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VAT Collection and Social Security Contributions under Tax Evasion: Is There a Link?

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Abstract

In this work we estimate the potential government revenue collection to finance Levy (2008)'s proposal of financing social security with Value Added Taxes, taking into account general equilibrium effects in a context of coexistence of formality and informality. Here, the latter is defined in terms of tax evasion.

Resumen

Este artículo estima la propuesta de Levy (2008) de financiar con impuestos un sistema de seguridad social, removiendo las contribuciones sociales, pero tomando en cuenta los efectos de equilibrio general en un contexto donde coexiste la formalidad y la informalidad.

Introduction

Mexican public finances are weak; national tax collection as a percentage of GDP is among the lowest in the world. On the other hand, -effective- expenditure needs are enormous. There have been several attempts to reform our tax system but they have not been successful due to different factors such as political interests, excess of oil revenues, and deficient design of the reforms. One of the most important problems is that every reform has been attempted with no significant change on the expenditure side, or what is more, ignoring links between taxes and other economic areas such as social security contributions.

Recently Levy (2008) has proposed a major change on the expenditure side. In particular, he argues that social policy should dramatically be modified to be able to provide a universal health care system together with an unemployment insurance. At the same time, the proposal aims at eliminating social security contributions in order to eliminate distortions in the labor market and promote formality. This calls for an adequate financial source. In this work we estimate the potential government revenue collection to finance this proposal, taking into account general equilibrium effects in a context of coexistence of formality and informality. Here, the latter is defined in terms of tax evasion.

To evaluate Levy's proposal from a revenue perspective, a static, general equilibrium model is presented. In this context, the fiscal authority imposes three types of taxes: contributions to social security, value-added taxes and income taxes. The model has three sectors: two intermediate sectors and a final good sector, in which intermediate inputs are aggregated. The motivation for having two intermediate sectors is that special tax treatments under the current Mexican law cause that a large fraction of goods produced do not pay value-added taxes in practice. Firms are price takers and maximize profits in the usual fashion. However, firms have an incentive to evade taxes. If firms evade, they face an endogenous probability of being detected by the authority. Such probability depends positively on the size of the firm. In the intermediate good sectors, this leads to the existence of three types of firms (*cfr*. Guner *et al.*, 2008): a set of firms hiring formal labor only; another set of firms hiring informal labor only; and a final group of firms hiring a mix of formal and informal labor, as in Levy (2008).

The intermediate-final good structure in the model gives place to a transmission mechanism of tax avoidance between sectors. In particular, the value-added tax is collected by the credit method. In such scheme, the tax rate is applied to each sale, but firms may claim a credit to the fiscal authority for the amount of taxes paid in the previous stages of production. Since tax credits cannot be generated from informal suppliers and tax

payments from formal suppliers cannot be used by informal buyers, there is an incentive for informal firms to conduct business with other informal firms. This scheme thus predicts that tax evasion of a firm in the final good sector is correlated to the tax evasion of firms from which it buys intermediate goods, as in de Paula and Sheinkman (2008).[1]

In terms of the model, there are two important sources of distortions affecting the relative price of intermediate goods faced by firms in the final good sector. First, the presence of different value-added tax rates (as a result of special tax treatments under the current law) causes a standard distortion in relative prices. The second source of distortion arises from differences in the rates of tax compliance.[2] As discussed below, data suggests that these differences may be relatively large in Mexico. Given the correlation of informality between sectors, the elimination of social security contributions has a significant effect on tax compliance by firms in the model. Thus a tax reform like the one proposed by Levy (2008) designed both to even out value-added tax rates and to eliminate social security contributions would decrease these distortions in relative prices. Additionally, these measures would raise government revenue in the model, not only because of the elimination of special tax treatments but also as a result of an increase in tax compliance.

