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Universal Social Insurance for Mexico: Modeling of a Financing Scheme

Arturo Antón[a], Roy Boyd[b], Alejandra Elizondo[c], and María Eugenia Ibarrarán[d]

Abstract

The provision of social insurance (SI) in Mexico and many developing countries is typically uneven in terms of both coverage and financing sources. In particular, contributory SI financed through payroll taxes generally covers a wider range of services but it is only available to formal workers. This paper examines the economic effects of introducing universal coverage for health, disability, and retirement in Mexico, where the sources of financing are not payroll taxes but general revenues. Through the lens of a dynamic computable general equilibrium model, we evaluate the effects of increasing the value added tax and/or eliminating subsidies to energy as alternative revenue sources for the provision of universal social insurance.

Keywords: Universal social insurance, value added tax, energy subsidies, Mexico

JEL: C68; E62; H20; Q43

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Introduction

The widespread lack of access to social insurance (SI) services remains a severe, and, of as yet unresolved problem in many parts of the developing world. Currently it is estimated that between 52% and 85% of the elderly in middle-income and low income countries do not receive pensions while this number falls to below 20% in high income areas. Furthermore, whereas only 60% of the population in developing countries has access to affordable health care, such access is available to 86% and 100% of the population in North America and Western Europe respectively (ILO, 2014). Concerns over this issue have been recently raised in various international and multinational forums (see, for example OECD, 2009, WHO, 2010, World Bank, 2012, IDB, 2013, ILO, 2014).The possibility of increasing social insurance coverage in developing areas, however, remains largely dependent upon stable and reliable sources of public funding.

The goal of this paper then is to examine the economic impacts of alternative methods of financing universal coverage for health, disability, and retirement (henceforth Universal Social Insurance or USI) in the highly important developing country of Mexico. More specifically, in this article we explore two sets of options (1) an increase in Mexico's value-added tax (VAT) rates and (2) the reduction of its existing subsidies to basic industries. The VAT is chosen because it has become one of Mexico's principle revenue generators. We also look at the possibility of eliminating current high cost consumer subsidies, particularly in Mexico's large energy sector, and funneling those resources into the USI. The elimination of energy subsidies effectively reduces transfers to the wealthiest 20% who presently spend six times as much on fuel than the poorest 20% in Mexico (IMF, 2013).[1]

As with many other developing countries, the SI system in Mexico is uneven in its coverage and divided into contributory (CSI) and non-contributory social insurance (NCSI) components.[2] The former is financed through contributions from employers and workers and the latter through other revenue sources. The limited SI coverage, combined with a new push to reform many areas of the Mexican economy, have recently led to increased discussion among economists and policy makers about ways to improve the current

[1] Remarkably, in countries like Jordan, Iran, and various African countries, energy subsidies have been used towards more targeted social protection programs (IMF, 2013).

[2] According to the national statistics office, approximately 70% of the total occupied labor force in the private sector in Mexico is not enrolled into a contributory social insurance scheme.

situation. In a seminal piece, Levy (2008) proposed a significant overhaul in the provision of SI funding. The basic of his proposal is to provide USI coverage to all workers and their families, regardless of their income source by linking its funding to general sources of revenue rather than employee wages. Given that the current SI benefits available to workers in Mexico's informal sector are less generous in scope than those in the formal sector, this proposal would not only provide SI to all workers and their families but also provide a broader set of SI services to those recipients.

To evaluate the economic impacts of such policies, we utilize a dynamic, computable general equilibrium (CGE) model developed by Boyd for the Mexican economy (Ibarrarán and Boyd 2006). The model has several features that make it suitable to examine the issue at hand (1) a careful disentangling of the energy sector (2) the existence of different tax rates and subsidies across sectors (3) the substitution between formal and informal workers, and (4) the presence of heterogeneous households in terms of income. Incorporating different types of households into the analysis is crucial, given the typical regressive nature of the VAT. Hence, the model we use allows us to analyze the impact of the alternative tax schemes on different income groups as well as the effects of such policies at the sectoral and macroeconomic levels.

After carrying out several sets of simulations, we find that a combined fiscal program with a 1 percentage point increase in the current level of the VAT (excluding the taxation of some sensitive goods such as food and medicines), and the elimination of energy subsidies, generates enough resources to finance the USI package. Here, total revenue would not be as great as when the VAT is extended to food and medicines, but the levels of investment, GDP, and manufacturing output would be above their pre-reform levels in the long run. In fact, the increase in GDP would yield higher consumption levels for most of the sectors, thus eliminating the adverse effects due to the higher VAT. Interestingly, the model also reports that the combined fiscal program plus the USI scheme would bring nearly uniform welfare gains across all households. This suggests that the reform would not only be welfare improving but also would have no adverse effects on inequality. On the other hand, the scheme would have the additional benefit of curtailing the use of fossil fuels at both the consumption and production levels because subsidies to energy use would no longer exist.

Our paper is divided into five sections. Section 1 presents a literature review that situates our research in the context of current work. Section 2 explains the status of social insurance provision in Mexico and Section 3 discusses the main features of a Universal Social Insurance scheme, including coverage and financing issues. Section 4 describes the model we use to simulate these policies. Section 5 discusses the simulations and results, and the last section concludes providing some policy implications.

1. Literature review

Currently there are several papers which deal with formal and informal labor markets within an applied general equilibrium framework (see, for example, Fortin et al., 1997; Bovenberg et al., 2000; Carneiro and Arbache, 2003; Estrades and Terra, 2011; Anton et al., 2012; and Hernandez, 2012). With the exception of Carneiro and Arbache (2003), these papers examine the effects of changes in payroll taxes on labor markets and other macroeconomic variables of interest.[3] In particular, Bovenberg et al. (2000) consider alternatively decreasing labor tax rates and increasing tax credits for households to evaluate the effects of such policies on unemployment and labor supply. In contrast to what is done here, the fall in government revenue in such cases is not compensated with increases in other tax rates for purposes of balancing the budget.

Our paper is closely related to Fortin et al. (1997), Estrades and Terra (2011) and Hernández (2012) in the sense that these authors consider simultaneous changes in different taxes (including labor and payroll taxes) in order to evaluate the effects of such policies on variables such as unemployment, informality and poverty. In contrast to our model, these papers use a static CGE framework. Thus, while these analyses are highly useful, they are not designed to address the long-run effects of changes in payroll taxes. More importantly, none of the papers cited above evaluate the efficiency and equity effects of implementing a tax reform to fund a universal social insurance (USI) program like the one presented here. Our paper is also related to Anton et al. (2012), who evaluate the effects of implementing a USI program on variables such as output, formal and informal employment, wages and government revenue. However, they abstract from equity issues and the elimination of energy subsidies to finance USI.

There is also currently a strand of literature that evaluates the efficiency and (typically) equity effects of a tax reform under which an income tax is replaced with a consumption tax in a revenue-neutral manner (see, for example, Fullerton et al., 1983; Ballard et al., 1987; Krusell et al., 1996; Ventura, 1999; Altig et al., 2001; Heer and Trede, 2003; Nishiyama and Smetters, 2005; Okamoto, 2005; Correia, 2010; and Lehmus, 2011). A tax reform of this sort is based on the idea that consumption taxes are in principle more efficient at raising revenue than income taxes. However, raising consumption taxes may exacerbate income inequality as poor households spend a higher fraction of their income on consumption goods. Depending on the model, these papers examine the effects of a fall in labor or capital income taxes, or both. However, the scenarios considered by these authors, while highly informative, do not include a fall in payroll taxes in the context of formal and informal labor markets which is a central aspect of the case considered here. On the other

[3] In a similar vein, Bohringer et al. (2005) analyze the effects of a labor tax cut on unemployment in a static, general equilibrium framework. Lehmus (2014) examine to what extent the fall in labor income taxes could explain the increase in both employment and inequality in Finland during the period 1996-2008. However, these papers abstract from informal labor markets.

hand, none of the papers cited above contemplate a tax reform to implement a USI program like the one proposed here.

