^{\zeta_{rh}}$$

where HD_{rh} is the consumption of good r , γ_{rh} is the minimum consumption or subsistence level of household h for good r , $0 < \zeta_{rh} < 1$, $\sum_r \zeta_{rh} = 1$, and $HD_{rh} - \gamma_{rh} > 0$.

The maximizing problem of household h is given by

$$\max_{HD_{1h}, \dots, HD_{Rh}} U(HD_{1h}, \dots, HD_{Rh})$$

subject to

$$\left(\sum_l (1 - \text{socrate}_{lh}) \overline{PL}_l LS_{lh} + \overline{PK} K_h + DIV_h + TRNSFG_h + \text{pfx} TRNSFR_h + STRNSH_h \right) \\ (1 - itx_h) = \sum_r (1 + \text{vat}_r + \text{txc}_r - \text{sbc}_r - \text{psub}_{rh} - \text{pvsb}_{rh}) PA_r HD_{rh} + S_h$$

where \overline{PL} and \overline{PK} are the average returns of labor (LS) and capital (KS) endowments, respectively; socrate_{lh} and itx_h are labor contributions and income taxes paid by household h ; psub_{rh} and pvsb_{rh} are the public and private household-commodity specific subsidy rates, respectively; DIV , $STRNSH$, $TRNSFG$ and $TRNSFR$ are transfers made by the firms (dividends and social security transfers), government and the rest of the world; pfx is the real exchange rate; and, S_h represents the resources destined to investment (i.e. savings).

B.3 Firms

There are two types of firms in this representation: those that manage the social security system and the rest that participate in the production activities²⁵. The first type of firms receives the contributions made by producers and workers to the system, transfers from the government ($GTRNSF$) and the rest of the world ($SFTRNS$) and uses them in providing subsidies (i.e. contingent consumption) and transfers (e.g. pensions) to households, or retains them for investment purposes ($SFSAV$).

$$\sum_h \sum_l (1 - \text{socrate}_{lh}) \overline{PL}_l LS_{lh} + \sum_s \sum_l PL_{ls} (1 + \text{lcont}_{ls} + \text{payt}_{ls}) LD_{ls} \\ GTRNSF + SFTRNS = \sum_h \left(\sum_r \text{pvsb}_{rh} PA_r HD_{rh} + STRNSH_h \right) + SFSAV$$

The second type of firms provides to producers capital (FKS), which returns use either to provide a fixed quantity of dividends (DIV_h), or retained earnings for investment purposes ($FSAV$), net of direct taxes (ftx). Technically,

$$\overline{PK} KFS (1 - \text{ftax}) = \sum_h DIV_h + FSAV$$

²⁵This kind of institutions are included within the model following the structure of the social accounting matrix, which is described in detail in section XXX.

B.4 Government

The public sector consumes goods, GD , makes transfers to households, $TRNSFG_h$, and to the rest of the world, $GTRNS$, and finances its balance ($GSAV$) from resources obtained from capital returns (GKS) and taxes imposed over production, consumption, imported goods and factor returns. As a non optimizing agent, the government follows the next accounting identity:

$$\begin{aligned} \overline{PK}GKS + \sum_s tax_s PY_s Y_s + \sum_s \sum_l PL_{ls} pay_{ls} LD_{ls} + \sum_r mt_{x_r} pfx PMW_r M_r \sum_r (vat_r + \\ tx_{c_r} - sbc_r) PA_r AG_r + \sum_h itx_h YH_h + ftx \overline{PK}FKS = \\ pfx GTRNS + \sum_r PA_r GD_r + \sum_h TRNSFG_h + GTRNSF + GSAV \end{aligned}$$

where YH is the full household income; mt_{x_r} is the import tariff rate over imported good r ; PMW_r is the international price of imported good r ; GD_r is the public expenditure on commodity r ; $GTRNS$ are public transfers to the rest of the world; GKS are the public capital returns; and $GSAV$ is the public balance.