In this document we report that, abstracting from changes in firm's behavior, data from national accounts indicates that the elimination of special tax treatments in the VAT structure would increase VAT revenue from its current level of 3.8 to 6.8% of GDP. Once tax evasion behavior by firms is taken into account, the model finds that a fiscal reform that simultaneously imposes a 15% tax on all goods and eliminates social security contributions (*i.e.*, Levy's proposal) would increase the VAT revenue/GDP ratio to 6.4%. Taking into account the revenue from corporate income taxes and the lost revenue from social security contributions, the net effect of such proposal on total government revenue as a share of GDP would be nearly zero. On the other hand, the effects of such fiscal reform on wages might be large. In particular, the model suggests that real wages would increase by 21%, mainly as a result of the large increase in labor demand due to the elimination of social security contributions.

In relation to the literature, a paper closely related to this work is Fortin *et al*. (1997), where the effects of taxation in a general equilibrium model with wage controls and an informal sector are studied. Such framework assumes a one sector model so the transmission mechanism of tax evasion studied here is absent. However, the closest paper to ours is Leal (2009). The

[1] The authors present empirical evidence supporting this idea.

[2] There is a growing strand of the literature focusing on policies that hinge on firm's size that may result in resource misallocations (see, among others, Gollin (2006), Restuccia and Rogerson (2008), Guner *et al*., (2008), Hsieh and Klenow (2009a, 2009b) and Leal (2009)). The class of resource misallocations studied here arises not only from differences in taxes between sectors but also from differences in the rates of tax compliance.

author presents a one sector, general equilibrium framework of occupational choice and capital accumulation with limited tax enforcement. His model is calibrated to Mexico in order to study the effects of full enforcement in income taxes on output and labor productivity. In contrast to Leal (2009), here we are interested in alternative tax reform scenarios and their effects on government revenue to evaluate the proposal of Levy (2008) mentioned earlier.

This work is structured as follows. Section 1 estimates VAT potential and evasion with and without special treatments. Section 2 presents a general equilibrium model with tax evasion. Section 3 calibrates and simulates the model. Finally, section 4 concludes.

1. Estimation of Potential VAT collection with no special treatments

This section estimates the potential VAT collection with no special treatments and no evasion. Next section addresses these phenomena in linear way. We take care of the general equilibrium effects of removing special treatments later in the paper.

The value added duty (VAT) is a consumption tax levied on any value that is added to a good or service. In contrast to sales tax, VAT is neutral with respect to the number of passages that there are between the producer and the final consumer; where sales tax is levied on total value at each stage , the result is a cascade (downstream taxes levied on upstream taxes). A VAT is an indirect tax, in that the tax is collected from someone who does not bear the entire cost of the tax.

The essential characteristics of a VAT-type tax are as follows:

- The tax applies generally to transactions related to goods and services.
- It is proportional to the price charged for the goods and services.
- It is charged at each stage of the production and distribution process.
- The taxable person (vendor) may deduct the tax paid during the preceding stages, that is, the burden of the tax is on the final consumer.

Value added taxation avoids the cascade effect of sales tax by only taxing the value added at each stage of production. Value added taxation has been gaining favor over traditional sales taxes worldwide. In principle, VATs apply to all commercial activities involving the production and distribution of goods and the provision of services. Under this concept the government is paid tax on the gross margin of each transaction.

Sales taxes are normally only charged on final sales to consumers: because of reimbursement, VAT has the same overall economic effect on final prices. The main difference is the extra accounting required by those in the middle of

the supply chain; this disadvantage of VAT is balanced by application of the same tax to each member of the production chain regardless of its position in it and the position of its customers, reducing the effort required to check and certify their status. When the VAT system has few, if any, exemptions such as with general sales tax (GST) in New Zealand, payment of VAT is even simpler. On the contrary, when it has many special treatments it becomes more complex.

By the method of collection, VAT can be accounts-based or invoice-based. Under the invoice method of collection, each seller charges VAT rate on his output and passes the buyer a special invoice that indicates the amount of tax charged. Buyers who are subject to VAT on their own sales, use these invoices to obtain a credit (reduction) towards their own VAT liability. The difference in tax shown on invoices passed and invoices received is then paid to the government (or a refund is claimed, in the case of negative liability). Under the accounts based method, no such specific invoices are used. Instead, the tax is calculated on the value added, measured as a difference between revenues and allowable purchases. Most countries today use invoice method, including Mexico; the only exception is Japan which uses accounts method.