2. Current status of social insurance provision

The provision of SI in Mexico is based on a dual system. On the one hand, firms and workers engaged in a salaried contractual relationship must contribute to the own worker's social insurance in accordance with the law. This is called the CSI scheme.[4] On the other hand, non-salaried workers (such as workers in family firms and the own-account) are not obliged by law to contribute to social insurance. Instead, they may receive social insurance benefits from the State financed through the federal budget.[5] This is called the NCSI scheme. The CSI and NCSI schemes are mutually exclusive in the sense that a worker cannot simultaneously belong to both systems and receive benefits from both programs. For the purposes of this study, a worker is labeled as formal if he/she belongs to the CSI scheme; otherwise, the worker is informal.[6]

A formal worker is entitled to receive a series of social benefits: insurance against health, life, disability and work risks, and a retirement pension. These workers also receive a series of benefits not directly related to SI, such as day care for workers' children, sports and cultural facilities, and housing loans. These benefits are financed through wage-based contributions by the firm and the worker, and are partially subsidized by the government.[7] All these benefits are bundled in the sense that workers and firms must pay for all the benefits, regardless of whether the worker effectively demands only a sub-set of them, or none. This implies that contributions to SI may be in fact a "pure tax" (see, for example,

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[4] The CSI scheme in Mexico is fragmented and complex. This is because the law makes a distinction between private and public sector workers, and mandates different SI institutions for each type. In addition, the provision of SI for public employees depends on whether the worker is affiliated to the federal or state government. On the other hand, the state-oil company (Pemex) and the Armed Forces have their own SI institutions. In general, SI benefits for public employees are more generous than those available to private sector workers (for details, see Albo et al., 2008). In this paper we concentrate on the CSI scheme for private sector workers for two reasons. First, the majority of public employees (about 90 percent) are affiliated to their own CSI scheme but the opposite is true for private sector workers, as pointed out later in this section. Thus the problem of SI coverage is particular to private sector workers. Second, we are interested in evaluating the efficiency and equity effects of the USI program, which is designed to tackle the problem of SI coverage among the population. For these reasons, henceforth CSI refers to the insurance program applying to the private sector only.

[5] For a detailed explanation of the social insurance system in Mexico and how the law makes a distinction between salaried and non-salaried workers, see Levy (2008).

[6] There is no consensus in the literature for a definition of informality. Here we follow Kanbur (2009) and define it in terms of a lack of observance regarding a particular regulation (in this case, the payment of CSI). For a discussion on the alternative concepts of informality, see Kanbur (2009).

[7] In particular, Levy (2008) estimates a SI non-wage labor cost of approximately 38 percent, of which 6 percentage points are subsidized by the government. This implies a non-wage labor cost of 32 percent that must be paid by the private agents.

Auerbach and Kotlikoff, 1987; Feldstein and Samwick, 1998), especially if formal workers are forced to pay for a series of benefits they do not want.

In contrast, an informal worker may receive some social benefits such as health services, subsidies for housing, access to day care centers for children, and retirement pensions. In general, the benefits provided by the State to informal workers are less generous in terms of coverage than those available to formal workers. However, in practice neither informal firms nor workers have to pay with their own resources for such benefits. On the other hand, benefits for informal workers are voluntary and unbundled. This means that a worker may choose to enroll to some (or all) of the social programs listed above.

This dual system for the provision of SI generates a sizable distortion in the labor cost for salaried and non-salaried workers. This leads to some firms (especially the small ones) to avoid the payment of SI contributions for their salaried workers, given the small probability of being detected by the government authorities in such illegal activity (Levy, 2008). Thus we should expect the share of informal workers in the data to be high as a result of a weak enforcement of the law. In addition, public resources to the NCSI scheme have increased substantially over the last 15 years as a response to the "truncated welfare state", i.e., the lack of effective provision of SI benefits to the entire population (see De Ferranti et al., 2003; and Levy, 2008).[8] Such transfers to informal workers exacerbate the distortion already mentioned between salaried and non-salaried workers. In fact, recent evidence suggests that this dual SI policy may actually incentivize informality (see, for example, Bosch and Campos-Vazquez, 2010; Aterido et al., 2011; and Anton et al., 2012).

Given the description of the dual SI scheme, it is not surprising that the share of informal workers is large. Data from the National Survey of Occupation and Employment (ENOE, for its Spanish acronym) for the second quarter of 2010 indicates that approximately 70 percent of the total occupied labor force in the private sector is informal, i.e., not enrolled into the CSI scheme. From the point of view of social policy, this number is disappointing given that CSI programs were implemented in 1943 and originally designed to cover the entire population. On the other hand, the provision of SI for informal workers through the NCSI scheme is far from being widespread, given that affiliation is non-compulsory and that government subsidies to this scheme are rather modest.

3. Universal social insurance and revenue sources

In this context, Levy (2008) proposes a USI scheme to replace the current dual SI system.[9] The idea is to provide the same SI benefits to all the workers in the private sector and their families, regardless of labor status (salaried and non-salaried). These benefits include

[8] Interestingly, these resources have not only increased relative to GDP but also relative to the government subsidies allocated to the CSI scheme.
[9] For details of the USI scheme, see Anton et al. (2012).

coverage against health, life, and disability risks, and a retirement pension.[10] Under USI, health benefits are equivalent to those received under the current CSI scheme, whose coverage is broader than that from the NCSI scheme. In addition, the retirement pension and the coverage against life and disability risks are equivalent to the amount received by a worker earning two times the minimum wage under the current CSI scheme.[11] From the perspective of informal workers, USI is a major improvement in terms of a broader coverage for SI and a higher amount of benefits received. For example, Anton et al. (2012) estimate an increase of 150 percent in the per capita monetary benefits received by informal workers under USI if compared to the status quo.

Simultaneously, the USI scheme considers a major shift in the provision of revenue sources for SI. In particular, the idea is to decrease the SI wage-based contributions substantially in order to ameliorate the distortion in the costs between salaried and non-salaried employment.[12] Naturally, this implies adopting other revenue sources for SI.

Recent discussions in Mexico focus on two important sources, namely increasing revenue from the value added tax and saving resources by eliminating energy subsidies. Increasing tax revenue is very important, since Mexico only collects 11.4% of GDP, as opposed to the average of OECD countries which collect 33.8% of GDP. In terms of Latin America and the Caribbean, Mexico lags behind all countries in tax collection (OECD/ECLAC/CIAT, 2012).

The current VAT rate in Mexico is 16 percent. However, the VAT system has many goods and services that face a 0% rate, including food and medicines, agricultural equipment, fertilizers and pesticides, and books and magazines. Some services are exempted from this tax, such as housing, urban transportation, education and health services, among others. This leaves a great amount of resources outside the reach of the fiscal system. Tax exemptions (VAT and others) cost Mexico about 5.9% of GDP (OECD/ECLAC/CIAT, 2012), and also increase the complexity of paying taxes and open room for evasion.

The value added tax in Mexico has been central to the discussion of the 2013 fiscal reform. Several options were analyzed but most were discarded.[13] Such minimum reforms and the

[10] Notice that USI implies the elimination of benefits not directly related to SI for formal workers, such as daycare, sports and cultural facilities, and housing loans. However, USI guarantees that formal workers continue to receive the same SI benefits as under the current CSI scheme.

[11] As a reference, roughly 40 percent of total workers earn up to 2 minimum wages (Anton et al., 2012).

[12] To be more specific, the wage-based tax under USI for those salaried workers earning up to 2 minimum wages would be nearly zero. This tax rate would increase gradually for higher wage-earners, up to a maximum of 9 percent. See Anton et al. (2012) for details.

[13] Food and medicines are still exempt. The main changes to VAT are that now sales of pets and animal food is taxed at 16%, eliminating the 0% rate; the VAT in the border region increased from 11% to 16%, as in the rest of the country; and the provision of hotel and related services by hotel companies to foreign tourists participating exclusively in congresses, conventions, exhibitions, and fairs in Mexico are now subject to the standard VAT rate (For other changes, see SAT 2013).

fact that exemptions and preferential treatments are still in place will have a small effect on revenue collection through this tax, where Mexico only collected (prior to the reform) 18.7% of total revenue through the VAT, whereas most Latin American countries, except Panamá, collect anywhere from 23 to over 45% of total revenue (OECD/ECLAC/CIAT, 2012).