B.5 Market Clearing Conditions

A general equilibrium for this economy is attained through the maximizing behavior of producers and households, and, fulfilling the following conditions:

a. Commodity Markets

$$D_r + M_r + MGS_r = \sum_s USE_{rs} + X_r + \sum_h HD_{rh} + GD_r + ID_r + MG_r \quad \forall i$$

where MGS_r and MG_r are the supply and aggregate demand of margin commodities, respectively, and ID stands for the investment demand for commodity r .

b. Margin Commodity Markets

$$\begin{aligned} MG_r = icd_{rs} ((1 + tax_s) \sum PY_s Y_s) \quad \forall ct(r) \\ MGS_r - MG_r = 0 \end{aligned}$$

where ct is a subset of r , and contains all margin commodities (i.e. trade and transportation).

c. Primary Factor Markets

$$\begin{aligned} \sum_r LD_{lr} = \sum_h LS_{lh} \quad \forall l \\ \sum_r KD_r = \sum_h K_h + GKS + FKS \end{aligned}$$

d. Balance of Payment Condition

$$\sum_r PXFOB_R X_r - PMW_R QM_r = RSAV + GTRNS + SFTRNS + \sum_h TRNSFR_h$$

where $RSAV$ stands for the rest of the world's savings in foreign currency.

e. Savings-Investment Balance

$$pfxRS_{AV} + GSAV + FSAV + SFSAV + \sum_h S_h = \sum_i QI_i$$

In order to achieved a unique solution, the price normalization is such that,

$$\sum_r cwt_s_r PA_r = CPI$$

where, cwt_s is the weight of commodity r in the consumer price index, CPI. Alternatively, pfx can be chosen as the numeraire.

B.6 Closures

The model was designed in such a way that different macroeconomic rules can be settled, depending on the experiment. In general, the model includes four types of closures:

1. **Savings-Investment closure:** by default the model is savings-driven, that is, investment is flexible, hence allowing adjusting to total savings. Conversely, investment can be fixed in real terms, letting firms' balances to be the adjusting variable (i.e. investment-driven).
2. **Labor market closures:** it is assumed by default that the labor is fully employed and mobile, fixing labor supply and letting PL to be the market-clearing variable. Alternatively, PL can be fixed, hence, labor supply is the market-clearing variable, allowing the labor to be unemployed and mobile.
3. **Balance of Payment closure:** the foreign savings are fixed, thus, the real exchange rate is flexible in order to clear the current account of the balance of payments.
4. **Government closures:** it is assumed by default, that public deficit is fixed and letting public consumption to clear the government balance. Alternatively, government expenses can be fixed in real terms, thus, letting the public deficit to be flexible and adjust the public sector balance.

C Simulation Results

Table 21: Macroeconomic Aggregates Variation (%)

	BASE	SIM	SIM2	SIM3
Consumption	-0.82	0.03	-0.30	-0.22
X-M	-2.26	-2.14	-2.17	-2.22
GDP	-0.52	0.08	-0.15	-0.10
Imports	-2.42	-2.22	-2.28	-2.34
Exports	-2.44	-2.23	-2.29	-2.36

Table 22: Summary Production Results (%)