In principle the potential VAT collection comes from applying the tax rate to the value added produced in any economy. There are many ways to estimate this number. The most popular involves the use of National Account System where the value added is calculated. From here, it is possible to obtain the potential VAT collection. However, that is contingent on the different exemptions the system may contain. Next, we focus on the Mexican case, which tax system is complex as many special treatments are applied.

1.1. Mexican VAT system and its potential collection

The VAT was first introduced in Mexico in 1979. Since then it has experienced many changes in its structure: in particular there has been changes in tax rates and exemptions. As of today Mexican prevailing VAT rate is 15% and has a myriad of special treatments such as tax exemptions and rate differentiation (see Annex A); however, this rate has recently been increased to 16% and will prevail starting in 2010. For this reason, this work considers the first rate.

Special treatments in VAT system include zero rate on most items of food and medicines (and other agricultural related items), exemptions on selected services such as education, medical appointments, urban ground transportation and the production of books, newspapers and magazines (for a complete description, see Annex A). In addition, in border cities the VAT rate is 10% to allegedly allow competitiveness with respect to neighboring countries (US, Belize and Guatemala) and up to the year 2004 micro

businesses in the retailing and fast food ("*pequeños comercios*") were also tax exempted.

Given this VAT structure next we calculate the *potential* collection of this duty in the absence of any special treatment and evasion/avoidance. To accomplish this we use National Accounts. Table 1 presents results. This table was obtained from calculating domestic final consumption excluding VAT; intermediate steps and details to obtain this are presented in Annex B.

TABLE 1. VAT: IDEAL SITUATION WITH NO SPECIAL TREATMENTS

	2003	2004	2005	2006
Domestic Final Consumption excluding VAT	5677433	6303361	6806624	7404282
+Residential Construction	401629	475296	509872	599826
-Imputed Rent	380664	417389	438258	460171
-Government Value Added (basic values)	317120	334209	353615	383011
VAT Base excluding special treatments	5381278	6027059	6524623	7160926
GDP	7554184.75	8566939.25	9247372.75	10372844.3
VAT Base excluding special treatments	5381278	6027059	6524623	7160926
VAT Base/GDP	0.71235716	0.70352531	0.70556504	0.69035322
VAT potential	807191.64	904058.785	978693.44	1074138.96
VAT potential as % of GDP	**10.7%**	**10.6%**	**10.6%**	**10.4%**

Source: National Account Systems, INEGI www.inegi.gob.mx, millions of pesos

Please note that the potential VAT collection as percentage of GDP when special treatments are excluded slightly surpasses 10%. This figure however assumes that there is no tax evasion. This is indeed a strong assumption as this tax is vulnerable, like any other one, to evasion and fraud, as its credit and refund mechanism does offer unique opportunities for abuse[3]. For this reason we now concentrate in estimating the VAT evasion in Mexico.

1.2. VAT Evasion Estimation

Allegedly the VAT's strength is that it is more difficult to evade than a general retail sales tax. The reasons are well known. Invoices provide a good audit trail; tax is collected at all stages of production rather than at the retail level only; the tax puts the burden of proof for tax credits on taxpayers; cross-checking helps income tax enforcement; better record-keeping is required; and the use of invoices helps make the VAT self-enforcing to some degree, since a taxable buyer has an incentive to insist on an invoice (see Agha and Haughton, 1996).[4]

These advantages should not be overstated as administration may be more difficult than a simple retail sales tax. Others argue that the self-enforcing

[3] See Keen and Smith (2007). This is even harder in the European Union as the so-called "carousel fraud" has arisen especially after 1992, when this union was formed.