On the other hand, a 16% VAT rate may still be low compared to other countries such as Uruguay (22%), Argentina (21%), Brazil (20,5% in average), Chile (19%), Peru, Paraguay, and Turkey (18%), which have rates in line to the average of OECD countries (i.e., 18.5%) (OECD/ECLAC/CIAT, 2012). Thus, either increasing the VAT rate to at least 17% and/or eliminating exemptions may provide some of the needed resources to finance USI.

An alternative source of revenue to finance USI is energy subsidies. Those include subsidies to electricity, gasoline, diesel, and liquefied petroleum gas. Between 2005 and 2009, subsidies were, on average, equal to Mex$200.4 billion per year, about 2% of GDP, and in 2008 they attained an all-times high of 3.3% of GDP. In that year, subsidies to gasoline were equivalent to 1.8% of GDP or 18% of programmable public expenditure. The amount of money used toward these subsidies has increasingly been questioned because of their fiscal and distributional implications. Subsidies to gasoline, for example, are quite regressive in Mexico since 75% of the subsidies go to the richest 40% of the population and only 12.5% goes to the 20% with lowest income (OECD/ECLAC/CIAT, 2012).

Other financing options exist but here we concentrate on these to highlight two obvious mechanisms that may be readily available and where a more equitable distribution of resources would help justify eliminating distortions such as energy subsidies and increasing taxes, both highly unpopular measures.

4. The model

We use a dynamic computable general equilibrium (CGE) model of the Mexican economy to address the effects of expanding USI and financing it through increases/broadening of VAT and/or eliminating energy subsides. Due to the comprehensive nature of either of these policies, they can have important repercussions throughout the economy so a broad analysis such as an economy-wide model that shows the interactions across sectors and groups of consumers is needed.

This model, developed by Boyd and Ibarrarán, is based on earlier work by Ramsey (1928) and Ballard et al. (1985).[14] It has been used since the mid-1990s to address issues related to trade, and later to analyze energy policies (Ibarrarán and Boyd, 2002 and 2006). It has also been used to evaluate specific issues related to the effects of climate change such as

[14] The model is solved via GAMS/MPSGE using the software developed by Rutherford as employed in Rutherford et al. (1997).

drought (Boyd and Ibarrarán, 2009), and particular public policies such as the 2008-2012 Special Program on Climate Change (Ibarrarán et al., 2011). In all cases it has addressed the macroeconomic and sectoral effects of policies.

It is a national model that has 12 producing sectors. The primary sector is disaggregated into agriculture, livestock, fisheries, and forestry. There is also a disaggregated energy sector that includes mining, oil and natural gas, refining, and chemicals and plastics. It has manufacturing, electricity, transport, and services. This allows us to explicitly deal with and quantify the interaction of sector-specific policies with other sectors.

There are nine consumption goods: food, household goods, consumption services, energy (which includes electricity and liquid petroleum gas, or LPG), private and public transport, gasoline, housing and water. These are produced by combining the outputs of the producing sectors through a conversion matrix.

The model has four household (income) categories: agent 1 (the poorest consumers) includes deciles 1 and 2; agent 2 groups deciles 3, 4, and 5; agent 3 the next three deciles; and agent 4 the top 20% of the population. There is also a foreign sector and a government in this model. The model uses the input-output matrix produced by the National Statistics Office (INEGI, 2003), and data from both national and international sources.[15]

Production and consumption sectors are modeled using nested constant elasticity of substitution (CES) production functions for both production and final consumption goods and services. This allows for different degrees of substitution for the inputs considered, particularly between labor, capital, energy, and non-energy inputs. Technologies are represented by production functions that exhibit constant elasticities of substitution, and technical progress is taken as exogenous to the model. The model has been modified to differentiate between formal and informal workers, and the effect of this distinction on production sectors. The indirect utility function as a function of income, prices, and preferences parameters for the consumer is defined as V, where

$$V = I[\alpha {P_H}^{(1-\sigma_2)} + (1-\alpha)[\frac{P_S P}{P_K \gamma}]^{(1-\sigma_2)}]^{(1-\sigma_2)}$$

Here, I is the expanded income, P_H is the price of present consumption (leisure, goods and services), P is the price of composite consumption commodity, P_S is the price of saving, P_K is the return on capital, γ is the physical service flow per unit of capital goods purchased, α is a weighting parameter, and σ_2 is the elasticity of substitution between present and future consumption, following Ballard et al. (1985).

[15] For a formal mathematical description of the model, see Ibarrarán and Boyd (2006, 114–126).

To capture the distinction between formal and informal workers, the model is slightly modified. In particular, we use a CES production function of the form

$$V_t = \phi_t \left[\delta_L L_t^{(\sigma-1)/\sigma} + \delta_K K_t^{(\sigma-1)/\sigma} + \delta_E E_t^{(\sigma-1)/\sigma} + \delta_M M_t^{(\sigma-1)/\sigma} \right]^{\frac{\sigma}{\sigma-1}},$$

where V_t is value added at time t, and L_t, K_t, E_t and M_t denote labor, capital, energy, and material inputs, respectively. Also, ϕ_t is a shift parameter, σ is the elasticity of substitution between inputs, and the δ´s are share parameters defined so that $\delta_L, \delta_K, \delta_E, \delta_M > 0$ and $\delta_L + \delta_K + \delta_E + \delta_M = 1$.

In addition, we assume that labor is a composite good consisting of formal (*F*) and informal (*I*) labor nested in the CES production function. In particular, the labor composite is given by

$$L_t = \Omega_t \left[\delta_F F_t^{(\varepsilon-1)/\varepsilon} + \delta_I I_t^{(\varepsilon-1)/\varepsilon} \right]^{\frac{\varepsilon}{\varepsilon-1}},$$

where Ω_t is a shift parameter, ε is the elasticity of substitution between formal and informal workers, and the δ´s are share parameters defined so that $\delta_F, \delta_I > 0$ and $\delta_F + \delta_I = 1$.

The government agent is modeled with an expenditure function similar to the household expenditure functions (that is, based on a CES utility function). Revenues derived from all taxes and tariffs are spent according to an expenditure function. Each sector has its own tax rate according to the latest information available, so it can reflect the tax structure, specially the VAT rates associated with each consumption sector. The structure of the model is optimal to analyze tax changes, since it divides consumption and production sectors, and thus gives room to specify the type of tax. Producers receive their income according to prices defined before taxes, and consumers take decisions based on after tax prices. Within this expenditure function the government spends its revenues on goods and services from the various private production sectors discussed above.

International trade within the model is handled by means of a foreign agent. Output in each of the producing sectors is exported to the foreign agent in exchange for foreign-produced imports. The model also reflects unemployment in Mexico. For this exercise, initial unemployment rate has been set at 4.5%, and it may change as a result of the policies simulated.

In the model, firms hiring formal workers pay payroll taxes (i. e., contributions to social insurance). In contrast, firms hiring informal workers do not pay payroll taxes. This creates a distortion in the cost of formal and informal salaried workers. In this setting, both formal and informal workers are demanded by firms, and the effect of a change in relative prices on the share of formal and informal workers is determined by the elasticity parameter ε. In keeping with the current situation, all payroll taxes are collected exclusively from formal workers.

Under USI, payroll taxes are eliminated and thus the distortion between formal and informal salaried workers no longer holds. The elimination of payroll taxes may lead to a reallocation of labor across all sectors in the economy. In general, this reallocation may depend upon the elasticity parameter ε and the labor intensity in each sector.

The economic variables determined by the model are investment, capital accumulation, production (aggregate and by sector), household consumption by sector and welfare by agents, imports and exports. The level of depreciation and the initial return to capital are taken as exogenous, as is the rate of labor force growth.

Estimation of formal and informal workers

To take into account the division between formal and informal workers, we disaggregated labor for each of the 12 production sectors. Disaggregated data was obtained from the National Survey of Occupation and Employment (ENOE).[16] The ENOE was also used to determine the sectoral distribution of the occupied labor force. Information was taken for the second quarter of 2010, since 2010 is the year in which the model is calibrated, and it represents a fairly stable period in terms of economic activity.