	REM01	REM02	REM03	VA	CI	Y	D	M	AG
<i>Base Simulation</i>									
FOD	-1.27	-1.66	-1.58	-1.07	-1.07	-1.07	-1.09	-0.91	-1.07
BVT	0.69	0.30	0.37	0.11	0.11	0.11	0.18	0.92	0.22
CLT	-1.06	-1.45	-1.37	-0.92	-0.92	-0.92	-0.81	-0.43	-0.73
HSV	0.07	-0.33	-0.25	-0.11	-0.11	-0.11	-0.15	-0.32	-0.17
FUR	-2.00	-2.39	-2.31	-1.00	-1.00	-1.00	-0.94	0.66	-0.31
HTH	-0.04	-0.43	-0.35	-0.28	-0.28	-0.28	-0.30	-0.32	-0.30
TRC	-0.78	-1.18	-1.10	-0.77	-0.77	-0.77	-0.77	-0.73	-0.76
SOC	-0.68	-1.07	-1.00	-0.84	-0.84	-0.84	-0.84	-0.87	-0.84
EDU	0.40	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00
PSV	1.31	0.91	0.99	0.61	0.61	0.61	0.60	-0.53	0.57
AGGT	-0.31	-0.28	-0.29	-0.17	-0.31	-0.33	-0.30	-0.23	-0.29
U	3.15	2.84	2.90	0.00	0.00	0.00	0.00	0.00	0.00
<i>Compensation Using Full Set of Subsidies</i>									
FOD	0.84	1.31	1.34	0.82	0.82	0.82	0.86	0.84	0.85
BVT	5.43	5.92	5.95	1.84	1.84	1.84	1.92	2.36	1.94
CLT	2.57	3.05	3.08	1.94	1.94	1.94	2.00	1.74	1.95
HSV	-0.42	0.04	0.07	0.00	0.00	0.00	0.01	0.08	0.02
FUR	1.13	1.59	1.63	0.65	0.65	0.65	0.65	0.02	0.40
HTH	-0.84	-0.38	-0.35	-0.25	-0.25	-0.25	-0.28	-0.32	-0.28
TRC	-1.68	-1.23	-1.20	-0.86	-0.86	-0.86	-0.85	-0.73	-0.81
SOC	-2.07	-1.62	-1.59	-1.32	-1.32	-1.32	-1.32	-1.31	-1.32
EDU	-0.48	-0.02	0.02	-0.01	-0.01	-0.01	-0.01	0.00	-0.01
PSV	-1.62	-1.17	-1.13	-0.77	-0.77	-0.77	-0.76	0.94	-0.71
AGGT	-0.21	-0.25	-0.25	-0.14	-0.05	0.01	-0.01	0.08	0.01
U	2.14	2.50	2.52	0.00	0.00	0.00	0.00	0.00	0.00
<i>Compensation by Lump-Sum Transfers</i>									
FOD	-0.03	0.07	0.13	0.03	0.03	0.03	0.05	0.09	0.05
BVT	2.95	3.06	3.11	0.96	0.96	0.96	1.03	1.54	1.06
CLT	1.25	1.35	1.41	0.87	0.87	0.87	0.96	0.96	0.96
HSV	-0.13	-0.03	0.02	-0.01	-0.01	-0.01	-0.02	-0.04	-0.02
FUR	-0.04	0.06	0.11	0.02	0.02	0.02	0.04	0.30	0.14
HTH	-0.50	-0.40	-0.35	-0.26	-0.26	-0.26	-0.29	-0.32	-0.29
TRC	-1.35	-1.25	-1.19	-0.85	-0.85	-0.85	-0.84	-0.75	-0.81
SOC	-1.52	-1.42	-1.36	-1.14	-1.14	-1.14	-1.14	-1.15	-1.14
EDU	-0.11	-0.01	0.05	-0.01	-0.01	-0.01	-0.01	0.00	-0.01
PSV	-0.45	-0.35	-0.29	-0.23	-0.23	-0.23	-0.22	0.33	-0.21
AGGT	-0.25	-0.26	-0.26	-0.15	-0.15	-0.12	-0.12	-0.04	-0.11
U	2.55	2.63	2.68	0.00	0.00	0.00	0.00	0.00	0.00
<i>VAT and Direct Tax Reform</i>									
FOD	0.22	0.43	0.49	0.26	0.26	0.26	0.29	0.36	0.30
BVT	4.58	4.80	4.86	1.50	1.50	1.50	1.59	2.19	1.62
CLT	1.45	1.66	1.71	1.06	1.06	1.06	1.15	1.10	1.14
HSV	-0.30	-0.09	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
FUR	0.13	0.34	0.39	0.14	0.14	0.14	0.15	0.22	0.18
HTH	-0.58	-0.38	-0.32	-0.25	-0.25	-0.25	-0.27	-0.30	-0.27
TRC	-1.61	-1.41	-1.35	-0.97	-0.97	-0.97	-0.96	-0.84	-0.92
SOC	-1.56	-1.36	-1.31	-1.10	-1.10	-1.10	-1.10	-1.09	-1.10
EDU	-0.22	-0.01	0.04	-0.01	-0.01	-0.01	-0.01	0.00	-0.01
PSV	-0.74	-0.53	-0.48	-0.35	-0.35	-0.35	-0.34	0.56	-0.32
AGGT	-0.24	-0.26	-0.26	-0.15	-0.13	-0.09	-0.09	-0.03	-0.08
U	2.43	2.59	2.63	0.00	0.00	0.00	0.00	0.00	0.00