[4] As we show later, the same can be said in the presence of different rates and informality: producers might want to engage business with informal intermediate producers.

mechanism may even be illusory (Hemming and Kay, 1981). Still most research suggests this tax may indeed be evaded. Some of the most common methods are:

i. understate sales;
ii. inflate claims for VAT paid on inputs;
iii. claim credit for tax paid on inputs used in producing goods which are exempt from VAT;
iv. VAT is collected by a firm, which does not remit it to the fisc, and then disappears (this is especially true for developing countries);
v. claim VAT credit for non-creditable purchases, such as cars used for non-business purposes;
vi. non-registration for VAT (this is especially true for those countries with high levels of underground –informal- businesses);
vii. divert zero-rated exports to the domestic market; and,
viii. claim the transaction is not a taxable event, and that it is a gift rather than a sale.

All of these types of evasion are possible even with a single-rate VAT. However, more than three fifths of all VAT systems currently in operation have more than one tax rate, mainly on equity grounds (see Agha and Haughton, 1996; Hernández & Zamudio, 2003).

Nevertheless there is a tendency for VAT to get simpler. Furthermore some have argued against multiple rates. The most obvious reason is that it becomes possible for the taxpayers to apply the wrong rate to output. A multiple-rate VAT also exacerbates the tax credit problem (some items in the production chain are taxed at a lower rate than the tax on final output).

All foregoing reasons may explain the differences in tax collection among countries. Table 2 reports the VAT productivity of different countries (Annex C presents tax collection as a percentage of GDP and VAT rates) defined as tax collection as a percentage of GDP per percentage point of VAT rate. Many of these countries have a myriad of special treatments and still VAT productivity differs substantially among countries. Mexico presents the lowest figure among OECD countries and one of the lowest among Latin American countries (only Argentina and Brasil present lower figures). This may suggest that México is somehow inefficient at collecting this tax, and this may occur due to: *i)* tax avoidance is high as a result of excessive special treatments;[5] *ii)* the tax agency (SAT) is inefficient at collecting taxes; or *iii)* the rate of evasion is high; or, *iv)* a combination of two or more of them.

Hence it is important to estimate the rate of evasion to be able to disentangle the phenomena. Here we follow two paths to estimate VAT

[5] It should be noted that countries like Canada, Sweden and South Korea, among others, also present a good number of special treatments, and still are much better at collecting taxes.

evasion given the availability of official detailed information. The first one uses our previous estimation of potential VAT collection. Recall that we have estimated private consumption from National Account system. We may use the household income-expenditure survey (ENIGH) to determine the proportion of this consumption that is spent on zero-rate VAT, and those items that are tax exempt. After this we may adjust this for the special border non-border consumption. Finally, we may subtract the so called "repecos". Still we have ruled out some items that are either zero-rate or exempt such as interest on pension schemes, some agricultural machines and some insurances (such as life and re-insurances). These may be the limitations of this approach. However, these items do not represent a high proportion of the total value added; hence this could be a good proxy.

TABLE 2. VAT PRODUCTIVITY (TAX COLLECTION AS A % OF GDP PER PERCENTAGE POINT OF VAT RATE)

2006			
OCDE Countries		**LA Countries**	
México	*28%*	Argentina	19%
		Panama	19%
Chec Rep	30%	Brasil	*25%*
Italy	32%		
Turkey	32%	*México*	*28%*
Slovenia	33%		
Norway	33%	Peru	30%
Belgium	35%	Colombia	36%
Sweden	37%	Chile	39%
Poland	37%	Uruguay	40%
Ireland	38%	Costa Rica	42%
Luxembourgh	38%	Ecuador	45%
Finland	38%	Guatemala	45%
Great Britain	38%	Venezuela	47%
Greece	38%	Nicaragua	49%
Austria	39%	Paraguay	54%
Holland	39%	El Salvador	54%
Hungary	39%	Bolivia	68%
Germany	39%		
Australia	40%	**Average**	40%
Spain	40%	**Coef. of Var.**	0.34
Denmark	41%		
France	42%		
Korea	45%		
Iceland	46%		
Portugal	47%		
Japan	52%		
Swisstzerland	52%		
Canada	67%		
New Zealand	72%		
Average	41%		

Source: OECD & IMF

The second methodology is as follows. Consider the following equation:

$$DY = GDP - D + TrM + TrX \quad (1)$$

Where:
DY: disposable income at market prices
D: Depreciation
TrM: transfers and payments (market values) coming from the rest of the world to national origin factors
TrX: transfers and payments (market values) coming from the rest of the world to foreign origin factors, sent abroad.