The total occupied labor force for the second quarter of 2010 was 46.89 million workers. For each sector, workers were divided according to the CSI scheme from which they receive their benefits. These estimates are provided in Table 1 (see also Appendix 1).

In our initial scenario, the proportion of formal and informal workers in each sector remains fixed at their 2010 levels, according to the information provided in Table 1. As the relative price between formal and informal labor is changed after USI, each sector may vary the demand of formal and informal workers, according to a non-zero elasticity of substitution between them.[17] The incentives here thus work through the 12 production sectors rather than the agents.

[16] This survey provides information on medical services coverage, divided by economic sector and type of SI institution. Two other sources of data were considered: the 2009 Economic Census (INEGI, 2009), and the IMSS (2008) database. The Census excludes most of the informal workers, and leaves out activities in the agriculture, livestock, and forestry sectors, which represent most of the primary activities, and 3 out of the 13 sectors of production defined in our CGE model. The IMSS database only provides information on the CSI scheme for private sector workers, and thus excludes the rest of the SI schemes. For these reasons, these data sources were not considered for this study.

[17] As discussed in the next section, we vary this elasticity parameter in our simulations to check for robustness.

Table 1. Share of formal and informal workers per sector

	Formal workers	Informal workers
Agriculture	3.4	96.6
Livestock	10.6	89.4
Forestry	3.6	96.4
Fisheries	7.5	92.5
Mining	67.1	32.9
Oil and gas	95.3	4.7
Electricity	95.3	4.7
Chemicals and Plastics	83.0	17.0
Manufacturing	36.8	63.2
Refining	96.6	3.4
Transport	24.4	75.6
Services	27.1	72.9

Source: Own estimation according to medical coverage declared in the National Survey of Occupation and Employment (INEGI, 2010).

5. Scenarios and results: Overview

As noted above, the problems addressed in this paper are both important and complex, involving as they do, questions of economic efficiency, distributional equity, health reform, and environmental protection. Hence, before proceeding on to our model's simulation results it is vital to explain why the model we use and have just described is uniquely suited to deal with this particular task. First, and most importantly, the fiscal reforms proposed involve a complicated mixture of taxation and subsidy initiatives differentially impacting various sectors and agents in the Mexican Economy. Such policies, by their very nature will entail spillover effects as capital, labor, and material resources are redistributed between industries and government agencies over time. Quantifying such changes is impossible without a computable general equilibrium model which allows for the implementation of taxes at various levels and calculates their impact throughout the economy.[18] Second, by including various income groups, our model allows us to measure the impact of each series of tax and subsidy changes on equity and the distribution of income in the Mexican economy. Third, the dynamic nature of our CGE model gives us the capability of

[18] Any complicated CGE model such as that developed for this paper involves the use of a number of parameters including various elasticities, growth estimates, depreciation assumptions, and technological change assumptions. The estimates used for this model are given above in the preceding section. However, as with any modeling effort, there is a bit of uncertainty connected to such assumptions. Hence, along with the simulations results listed here, a number of sensitivity tests were conducted to see how much our conclusions changed when various assumptions were changed. These tests will be explained in the footnotes of this results section and the results themselves can be obtained from the authors upon request.

accounting for changes in investment, the capital stock, and economic growth over a 25 year period; and finally, because of the inclusion of numerous energy related sectors we are able to see the effect of the removal of energy subsidies on fossil fuel use, energy efficiency, and effluent emissions of greenhouse gases.

Simulations

Our initial model simulation is termed the Benchmark or Steady State case. Here each equation is calibrated so that the level of each variable matches the actual level observed in 2010. In this case we assume that there is no change in policy or technology over the 2010-2035 time horizon beyond a 3.5% overall growth we consider adequate given official projections in Mexico. Furthermore, we assume that the production of oil grows at the same steady rate as the rest of the economy in spite of decreasing reserves. The function of the benchmark case is to see that our Dynamic CGE model is working and that our social accounting matrix is balanced. Finally, it provides a framework in which a more realistic set of assumptions (i.e. the business as usual case) will be contrasted.

Following the simulation of the benchmark case we next run the Business as Usual case. Here we assume (in keeping with most realistic forecasts of the Mexican energy sector) that we have depletion and that the level of aggregate petroleum production levels off to 2.8 thousand barrels per day in 2015 and remains at that level throughout the remainder of the analysis.[19] In a sense, however, the Business as Usual case is the "true" benchmark case in our analysis since it represents what we can reasonably expect to happen over the length of the simulation period if no policy actions were to be taken. For that reason the numbers for the remainder of our simulation runs are listed as percent deviations from the Business as Usual case, and it is these results which are dealt with in the most depth.

After completing the Business as Usual case, the next order of business is to look at the effect of removing the payroll taxes associated with social insurance and health care.[20] As touched upon before, what this effectively does is that it reduces variation in expenses incurred by the formal and informal sector and increases the incentive for businesses located in the informal sector to move into the formal sector, raising their economic efficiency.[21] In our model, payroll taxes are levied separately for each sector with the

[19] Because of the great importance of fossil fuels to the Mexican economy it is of some interest to see the impact of such depletion on income and growth, and, for that reason the results of the Business as Usual case are given as percentage changes from the original Benchmark Case.

[20] It should be noted that there are a number of taxes on labor. In this exercise, however, we only remove these related to health care and social insurance while other labor taxes (e.g. those collected as revenue by the state) remain in place (income taxes, for instance).

[21] The degree to which this switch occurs depends critically on the ease by which labor can move between the formal and informal sectors (i.e. the elasticity of substitutability of labor). Since we have no good empirical estimate of this elasticity we initially set it at one. Sensitivity tests are conducted, however, to see how our results vary under alternative assumptions. In this simulation as well as in those that follow (where VAT taxes and energy subsidies are raised and lowered respectively) this elasticity is lowered to 0.5 and then raised to

proceeds going to wage earners in each of our income groups. Hence, this tax removal could be modeled directly before wage earners income was subjected to income taxes. It should be noted that all fiscal measures (the elimination of contributions and subsidies) were done gradually over a 6 year period, in order to replicate a more politically acceptable policy.

Lowering the level of payroll taxes, of course, leads to a large decrease in revenues at the federal level, and in any realistic analysis these revenues need to be regained by increases of other taxes and/or decrease in subsidy levels. Thus in the following set of simulations we look at policies designed to recoup funds for the government. Initially, we run a simulation where the Value Added Tax (VAT) in Mexico is increased from 16% to 17% and where food and medicine items (which are presently exempted from the tax) are taxed at a similar level.[22] Subsequently, we run a simulation where the VAT is increased from 16% to 17% on all items presently taxed, but where the exemption on food and medicine remains intact.

Currently, the Mexican government provides consumer subsidies (at varying levels) to a wide range of goods and services. By far, however, the largest of these subsidies occur in the energy sector where the prices of gasoline, diesel, LPG, and electricity are presently substantially below their free market levels. In our final set of simulation exercises then, we examine impacts of eliminating all of these energy subsidies as a means of enhancing revenue. First, we eliminate the subsidies without changing the VAT rates to examine how much revenue it generates. Then, in our final simulation we simultaneously combine a reduction of the labor tax with an increase in the VAT (exempting food and medicine) and a removal of energy subsidies to measure their net economic impact.

The aggregate outcome of our model simulations are listed in tables within the text. A complete listing of all results, however, is given in the tables found in Appendix 3. For clarity of presentation those tables are divided into aggregate results, production sector results, and consumption sector results respectively.[23] Due to the linkages inherent in a CGE model, our description of any given result will frequently make reference to related numbers in several tables however, and some going back and forth may be necessary.

As discussed above, the business as usual scenario differs from the benchmark run in that it makes allowances for the depletion of petroleum over the span of the simulation period.[24]

2.0. We find that the consequences of such changes are small giving us confidence in the robustness of the results reported below.

[22] In Mexico this tax is referred to as the Impuesto al Valor Agregado or IVA.