Table 23: Summary Demand Results (%)

	HH01	HH02	HH03	HH04	G	I	X
<i>Base Simulation</i>							
FOD	-1.53	-1.71	-1.66	0.40	0.00	-1.12	-0.97
BVT	-0.15	-0.58	-0.61	1.99	0.00	3.22	-1.26
CLT	-1.06	-1.48	-1.47	1.63	0.00	1.42	-1.27
HSV	-1.17	-1.51	-1.49	1.26	0.00	0.89	0.07
FUR	-1.96	-2.40	-2.36	1.47	0.00	0.33	-1.33
HTH	0.00	0.00	0.00	0.00	-0.71	-0.71	-0.02
TRC	-2.60	-2.95	-2.86	0.80	0.00	-0.93	-0.78
SOC	-2.71	-3.12	-3.04	1.11	-0.56	-0.56	-0.32
EDU	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PSV	-1.06	-1.64	-1.65	2.43	1.95	1.95	1.08
AGGT	-1.41	-1.71	-1.64	1.10	1.36	0.45	-0.49
<i>Compensation Using Full Set of Subsidies</i>							
FOD	12.91	3.54	-3.30	-3.53	0.00	-0.63	0.56
BVT	19.17	6.52	-2.66	-3.10	0.00	4.09	0.38
CLT	21.96	7.14	-3.62	-4.10	0.00	2.91	1.76
HSV	18.13	5.31	-3.94	-4.30	0.00	0.73	-0.06
FUR	25.68	7.79	-5.22	-5.74	0.00	1.29	0.70
HTH	0.00	0.00	0.00	0.00	-0.45	-0.45	0.12
TRC	22.36	5.87	-6.15	-6.53	0.00	-1.29	-0.92
SOC	25.83	6.99	-6.74	-7.19	-0.81	-0.81	-0.89
EDU	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PSV	25.99	7.27	-6.36	-6.84	-0.26	-0.26	-1.52
AGGT	16.08	4.71	-3.94	-4.47	-0.38	0.59	0.15
<i>Compensation by Lump-sum Transfers</i>							
FOD	3.30	1.15	-0.61	-3.14	0.00	-0.81	-0.04
BVT	6.38	3.33	0.89	-2.60	0.00	3.86	-0.29
CLT	6.71	3.21	0.39	-3.65	0.00	2.29	0.59
HSV	5.20	2.19	-0.22	-3.71	0.00	0.77	0.01
FUR	7.31	3.14	-0.24	-5.10	0.00	0.90	-0.09
HTH	0.00	0.00	0.00	0.00	-0.55	-0.55	0.08
TRC	5.59	1.82	-1.28	-5.74	0.00	-1.20	-0.89
SOC	6.71	2.38	-1.18	-6.28	-0.71	-0.71	-0.66
EDU	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PSV	7.60	3.18	-0.42	-5.58	0.62	0.62	-0.48
AGGT	4.40	1.78	-0.43	-3.85	0.31	0.51	-0.10
<i>VAT and Direct Tax Reform</i>							
FOD	12.87	-0.90	-2.12	-2.26	0.00	-0.78	0.07
BVT	18.99	0.55	-1.17	-1.49	0.00	3.73	-0.11
CLT	21.68	0.09	-1.90	-2.23	0.00	2.46	0.80
HSV	18.22	-0.56	-2.26	-2.51	0.00	0.82	-0.03
FUR	25.51	-0.66	-3.04	-3.39	0.00	1.05	0.06
HTH	0.00	0.00	0.00	0.00	-0.53	-0.53	0.05
TRC	22.45	-1.83	-3.99	-4.21	0.00	-1.24	-1.02
SOC	25.94	-1.79	-4.26	-4.54	-0.75	-0.75	-0.72
EDU	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PSV	26.66	-1.08	-3.59	-3.92	0.41	0.41	-0.77
AGGT	16.07	-0.80	-2.37	-2.69	0.14	0.57	-0.08