Based on this, the VAT base can be obtained in the following manner:

$$VAT\ Base = DY + M - X - VatRev + TB - NI \quad (2)$$

Where:
M: imports
X: exports
VatRev: Vat collection in $
TB: tourism balance
NI: net investment

From this VAT base, special treatments will be deducted (see Annex A), namely: *i)* zero-rated products; *ii)* tax exempt g & s;[6] *iii)* adjust for border and non-border consumption; *iv)* adjust for the value added of micro retailers ("pequeños comercios"); calculate that amount of imports subject to the VAT. Once this is done, we obtain the true tax base, which can be compared to the actual VAT collection and thus evasion is obtained.
Next both calculations are presented. We expect to obtain similar tax evasion rates if methodologies are appropriate.

a) Tax Evasion estimation: The final consumption approach

This methodology obtains final private consumption excluding all special treatments. In Table B2 in Annex B private domestic final consumption is presented. We use the Encuesta Nacional de Ingreso-Gasto de los Hogares (ENIGH) to take into account zero-rated and exempt goods and services. Table 3 presents this result and in Annex D we present the different steps to obtain it.

[6] Note that that tax exempt goods and services may pay some VAT in different stages of production. Later we describe the way this can be done.

TABLE 3. CONSUMPTION DISTRIBUTION IN TERMS OF VAT RATES (%)

	Zero-Rated	VAT-Exempt	VAT
Electricity, water and gas to final consumer	0.00%	0.00%	100.00%
Manufacturing Sector	42.46%	2.21%	55.32%
Transportation, post office and storage	0.00%	90.27%	9.72%
Professional, Scientific and Technical services	0.00%	9.00%	91.00%
Education Services	0.00%	100.00%	0.00%
Health expenditure	0.00%	59.18%	40.82%
Recreational, cultural and sport services	0.00%	4.63%	95.37%
Hotels and Restaurants	0.00%	0.00%	100.00%
Total	**25.89%**	**18.73%**	**55.38%**

Source: Own calculations based on ENIGH, INEG.

As it can be observed 55.3% of the total consumption is spent on goods and services that are subject to VAT, 25.8% is spent on zero-rated products whereas 18.7% on tax exempt ones.

Based on these numbers it is possible to adjust domestic private consumption and then go after the steps followed for estimating the potential VAT collection with no special treatments. Table 4 presents final results (intermediate steps are presented in Annex E). It is worth pointing out that 12% of the production process of tax exempt goods and services are subject to VAT (own calculation from national accounts), and that 88% of consumption is made in non-border cities (own calculations based on Regional National Accounts).

As it may be noted tax evasion averages 37%. Nevertheless, several points should be made. First, this methodology cannot take into account some of the services that are zero-rated or exempt. In particular, these include agricultural and forestry machinery, agricultural inputs such as fertilizers, agricultural insurance, re-insurances, gold and jewelry, interest on pension schemes and some other financial commissions (on mortgages and pensions). This indeed would reduce that tax evasion rate. Because of these limitations we proceed to estimate this rate using the second methodology presented above.

TABLE 4. VAT EVASION

	2003	2004	2005	2006
GDP	7554184.75	8566939.25	9247372.75	10372844.3
VAT base adjusted for zero-rate and exempts	3220961.20	3596483.20	3893641.25	4284536.20
VAT base adjusted for zero-rate and exempts non-border	2834445.85	3164905.21	3426404.30	3770391.86
VAT base adjusted for zero-rate and exempts(border cities)	386515.34	431577.98	467236.95	514144.34
Adjusted VAT base/GDP	0.43	0.42	0.42	0.41
Potential VAT base adjusted for zero-rate and exempts and border cities	427920.93	477183.48	538712.58	592327.34
Micro-retailers (pequeños comercios)	249288.10	282709.00	152581.65	171151.93
Potential VAT collection (microretailers)	0.06	0.06	0.06	0.06
Actual Total VAT Collection	259167.00	291147.00	327182.00	390735.00
VAT evasion	168753.93	186036.48	211530.58	201592.34
Rate of VAT Evasion	39.44%	38.99%	39.27%	34.03%