[23] Since our model also contains a foreign sector, results were also obtained in the various import and export markets for each good. These results, however, are not reported here since they are generally small and only peripherally related to the intent of the fiscal reforms being studied. Here again, however, the results can be obtained from the authors upon request.

[24] This business as usual scenario includes some stylized facts of the economy, and therefore it is our base case for purpose of comparison. Since this scenario only sets the conditions on oil depletion and reconstructs the structure of payroll taxes, results are discussed but they are not included in the summary tables. However,

Following our expectations, the impact of depletion is to generally depress the economy with the largest losses occurring in the petroleum and natural gas extraction sectors (see Appendix 2).

Removing payroll contributions to Social Insurance

In our first policy scenario, the business as usual scenario is modified so as to eliminate the social insurance and medical related payroll taxes that are presently levied in the formal sector, and increase consumer services expenditure by 344 billion pesos (of 2008) in order to finance universal coverage of social insurance.[25] This has the effect of moving firms from the (less efficient) informal sector to the (more efficient) formal sector, increasing income and augmenting economic growth.

In the wake of the revenue losses, the purchases of the government are forced to decline.[26] Aside from labor, the bulk of government purchases come from the services industry and fewer government service purchases serves to dampen the gains that the services sector would otherwise have experienced. The large gains experienced by the chemical industry (see Appendix 3 Table 2), are due to a host of reasons. First, although much of chemical manufacturing labor is in the formal sector, the labor to capital ratio in this sector is the largest of any in the Mexican economy, and hence the total tax relief given here is actually quite substantial. Second, a substantial percentage of all chemical outputs serve as inputs to agriculture and manufacturing and, as we have noted, these sectors experience significant gains. Finally, the decline in production taxes serves as a stimulant to investment and much of the investment goods come from the chemical sector.

The rise in production among all sectors leads to a general rise in income and economic growth. The increase in investment levels contributes to a 4.5% rise in the level of the capital stock at the end of the period analyzed, and, although government revenues fall, the overall level of GDP rises over 8.5% higher than in the business as usual case (Table 2). With more resources available to consumers, consumption levels rise fairly evenly among all consumption sectors and all agents throughout the economy experience welfare gains on the order of 7 to 8 percent over the course of the analysis.

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numerical results comparing the Business as Usual Scenario and the Benchmark case can be requested from the authors as well.

[25] The government enhances the nature of the medical coverage provided. According to Anton et al. (2012), this would entail an expenditure close to 560 billion pesos, but would also include the elimination of subsidies currently paid for both CSI and NCSI. Net expenditure subsidized consumer services since a larger set of services will be demanded in order to deliver universal services.

[26] In keeping with the assumptions of most CGE models, our model here forces the government to maintain a balanced budget.

Table 2. Changes in economic variables from removing payroll contributions
(Percentage change with respect to Business as Usual)

Aggregate Macroeconomic Results					
	2016	2020	2026	2030	2036
GDP	2.2742%	3.8631%	5.5251%	6.7302%	8.5891%
Investment	5.1071%	7.4349%	6.6967%	6.6392%	3.9054%
Government resources	-12.9191%	-12.4257%	-10.4258%	-9.1611%	-6.4231%
Cummulative Welfare 2036					
	Agent 1	Agent 2	Agent 3	Agent 4	Total
Welfare change	8.1307%	7.7621%	7.2759%	7.6669%	7.6031%
Government Welfare					-10.8931%

Source: own.

Effects of various Value Added Tax Increases

In our next set of simulations we examine the sectoral and economy-wide impact of increasing the rates on Mexico's Value Added Tax (VAT). In the first of these simulations we combine the changes of the previous scenario with a simultaneous increase in the VAT in order to offset the revenue losses due to lowering the labor tax and the extra expenditures on health and social policy. In addition to raising the rate (from 16% to 17%) on items previously taxed, the VAT is also levied on goods such as food and medicine which had heretofore been exempt. The results of these changes are listed in section 2 of the tables in Appendix 3 where the numbers are again listed as percent deviations from the business as usual case.

Comparing these numbers with those of the previous group in the table reporting results on consumption in Appendix 3 reveals that this increase in consumption taxes leads to similar changes in consumption, except in the expenditure related to food items. Faced with higher prices on final goods, consumers reduce their expenditures on food items the first years of the period analyzed. However, consumption in this sector bounces back and it increases related to the BAU case at the end of the period. Government revenues rise almost to "Business as Usual" levels, and consumer welfare increases for all agents, in a fairly similar manner. This means that although consumers have to pay higher final prices due to the increase in VAT, the impact on welfare is more than compensated by the increase in social security services.

As a result of increasing social insurance coverage and funding it with VAT taxes, we see higher investment, growth, and a capital stock levels (Table 3). The increase in investment levels, combined with the increase in government resources lead to a level of GDP in the final period that is only about 0.5% less than in the previous scenario.

Table 3. Aggregate results from removing payroll contributions, and increasing VAT to 17% including food and medicine

(Percentage change with respect to Business as Usual)

Aggregate Macroeconomic Results					
	2016	2020	2026	2030	2036
GDP	0.9310%	2.5401%	4.5055%	5.8869%	8.0929%
Investment	1.3180%	8.2528%	6.8255%	7.0505%	6.2179%
Government resources	-3.7128%	-2.5165%	0.0729%	1.7138%	4.7299%
Cummulative Welfare 2036					
	Agent 1	Agent 2	Agent 3	Agent 4	Total
Welfare change	4.5496%	4.6832%	4.8400%	5.6862%	5.1926%
Government Welfare					-0.9189%

Source: own.

Production in a few sectors declines in the early periods as the VAT is increased with the largest declines occurring in agriculture, oil and natural gas, but the losses are only temporary and they show significant increases at the end of the period.[27] Finally, production in both fossil fuels and electricity, while initially lower than in the previous simulation, outpace their prior levels in the later period of the analysis as investment demand rises at ever increasing rates.

One drawback to this kind of overall increase in the VAT is, as we have seen, its regressive impacts on equity and the distribution of income. As an alternative, then we run the same model with the increase in VAT rates but *without* the exemption of the tax to food and medicine. The results of this simulation are given in the third section of columns of the tables, and, as can be seen, there is a marked increase in the consumption of food and the production of agricultural products. This has the immediate effect of increasing the aggregate level of welfare for all agents with the highest percentage gains being experienced by the lowest agents. Government revenues, however, fall fairly significantly during the first years and until the end of the period, as opposed to the previous case (Table 4). As a policy matter, then, the equity benefits that excluding food and medicine offer has to be balanced against a rather substantial loss in government revenue.

[27] The demand for a production sector output can come from other production sectors, exports, investment, final consumption, or government. While the manufacturing and chemical sectors are characterized by high demand from investment and raw production, services is characterized by higher proportional demand in government and final consumption. Hence, an increase in consumption taxes leads to a lower increase in the total demand for services.

Table 4. Aggregate results from removing payroll contributions, and increasing VAT to 17% excluding food and medicine

(Percentage change with respect to Business as Usual)

Aggregate Macroeconomic Results					
	2016	2020	2026	2030	2036
GDP	1.7808%	3.2944%	5.1115%	6.4046%	8.4308%
Investment	4.5305%	8.1041%	7.0187%	7.0505%	5.1387%
Government resources	-7.7745%	-6.8811%	-4.6334%	-3.1168%	-0.1833%
Cummulative Welfare 2036					
	Agent 1	Agent 2	Agent 3	Agent 4	Total
Welfare change	6.6256%	6.3739%	6.0544%	6.4940%	6.3563%
Government Welfare					-5.3400%

Source: Own.

Impact of Reducing Energy Subsidies

The final set of simulations examines the impact of eliminating all of the subsidies presently extended by the Mexican government to consumers of electricity, LPG, diesel, kerosene, and gasoline. In our initial exercise of this set of simulations (listed in section 4) we examine the effects of eliminating all energy subsidies throughout the first 6 years at the same time as payroll taxes are reduced as in our first counter-factual simulation. Hence, the impacts of subsidy removal can be seen in comparing the results in the first and fourth sections of the various tables in Appendix 3. As we would expect, the effect of this on energy consumption is drastic as purchases of these items plummets. Gasoline consumption also declines sharply compared to the first section. As a result of this, production declines in the fossil fuel sectors as well with fossil fuel extraction and refinery output declining. Government revenue even though it falls compared to business as usual, however, increases significantly over the case reported (Table 5).