Table 24: Summary Household income (%)

	HH01	HH02	HH03	HH04
<i>Base Simulation</i>				
REM01	-4.34	-4.34	-4.34	-4.34
REM02	-3.93	-3.93	-3.93	-3.93
REM03	-4.01	-4.01	-4.01	-4.01
K	-3.97	-3.97	-3.97	-3.97
GSUB	0.16	0.11	0.11	0.11
Dividends	6.25	6.25	6.25	6.25
Expenses	-0.96	-1.39	-1.53	0.85
Savings	0.00	0.00	0.00	-1.66
EV	-178,564	-548,983	-826,602	-575,296
<i>Compensation Using Full Set of Subsidies</i>				
REM01	-2.98	-2.98	-2.98	-2.98
REM02	-3.46	-3.46	-3.46	-3.46
REM03	-3.50	-3.50	-3.50	-3.50
K	-3.28	-3.28	-3.28	-3.28
GSUB	4,827.41	2,411.06	0.55	0.55
Dividends	-6.85	-6.85	-6.85	-6.85
Expenses	13.46	4.30	-3.69	-4.33
Savings	0.00	0.00	0.00	-3.87
EV	2,136,232	1,569,785	-2,075,283	-1,677,085
<i>Compensation by Lump-sum Transfers</i>				
REM01	-3.54	-3.54	-3.54	-3.54
REM02	-3.65	-3.65	-3.65	-3.65
REM03	-3.71	-3.71	-3.71	-3.71
K	-3.54	-3.54	-3.54	-3.54
GSUB	45.78	59.40	62.47	46.39
Dividends	-7.25	-7.25	-7.25	-7.25
Expenses	3.78	1.70	-0.40	-3.82
Savings	0.00	0.00	0.00	-3.35
EV	588,601	602,181	-212,532	-1,393,571
<i>VAT and Direct Tax Reform</i>				
REM01	-3.38	-3.38	-3.38	-3.38
REM02	-3.60	-3.60	-3.60	-3.60
REM03	-3.65	-3.65	-3.65	-3.65
K	-3.48	-3.48	-3.48	-3.48
GSUB	4,415.98	465.49	0.43	0.43
Dividends	0.69	0.69	0.69	0.69
Expenses	13.52	-0.64	-2.22	-2.67
Savings	0.00	0.00	0.00	-2.49
EV	2,136,230	-277,379	-1,304,065	-1,040,998

Table 25: Summary Prices (%)