Source: Own calculations based on National accounts and ENIGH, INEGI. Millions of pesos

b) Tax Evasion estimation: National Accounts Approach

Here we apply the methodology described earlier. Table 5 presents the estimation of the VAT base in the case no special treatment existed as it was stated in equation (2) above.

TABLE 5. VAT BASE (NO SPECIAL TREATMENTS) (MILLIONS OF PESOS)

Year	DY	X	M (subject to VAT)	VAT Collection	Tourism Balance	Net Capital Form.	VAT base
2003	6891864.25	1915765.55	1478742.49	259166.66	46217.84	1046272.94	5195619.43
2004	7876046.81	2281359.00	1778467.89	291147.19	54333.36	1355198.70	5781143.17
2005	8493680.75	2507352.69	1942961.81	327181.92	55140.44	1417737.88	6239510.51
2006	9566865.89	2902867.79	2231033.23	390735.21	55657.67	1795532.61	6764421.18
2007	10323315.49	3163019.44	2454672.89	422394.19	59800.83	1895575.61	7356799.96

Source: National Account System, INEGI

Based on this VAT base it is possible to obtain the potential VAT collection should there not be multiple rates. We simply multiply that base times the uniform rate, in our case this would be 15% (see Table 6).

TABLE 6. POTENTIAL VAT COLLECTION (% OF GDP)

Year	VAT base (mll. of pesos)	Potential VAT Collection (in mll. pesos)	Potential VAT Collection (% of GDP)
2003	5195619.43	779342.91	11.31%
2004	5781143.17	867171.48	11.01%
2005	6239510.51	935926.58	11.02%
2006	6764421.18	1014663.18	10.61%
2007	7356799.96	1103519.99	10.69%

Source: National Account System, INEGI.

As it may be noted this methodology yields and average of 10.9% of GDP, which is consistent with the other methodology (10.6 %). It is now necessary to take into consideration all special treatments our legislation applies (see discussion above). Hence we first obtain the value added of all zero-rated and exempt products. Next we subtract the value added of the micro-retailers ("repecos") and adjust for the new legislation in 2005 and 2006.[7] Finally, we weight for the border & non-border final consumption. Table 7 presents these results. Several observations must be made in calculations. First, national accounts system does not disaggregate enough some of the items. We used, when possible, different sources to adjust for these limitations. In particular, in beverages, according to ENIGH (see table in Annex E), 10% of this item is spent on zero-rated natural juices; we adjusted for this. Second, in insurances pension systems and bails, a correction was in place. 43% of the insurance industry accounts for life insurance and approximately 48% of this receive voluntary deposits (which are tax exempt); 14% of this industry goes to reassurances (which are exempt); 0.5% are agricultural related and, finally only 3.7% comes from pension systems.[8] All these were considered when calculating the tax exempt amount.

On the other hand, only some of the government value added is subject to VAT; we used NAS to adjust for this. Finally, "repecos" and changes in legislation of 2005 were considered (see Annex F).

[7] In 2005 a modification took place. Repecos –those whose sales are less than 2 million pesos- are obliged to pay a fixed amount which includes income and consumption taxes. In addition, this fee collection is carried out by the states. Before this change repecos were not required to explicitly pay the VAT. This was indirectly charge by the suppliers such as the Coke retailer.

[8] These figures were obtained from the Comisión Nacional de Seguros y Fianzas, Comisión Nacional del Sistema de Ahorro para el Retiro and Comisión Nacional Bancaria y de Valores.