Table 5. Aggregate results from removing payroll contributions, and reduction of energy subsidies

(Percentage change with respect to Business as Usual)

Aggregate Macroeconomic Results					
	2016	2020	2026	2030	2036
GDP	2.2266%	3.8333%	5.4783%	6.7238%	8.6383%
Investment	7.1664%	7.8810%	7.0831%	7.2268%	4.9332%
Government resources	-11.5664%	-10.9804%	-9.0452%	-6.6561%	-2.8757%
Cummulative Welfare 2036					
	Agent 1	Agent 2	Agent 3	Agent 4	Total
Welfare change	7.5988%	7.2603%	6.8930%	7.4140%	7.2505%
Government Welfare					-7.6425%

Source: Own.

Given these revenue gains, a natural extension of this experiment is to combine subsidy removal with an increase in the VAT. Thus, in our final simulation we simultaneously increase the VAT from 16% to 17% (excluding food and medicines) and eliminate all energy subsidies to study their combined impact on government revenue, sectoral output, and consumer welfare. These results, listed in the final section of the columns show that most of the revenue lost from moving from labor tax financing (of health and social insurance programs) is made up eliminating energy subsidies column and modestly increasing the VAT. Moreover, by the final period of the analysis, the government revenue collected actually outstrips that of the "Business as Usual" case (Table 6).

Table 6. Aggregate results from removing payroll contributions, increasing VAT to 17% and reducing energy subsidies

(Percentage change with respect to Business as Usual)

Aggregate Macroeconomic Results					
	2016	2020	2026	2030	2036
GDP	1.2686%	2.9370%	4.7652%	6.1041%	8.2850%
Investment	3.4597%	8.0297%	6.8899%	7.2268%	6.5776%
Government resources	-5.6807%	-4.6588%	-2.3261%	-0.1865%	2.1973%
Cummulative Welfare 2036					
	Agent 1	Agent 2	Agent 3	Agent 4	Total
Welfare change	5.9297%	5.6658%	5.4375%	5.9260%	5.7408%
Government Welfare					-2.0269%

Source: Own.

As in the previous simulation, this combined tax and subsidy program, serious curtails the use of fossil fuels at both the consumption and production levels. This does, however, have the benefit of conserving fossil fuels and limiting the emission of greenhouse gases. Total revenues here, are not as great as when the VAT was extended to food and medicine. The levels of investment, GDP, and manufacturing output are fairly similar to that earlier case though. Additionally, this alternative does have the advantage of showing a greater benefit for the poorest agent compared to the next two representative agents, since there is no cutback in the consumption of food and the production of agricultural products.[28]

6. Conclusions

This paper has examined the economic effects of alternative fiscal schemes for providing universal social insurance coverage. As already mentioned, this is a topic of special concern

[28] While it is true that taxing consumption of energy is slightly regressive, it is less so than taxing food. Additionally, unlike in the United States, gasoline in Mexico is more heavily consumed by the higher income groups.

in developing countries, given that a substantial share of their population is typically not covered against risks related to health, disability, and retirement. In particular, we have explored the idea proposed by Levy (2008) whereby the source for financing social insurance services may be changed from payroll taxes to other revenue sources. In practical terms, a social program along these lines requires implementing a fiscal reform with stable revenue sources and, at the same time, non-negligible changes in tax rates and/or subsidies. Given the complexities involved under this type of exercise, we have used a dynamic, CGE model uniquely suited to examine these effects. Specifically, the model considers different tax rates and subsidies across sectors, the substitution between formal and informal workers, and heterogeneous households. In this manner, the effects of alternative financing schemes on efficiency, resource allocation and distributional equity may be appropriately addressed.

The CGE model has been calibrated for the Mexican economy, a typical middle-income country with limited social insurance coverage and a relatively weak revenue system full of exemptions and subsidies. Here, particular attention has been given to the VAT and the elimination of energy subsidies as steady sources of revenue for funding social insurance services. The dynamic nature of the model allows us to evaluate the changes for the variables of interest over a 25 year period.

The model suggests that a uniform VAT rate of 17% to finance USI would yield a substantial increase in variables such as investment, the capital stock, GDP, production at each sectoral level, and government revenue in the long run. However, the effects of the representative agents are distorting. If the VAT rate were increased to 17%, the system of VAT exemptions were kept in place and the current resources allocated to energy subsidies were used instead to finance USI, government revenue would increase over the business-as-usual scenario, with the largest welfare revenues going to the agent with the lowest income. At the same time, the effects on GDP, sectoral production and investment would be roughly the same as before, with the exception of the energy-related sectors which would experience large falls.

Interestingly, each of the scenarios examined would also yield welfare gains over the business-as-usual case for all households in the long run, regardless of their income level. This is the case since GDP (and thus consumption) increases under all the scenarios, despite the hike in VAT rates and the elimination of energy subsidies. At the same time, the welfare gains estimated are of a similar magnitude across agents, suggesting that the tax reform would not bring an increase in inequality. In terms of welfare, all households would prefer a combination of a VAT rate of 17% with exemptions plus the elimination of energy subsidies rather than a uniform VAT rate of 17% for the financing of USI. However, it should be emphasized that the former alternative also implies a lower tax burden for all agents.

Overall, the results suggest that the provision of social insurance coverage for the entire population may be feasible from a revenue point of view. This is the case even if payroll taxes are eliminated. Of course this is not a general result. For the case considered here, payroll taxes are paid by one-third of the private labor force only, and their elimination does not represent a substantial burden for the government. For this reason, one should be careful when trying to generalize the results presented here to other economies. Keeping this in mind, the model also suggests that alternative sources for the financing of social insurance may be more efficient, and that the reallocation from energy subsidies to social insurance subsidies may be in fact a more sensible policy.

There are some important issues that are not addressed in the paper but that we believe deserve further analysis. First, the model abstracts from changes in the age profile of the population over time. Naturally, the provision of social insurance services is more expensive if, for example, the share of population under retirement or the share of the elderly is higher. Here, the expenses for the provision of social insurance grow at the same rate of the economy but this is not expected to be the case in practice. In this regard, an overlapping generations model addressing growing expenses on social insurance over time may provide some interesting insights. Second, the model neglects political economy issues for the implementation of reforms like the one proposed here. For example, workers not currently covered by a social insurance scheme may be naturally in favor of such a proposal, but reducing the coverage to a minimum to the already insured, and the politics behind reducing energy subsidies may be harder issues to address. These topics are beyond the scope of this paper but would be worthwhile areas of future research.

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Appendix 1

Definition of formal and informal sectors

For most of the 12 production sectors in the model, a large share of formal workers is affiliated to the CSI institution for private sector workers (IMSS), and only a small percentage is affiliated to other CSI schemes (less than 4% of the workforce in the corresponding sector). For practical purposes, we assume that all formal workers are affiliated to IMSS in such cases. However, this is not the case for the refining, and oil and gas sectors, where more than 50% of the formal workers have SI services different from those provided by IMSS (see Table 7). The explanation is that workers in such sectors are mostly public sector employees, and thus are covered by their own CSI scheme (i.e., Pemex insurance scheme). Given that USI is designed for workers in the private sector as discussed previously, these workers would not be affected by the fall in payroll taxes as proposed by the USI scheme. To take into account this issue, the fall in payroll taxes under USI is weighted by the share of formal workers affiliated to IMSS in such sectors. This means that the fall in payroll taxes under USI would be 44.7 and 15.1 percent for the oil and gas, and refining sectors, respectively. For all the other sectors, the fall in payroll taxes after USI would be of 100 percent.

Table 7. Formal workers in selected sectors: Refining and Oil and Gas
Share of coverage by SI system

	Covered by IMSS	Covered by alternative CSI schemes
Oil and Gas	44.7	55.3
Refining	15.1	84.9

Source: Own estimation according to medical coverage declared in the National Survey of Occupation and Employment (INEGI, 2010).