	REM01	REM02	REM03	PY	PCI	PVA	PM	PD	PX	PA	PK
<i>Base Simulation</i>											
FOD	-4.04	-3.66	-3.73	-1.80	-0.42	-4.23	-2.20	-1.81	-1.72	1.13	-5.26
BVT	-4.04	-3.66	-3.73	-0.43	-0.55	-3.48	-2.20	-0.37	-1.57	-3.12	-3.37
CLT	-4.04	-3.66	-3.73	-1.28	-0.86	-4.17	-2.20	-1.18	-1.57	-1.40	-5.05
HSV	-4.04	-3.66	-3.73	-2.37	-0.81	-3.87	-2.20	-2.41	-2.23	-0.88	-3.98
FUR	-4.04	-3.66	-3.73	-1.27	-0.66	-5.01	-2.20	-1.21	-1.54	-0.33	-5.96
HTH	-4.04	-3.66	-3.73	-2.40	-0.01	-3.81	-2.20	-2.41	-2.19	0.71	-4.07
TRC	-4.04	-3.66	-3.73	-1.75	-0.48	-4.05	-2.20	-1.73	-1.81	0.94	-4.79
SOC	-4.04	-3.66	-3.73	-2.46	0.08	-3.88	-2.20	-2.46	-2.04	0.56	-4.69
EDU	-4.04	-3.66	-3.73	-3.38	-1.03	-3.66	0.00	-3.38	0.00	0.10	-3.66
PSV	-4.04	-3.66	-3.73	-3.10	-0.45	-3.37	-2.20	-3.11	-2.72	-1.91	-2.78
<i>Compensation Using Full Set of Subsidies</i>											
FOD	-2.78	-3.23	-3.26	-2.37	0.19	-2.76	-2.30	-2.34	-2.57	0.63	-1.96
BVT	-2.78	-3.23	-3.26	-1.31	-0.47	0.65	-2.30	-1.25	-2.49	-3.93	2.50
CLT	-2.78	-3.23	-3.26	-3.01	-1.30	-2.18	-2.30	-2.96	-3.15	-2.83	-0.28
HSV	-2.78	-3.23	-3.26	-2.23	-0.60	-3.19	-2.30	-2.22	-2.27	-0.72	-3.19
FUR	-2.78	-3.23	-3.26	-2.67	-0.67	-2.32	-2.30	-2.68	-2.64	-1.28	-1.68
HTH	-2.78	-3.23	-3.26	-2.67	0.05	-3.35	-2.30	-2.69	-2.36	0.45	-3.59
TRC	-2.78	-3.23	-3.26	-1.26	-0.08	-3.58	-2.30	-1.13	-1.85	1.31	-4.42
SOC	-2.78	-3.23	-3.26	-2.21	0.14	-3.52	-2.30	-2.21	-1.86	0.82	-4.79
EDU	-2.78	-3.23	-3.26	-2.88	-0.03	-3.23	0.00	-2.88	0.00	0.61	-3.24
PSV	-2.78	-3.23	-3.26	-0.92	0.07	-3.61	-2.30	-0.91	-1.55	0.26	-4.35
<i>Compensation by Lump-sum Transfers</i>											
FOD	-3.30	-3.40	-3.45	-2.16	-0.06	-3.36	-2.24	-2.15	-2.22	0.81	-3.33
BVT	-3.30	-3.40	-3.45	-1.07	-0.52	-1.39	-2.24	-1.01	-2.10	-3.72	-0.44
CLT	-3.30	-3.40	-3.45	-2.31	-1.11	-2.93	-2.24	-2.24	-2.53	-2.24	-2.09
HSV	-3.30	-3.40	-3.45	-2.26	-0.67	-3.41	-2.24	-2.27	-2.25	-0.76	-3.43
FUR	-3.30	-3.40	-3.45	-2.11	-0.65	-3.36	-2.24	-2.09	-2.20	-0.89	-3.34
HTH	-3.30	-3.40	-3.45	-2.56	0.03	-3.53	-2.24	-2.58	-2.28	0.56	-3.79
TRC	-3.30	-3.40	-3.45	-1.39	-0.21	-3.78	-2.24	-1.30	-1.80	1.21	-4.60
SOC	-3.30	-3.40	-3.45	-2.31	0.12	-3.67	-2.24	-2.31	-1.92	0.72	-4.76
EDU	-3.30	-3.40	-3.45	-3.08	-0.42	-3.40	0.00	-3.08	0.00	0.41	-3.41
PSV	-3.30	-3.40	-3.45	-1.80	-0.13	-3.52	-2.24	-1.79	-2.01	-0.61	-3.74
<i>VAT and Direct Tax Reform</i>											
FOD	-3.15	-3.35	-3.40	-2.19	-0.01	-3.18	-2.32	-2.17	-2.35	0.79	-2.93
BVT	-3.15	-3.35	-3.40	-0.95	-0.49	-0.21	-2.32	-0.88	-2.26	-3.59	1.29
CLT	-3.15	-3.35	-3.40	-2.50	-1.19	-2.78	-2.32	-2.43	-2.71	-2.41	-1.75
HSV	-3.15	-3.35	-3.40	-2.31	-0.69	-3.40	-2.32	-2.31	-2.30	-0.81	-3.43
FUR	-3.15	-3.35	-3.40	-2.29	-0.70	-3.15	-2.32	-2.28	-2.35	-1.03	-3.02
HTH	-3.15	-3.35	-3.40	-2.58	0.02	-3.47	-2.32	-2.60	-2.34	0.53	-3.71
TRC	-3.15	-3.35	-3.40	-1.31	-0.21	-3.78	-2.32	-1.20	-1.82	1.26	-4.71
SOC	-3.15	-3.35	-3.40	-2.27	0.11	-3.61	-2.32	-2.27	-1.96	0.76	-4.66
EDU	-3.15	-3.35	-3.40	-3.03	-0.34	-3.35	0.00	-3.03	0.00	0.46	-3.36
PSV	-3.15	-3.35	-3.40	-1.59	-0.09	-3.52	-2.32	-1.58	-1.94	-0.41	-3.86