TABLE 7. TOTAL POTENTIAL VAT COLLECTION UNDER CURRENT LEGISLATION (MILLIONS OF PESOS)

Year	VAT Base no special treatments	Zero-Rated and Exempt	Repecos*	VAT Base before Border treatment	Non-Border VAT Base	Border VAT Base	TOTAL POTENTIAL VAT COLLECTION
2003	5195619.43	2054251.06	227431.52	2913936.84	2585244.77	328692.08	420655.92
2004	5781143.17	2229186.68	259909.54	3292046.95	2920704.05	371342.90	475239.90
2005	6239510.51	2369696.83	210218.60	3659595.07	3246792.75	412802.32	528299.14
2006	6764421.18	2565572.83	236779.93	3962068.42	3515147.10	446921.32	571964.20
2007	7356799.96	2783849.73	255502.06	4317448.18	3830440.02	487008.15	623266.82

Source: Own calculations, National Account System, INEGI; * Legislation changed in 2005. Millions of pesos.

The last column represents the total potential VAT collection under the current legislation. We compare this with respect to the actual collection and then obtain the evasion rate (Table 8). As it can be seen for the years 2006 and 2007 this reaches around 32%. Note that in previous years this figure is higher, this may be due to some way of calculation of the NAS, Inegi (which is frequent), or because of the change in legislation to force some repecos to pay —some— VAT.

TABLE 8. VAT EVASION

Year	TOTAL POTENTIAL VAT COLLECTION*	Actual VAT Collection*	Evasion in pesos*	Evasion Rate (% of potential)
2003	420655.9226	259166.664	161489.2586	38.39%
2004	475239.8977	291147.188	184092.7097	38.74%
2005	528299.145	327181.921	201117.224	38.07%
2006	571964.1968	390735.205	181228.9918	31.69%
2007	623266.8186	422394.191	200872.6276	32.23%

Source: Own calculations, National Account System, INEGI.

In sum, however the methodology, the evasion rate seems to reach slightly more than 30%, which averages between 1.7-1.8% of GDP. It is important to mention that either methodology has its own limitations (mentioned timely during the description of both). Nevertheless, as they are both somehow consistent we may assert that VAT Evasion Rate is around 32%.

Should we remove all special treatments, this analysis would suggest that potential VAT collection would be around 6.84% of GDP, considering that potential VAT collection with no special treatments and no evasion is about 10.6% of GDP. This is an approximation as it considers that the behavior of entrepreneurs and consumers does not change. Table 9 presents a synthesis of the losses coming from special treatments. As it may be noted, most come from the zero-rate on food and medicine, as the others –repeco, and border rate- represent only a small part as a proportion of GDP.

TABLE 9. SUMMARY OF RESULTS (% OF GDP)

Year	Potential VAT no special treat	Special Treat. Loss (%GDP)*	Actual VAT Collection	Evasion in % GDP
2003	10.32%	4.75%	3.43%	2.14%
2004	10.12%	4.57%	3.40%	2.15%
2005	10.12%	4.41%	3.54%	2.17%
2006	9.78%	4.27%	3.77%	1.75%
**Distribution of Special Treat. Loss*				
Special Treat. Loss (%GDP)	**Food and Medicines Loss**	**Small Ent. Loss**	**Border Loss**	
4.75%	4.08%	0.45%	0.22%	
4.57%	3.90%	0.46%	0.22%	
4.41%	3.84%	0.34%	0.22%	
4.27%	3.71%	0.34%	0.22%	

Source: Own calculation based on results

As it is known, any time a change in taxes occurs, economic agents modify their behavior and these methodologies does not consider this, besides its own limitations. Furthermore, their behavior may change even more if social contributions are eliminated. Next, we present a model that takes this into account.

2. The model

The purpose of the model is to have an understanding of how firms may change their behavior when facing a fiscal reform in the context of tax evasion. In particular, the model below is a three sector model, with two intermediate sectors and a final good sector. The final good is the numeraire. To simplify the analysis, it is assumed that these goods are internationally traded and that the economy is small in world markets. In terms of the model, this implies that prices of goods are exogenously given. The technology is such that labor is needed to produce both intermediate and final goods.