Appendix 2

Impacts of Depletion

The losses in petroleum extraction rise to over 42% in the final year of the analysis. Because of their dependence on oil and natural gas, refining and chemicals (which includes petrochemicals) also experience huge declines. The decline in other production sectors are not quite as severe but industries such as electricity and manufacturing which have strong input-output linkages to fossil fuel go down significantly as well.

Perhaps the largest driver of aggregate growth is the level of investment. Investment, in turn, is closely tied to supply and demand in the manufacturing sector. Hence, it is not surprising that declines in investment mirror those in manufacturing with investment sinking over 8% relative to the benchmark case. This, in turn, leads to significant losses in

GDP and the final level of the capital stock, of 5.7% and almost 4% respectively in the last year of the analysis.

Consumption losses are most severe in those sectors most closely associated with fossil fuels. We see then that the largest impacts occur in the markets for gasoline, energy, and manufactured goods. In the wake of these consumption losses, the level of welfare declines for all income groups. Since both luxury goods and essential items are heavily affected, the distributional impact of depletion is fairly neutral with all agents experiencing similar percentage declines in their welfare levels.

Appendix 3

Simulation Results

Table 1. Aggregate results
(Percentage change with respect to Business as Usual)

	Removing payroll contributions to Social Security (1)					No payroll contributions to SS, Increasing VAT to 17% covering food and medicine (2)				
	2016	2020	2026	2030	2036	2016	2020	2026	2030	2036
GDP	2.2742%	3.8631%	5.5251%	6.7302%	8.5891%	0.9310%	2.5401%	4.5055%	5.8869%	8.0929%
Investment	5.1071%	7.4349%	6.6967%	6.6392%	3.9054%	1.3180%	8.2528%	6.8255%	7.0505%	6.2179%
Government Resources	-12.9191%	-12.4257%	-10.4258%	-9.1611%	-6.4231%	-3.7128%	-2.5165%	0.0729%	1.7138%	4.7299%
Caapital Stock	—	—	—	—	4.5435%	—	—	—	—	4.6015%
Welfare										
Agent 1	—	—	—	—	8.1307%	—	—	—	—	4.5496%
Agent 2	—	—	—	—	7.7621%	—	—	—	—	4.6832%
Agent 3	—	—	—	—	7.2759%	—	—	—	—	4.8400%
Agent 4	—	—	—	—	7.6669%	—	—	—	—	5.6862%
Aggregate Agent´s Welfare	—	—	—	—	7.6031%	—	—	—	—	5.1926%
Government Welfare	—	—	—	—	-10.8931%	—	—	—	—	-0.9189%

Source: Own.

Table 1. Aggregate results
(Percentage change with respect to Business as Usual)
Continued

	No payroll contributions to SS, Increasing VAT to 17% excluding food and medicine (3)					No payroll contributions to SS and Reduction of energy subsidies (4)				
	2016	2020	2026	2030	2036	2016	2020	2026	2030	2036
GDP	1.7808%	3.2944%	5.1115%	6.4046%	8.4308%	2.2266%	3.8333%	5.4783%	6.7238%	8.6383%
Investment	4.5305%	8.1041%	7.0187%	7.0505%	5.1387%	7.1664%	7.8810%	7.0831%	7.2268%	4.9332%
Government Resources	-7.7745%	-6.8811%	-4.6334%	-3.1168%	-0.1833%	-11.5664%	-10.9804%	-9.0452%	-6.6561%	-2.8757%
Caapital Stock	—	—	—	—	4.7884%	—	—	—	—	5.1266%
Welfare										
Agent 1	—	—	—	—	6.6256%	—	—	—	—	7.5988%
Agent 2	—	—	—	—	6.3739%	—	—	—	—	7.2603%
Agent 3	—	—	—	—	6.0544%	—	—	—	—	6.8930%
Agent 4	—	—	—	—	6.4940%	—	—	—	—	7.4140%
Aggregate Agent´s Welfare	—	—	—	—	6.3563%	—	—	—	—	7.2505%
Government Welfare	—	—	—	—	-5.3400%	—	—	—	—	-7.6425%

Table 1. Aggregate results
(Percentage change with respect to Business as Usual)
Continued

	No payroll contributions to SS, Increasing VAT to 17%, excluding food and medicines, and Reducing energy subsidies (5)				
	2016	2020	2026	2030	2036
GDP	1.2686%	2.9370%	4.7652%	6.1041%	8.2850%
Investment	3.4597%	8.0297%	6.8899%	7.2268%	6.5776%
Government Resources	-5.6807%	-4.6588%	-2.3261%	-0.1865%	2.1973%
Caapital Stock	—	—	—	—	4.9903%
Welfare					
Agent 1	—	—	—	—	5.9297%
Agent 2	—	—	—	—	5.6658%
Agent 3	—	—	—	—	5.4375%
Agent 4	—	—	—	—	5.9260%
Aggregate Agent´s Welfare	—	—	—	—	5.7408%
Government Welfare	—	—	—	—	-2.0269%

Table 2. Production changes from removing labor taxes
(Percentage change with respect to Business as Usual)

	Removing payroll contributions to Social Security (1)					No payroll contributions to SS, Increasing VAT to 17% covering food and medicine (2)				
	2016	2020	2026	2030	2036	2016	2020	2026	2030	2036
Agriculture	2.4390%	5.8801%	8.6381%	10.3795%	12.5687%	-1.7639%	0.3881%	3.3262%	5.2347%	8.1219%
Livestock	3.7274%	5.8264%	7.8220%	9.3152%	11.2802%	0.2130%	2.4257%	4.2666%	5.8174%	8.3320%
Forestry	3.2995%	6.8027%	9.2843%	10.8772%	13.3231%	1.0152%	4.7619%	7.3501%	9.1228%	12.2511%
Fishery	4.2636%	7.9861%	10.3858%	12.0968%	15.1869%	-0.7752%	-0.3472%	2.3739%	4.3011%	7.2430%
Oil	-0.6268%	0.7695%	3.6145%	5.4265%	8.1266%	-2.8004%	-0.0531%	4.7134%	7.6446%	12.2823%
Natural Gas	-0.3358%	1.1007%	3.9417%	5.7539%	8.3945%	-2.5182%	0.3302%	5.1836%	8.1513%	12.8541%
Mining	3.7007%	6.5586%	9.0273%	10.9820%	13.3607%	0.5757%	5.6743%	8.2645%	10.5171%	14.1829%
Refining	1.6246%	3.0699%	5.7443%	7.4987%	9.9541%	-0.5543%	2.5919%	7.5131%	10.7125%	15.7593%
Transport	4.0615%	5.9926%	8.3348%	9.9282%	12.6613%	1.8279%	3.5302%	6.4506%	8.2551%	11.2719%
Electricity	3.4460%	5.2805%	7.6200%	9.2482%	11.9301%	1.6369%	4.0575%	7.1836%	9.2176%	12.6160%
Chemicals and Plastics	5.8255%	9.4883%	14.0484%	17.9649%	24.7018%	1.4993%	8.3398%	15.5959%	21.6148%	27.8397%
Services	1.1182%	2.9895%	5.2190%	6.7420%	9.3687%	0.1034%	1.5850%	4.3386%	6.0420%	8.9054%
Manufacturing	4.6413%	7.4649%	9.3591%	11.0910%	13.3680%	0.9437%	5.8375%	7.7746%	9.6817%	12.7620%

Table 2. Production changes from removing labor taxes
(Percentage change with respect to Business as Usual)
Continued