Table 26: Summary Government Finances (%)

	BASE	SIM	SIM2	SIM3
PAYT	-3.96	-3.26	-3.53	-3.47
TXA	-2.59	-1.86	-2.15	-2.09
TXC	-1.35	-0.89	-1.09	-1.00
SBC	-0.61	0.27	-0.07	0.01
VAT	61.44	62.25	61.96	61.98
MTX	-2.34	-1.94	-2.08	-2.09
itx	-1.59	-2.87	-1.86	-8.95
ftx	-3.97	-3.28	-3.54	-22.78
Balance	-61.02			
psub	0.12	2090.65	0.41	1300.45

Table 27: Poverty and Inequality Indicators

	LSM03 ¹	ADJ ²	BASE	SIM	SIM2	SIM3
FGT0	0.552	0.524	0.530	0.518	0.519	0.521
FGT1	0.316	0.273	0.274	0.259	0.266	0.263
FGT2	0.222	0.176	0.177	0.165	0.171	0.168
Gini	0.629	0.600	0.597	0.585	0.592	0.590
<i>Atkinson index</i>						
$\varepsilon = 0.5$	0.340	0.308	0.306	0.295	0.301	0.299
$\varepsilon = 1$	0.625	0.552	0.548	0.533	0.541	0.538
$\varepsilon = 2$	0.823	0.760	0.774	0.760	0.769	0.764
Percentage Variation						
FGT0		-5.10	1.17	-1.23	-1.05	-0.53
FGT1		-13.82	0.35	-4.86	-2.32	-3.36
FGT2		-20.59	0.31	-6.64	-3.06	-4.86
Gini		-4.71	-0.44	-2.40	-1.36	-1.69
<i>Atkinson index</i>						
$\varepsilon = 0.5$		-9.35	-0.63	-4.18	-2.41	-2.88
$\varepsilon = 1$		-11.77	-0.65	-3.30	-1.82	-2.45
$\varepsilon = 2$		-7.61	1.88	0.02	1.19	0.48

Poverty Line: CO\$198,000 month

¹ Source: 2003 Living Standard Measurement Survey.² 2003 LSM indicators adjusted to subsidy transfers.