	No payroll contributions to SS, Increasing VAT to 17% excluding food and medicine (3)					**No payroll contributions to SS and Reduction of energy subsidies (4)**				
	2016	**2020**	**2026**	**2030**	**2036**	**2016**	**2020**	**2026**	**2030**	**2036**
Agriculture	1.6768%	4.5605%	7.2812%	9.1345%	11.7578%	3.7239%	6.4623%	8.9194%	10.6645%	13.1441%
Livestock	3.0884%	5.2081%	7.0093%	8.5052%	10.7515%	5.0053%	6.7301%	8.4518%	9.9043%	12.0494%
Forestry	2.7919%	5.6689%	7.9304%	9.6491%	12.4043%	4.8223%	7.4830%	9.4778%	11.2281%	13.9357%
Fishery	2.3256%	5.2083%	8.0119%	9.9462%	13.0841%	3.8760%	7.2917%	9.7923%	11.2903%	14.4860%
Oil	-1.5869%	0.7563%	5.1370%	7.9218%	12.2296%	-4.4139%	-3.3966%	0.0397%	2.2841%	5.6992%
Natural Gas	-1.2311%	1.1558%	5.6156%	8.4177%	12.8017%	-4.8685%	-3.9626%	-0.4860%	1.7581%	5.1941%
Mining	3.2072%	6.6323%	9.0909%	11.2144%	14.3885%	3.9474%	6.2638%	8.5823%	10.6334%	13.4635%
Refining	0.8219%	3.4926%	8.0911%	11.1376%	15.7953%	-6.5940%	-6.1581%	-2.5919%	-0.1870%	3.3454%
Transport	2.9647%	4.6541%	7.3098%	9.0324%	11.9495%	3.3074%	5.0577%	7.4320%	9.0561%	11.8742%
Electricity	2.6707%	4.7564%	7.6536%	9.5851%	12.8312%	-14.8180%	-14.8709%	-12.8399%	-11.3918%	-9.0249%
Chemicals and Plastics	4.2811%	9.6083%	16.6896%	22.5865%	28.1826%	4.2901%	8.4940%	15.0126%	20.5246%	30.2518%
Services	0.6892%	2.4526%	4.9422%	6.5618%	9.3303%	1.3573%	3.7355%	5.9879%	7.5368%	10.2515%
Manufacturing	3.3999%	6.6939%	8.5859%	10.3999%	12.9895%	5.5936%	7.8595%	9.7408%	11.5307%	13.9706%

Table 2. Production changes from removing labor taxes
(Percentage change with respect to Business as Usual)
Continued

	No payroll contributions to SS, Increasing VAT to 17%, excluding food and medicines, and Reducing energy subsidies (5)				
	2016	2020	2026	2030	2036
Agriculture	0.8057%	4.0171%	6.8178%	8.7446%	11.7185%
Livestock	2.3695%	4.9227%	6.7655%	8.3395%	10.9438%
Forestry	2.2843%	5.4422%	7.7369%	9.6491%	12.7106%
Fishery	1.9380%	4.5139%	7.4184%	9.1398%	12.3832%
Oil	-6.1208%	-4.6305%	-0.8076%	1.5976%	5.4354%
Natural Gas	-6.6032%	-5.1734%	-1.3499%	1.0655%	4.9318%
Mining	0.8224%	4.7900%	7.1837%	9.4131%	13.0524%
Refining	-8.4098%	-7.4816%	-3.6077%	-1.0542%	2.9682%
Transport	1.7594%	3.4127%	6.0843%	7.7973%	10.7279%
Electricity	-16.1964%	-16.1910%	-13.9644%	-12.4330%	-9.8722%
Chemicals and Plastics	0.5780%	5.9055%	12.5091%	18.0913%	23.5447%
Services	0.6536%	2.5742%	5.1312%	6.7784%	9.6098%
Manufacturing	2.6575%	6.5643%	8.5016%	10.4202%	13.5466%

Table 3. Consumption changes from removing labor taxes
(Percentage change with respect to Business as Usual)

	Removing payroll contributions to Social Security (1)					**No payroll contributions to SS, Increasing VAT to 17% covering food and medicine (2)**				
	2012	**2018**	**2024**	**2030**	**2036**	**2012**	**2018**	**2024**	**2030**	**2036**
Food items	5.3515%	7.0605%	9.4784%	11.0790%	14.1421%	-0.6466%	-4.0005%	-1.1764%	0.4189%	3.1899%
Household goods	5.8656%	7.3728%	9.7254%	11.3877%	14.6721%	3.5816%	4.0734%	6.9265%	8.6618%	11.8069%
Consumer services	5.3382%	7.0241%	9.4340%	11.0362%	14.1002%	2.1104%	3.7770%	6.8239%	8.5523%	11.5524%
Autos	5.8786%	7.5493%	9.8758%	11.5462%	14.8907%	5.0990%	7.0047%	9.8758%	11.6466%	14.8907%
Electricity and LPG	5.0766%	6.6643%	9.1160%	10.6984%	13.6766%	4.1499%	5.9078%	9.0853%	10.8647%	13.8683%
Public Transport	5.0964%	6.7339%	9.1786%	10.7699%	13.7538%	3.9047%	5.4599%	8.6429%	10.4048%	13.4019%
Gasoline	4.7357%	6.1840%	8.6371%	10.2252%	13.2609%	3.6685%	5.0226%	8.1798%	9.9273%	12.9372%
Water	5.2968%	6.9749%	9.4456%	11.0018%	14.0074%	4.6575%	7.5426%	9.9247%	11.6779%	14.6919%
Housing	5.2200%	6.9003%	9.3515%	10.9295%	13.9580%	4.4006%	6.3342%	9.5108%	11.2768%	14.3257%

Source: Own.

Table 3. Consumption changes from removing labor taxes
(Percentage change with respect to Business as Usual)
Continued

	No payroll contributions to SS, Increasing VAT to 17% excluding food and medicine (3)					No payroll contributions to SS and Reduction of energy subsidies (4)				
	2012	2018	2024	2030	2036	2012	2018	2024	2030	2036
Food items	3.3554%	3.7794%	6.4900%	8.1289%	11.1310%	5.0862%	6.8836%	9.3363%	10.9155%	13.9402%
Household goods	4.0247%	4.5030%	7.0836%	8.7637%	11.9644%	5.3750%	6.9999%	9.3388%	10.9546%	14.1620%
Consumer services	2.3037%	3.8178%	6.5263%	8.1678%	11.1751%	5.1678%	9.2344%	11.7365%	13.3566%	16.4566%
Autos	5.2887%	6.9296%	9.5094%	11.2163%	14.5080%	5.6679%	7.3991%	9.7165%	11.3454%	14.6067%
Electricity and LPG	4.3513%	6.0159%	8.8398%	10.5044%	13.5329%	-17.5262%	-19.4164%	-17.5568%	-16.3803%	-14.1557%
Public Transport	4.1242%	5.5719%	8.3690%	10.0397%	13.0407%	3.8733%	5.3479%	7.7857%	9.3203%	12.2349%
Gasoline	3.8353%	5.0679%	7.8662%	9.5221%	12.5300%	0.6337%	1.1916%	3.4888%	4.9339%	7.6955%
Water	4.8402%	6.8127%	9.6509%	11.3092%	14.3233%	5.2055%	6.9749%	9.4456%	11.0633%	13.9547%
Housing	4.5827%	6.3881%	9.2150%	10.8887%	13.9405%	5.0683%	6.8733%	9.3743%	10.9499%	13.9405%

Source: Own.

Table 3. Consumption changes from removing labor taxes
(Percentage change with respect to Business as Usual)
Continued

	No payroll contributions to SS, Increasing VAT to 17%, excluding food and medicines, and Reducing energy subsidies (5)				
	2012	**2018**	**2024**	**2030**	**2036**
Food items	3.1863%	3.6526%	6.4153%	8.0438%	10.9425%
Household goods	3.6976%	4.1962%	6.7896%	8.4325%	11.4795%
Consumer services	2.2513%	3.8324%	6.5902%	8.2319%	11.1448%
Autos	5.1622%	6.8732%	9.4935%	11.1733%	14.3228%
Electricity and LPG	-17.9694%	-19.8847%	-17.7103%	-16.4634%	-14.2754%
Public Transport	3.0265%	4.2559%	7.0714%	8.6975%	11.5588%
Gasoline	-0.0667%	0.2564%	2.9270%	4.4572%	7.1630%
Water	4.7489%	6.8127%	9.7194%	11.4321%	14.3233%
Housing	4.5524%	6.4151%	9.3060%	10.9704%	13.9405%

Source: Own.