Firms in each sector must pay three types of taxes: value-added taxes, corporate income taxes, and social security contributions. However, firms in principle have an incentive to evade such taxes. In terms of our definition of informality, a firm is classified as informal if it evades any of these three taxes. Thus labor in the model may be classified as either formal or informal, depending on whether the firm demanding labor is formal or not. This implies that informal labor arises from three different tax sources, where these sources may in principle be correlated among them. Hence if one of these taxes is eliminated (say, social security contributions), such policy measure will have the effect of decreasing informal labor in the economy only partially, as there will exists a set of firms still evading the remaining taxes.

2.1. The intermediate good sectors

There are two types of intermediate goods M_z, indexed by $z = i, j$. Each good is produced by a Cobb-Douglas technology given by:

$$M_z = A_z L_z^{\alpha} K_z^{1-\alpha} \tag{3}$$

Where A_z, L_z and K_z denote the level of technology, labor and capital in sector z necessary to produce the intermediate good z, respectively. The parameter α satisfies $0 < \alpha < 1$. Physical capital K_z is a fixed factor, so that the representative firm makes positive profits in equilibrium.[9] Capital K_z is distributed with support $k_z = \left[0, \overline{K}_z\right]$, and distribution function $F(K_z)$. The corresponding density is denoted by $f(K_z)$. The capital endowment in the economy is denoted by $\overline{K}$. Firms in the intermediate good sector z sell their good to the final good producer at the exogenous price p_z.

In general, total labor in sector z is composed of both formal and informal labor, denoted respectively by $L_{f,z}$ and $L_{nf,z}$. Formal and informal labor are perfect substitutes. Thus total labor in intermediate sector z is just $L_z = L_{f,z} + L_{nf,z}$.

Labor endowment in the economy is denoted by $\overline{L}$, and perfect mobility of labor is assumed across sectors. This implies that wages in the formal sector must be the same in both sectors i and j. A similar assumption applies to wages in the informal sector.

From the employer's perspective, the difference between formal and informal labor is in terms of tax compliance, including contributions to social security programs. Let τ_n denote the cost of social security contributions per unit of labor. If w_f denotes the wage per unit of labor in the formal sector (net of contributions), the total cost of labor in the formal sector is just $w_f + \tau_n$. In contrast, informal labor does not face labor costs due to social security contributions by definition. The cost per unit of labor is simply given by the wage rate w_{nf}, where $w_{nf} < w_f + \tau_n$. Thus firms have an incentive to evade social security contributions.

Following Levy (2008), if a firm in sector z chooses to evade such contributions there is an endogenous probability $\lambda(L_{nf,z}, K_z)$ for the firm of being discovered by the authority. This probability depends positively on firm's size as measured by the amount of informal labor employed and the firm's level of capital. For example, if the firm is relatively small (say, the amount of labor demanded to conduct business is relatively low), the

[9] Alternatively, K_z may be interpreted as entrepreneurship's ability as in Lucas (1978).

probability that such firm is discovered evading social security contributions is practically zero. In contrast, if the size of the firm is such that it requires hiring too many workers, the firm will have an incentive to hire formal workers only as the probability of being discovered by the authority evading taxes is high. Based on this idea, the probability of detection satisfies:

$$\lambda(L_{nf,z}, K_z) \begin{cases} = 0 & \text{if } L_{f,z} + L_{nf,z} \in [0, \underline{L}_z] \\ \in (0,1) & \text{if } L_{f,z} + L_{nf,z} \in (\underline{L}_z, \overline{L}_z) \\ = 1 & \text{if } L_{f,z} + L_{nf,z} \in [\overline{L}_z, \infty). \end{cases} \quad (4)$$

In the expression above, $\underline{L}_z$ represents the maximum amount of labor for which the probability of detection is zero. This creates an incentive for small firms to hire informal workers only. As the size of the firm increases so that total labor demanded is above $\underline{L}_z$ but below $\overline{L}_z$, the probability of detection becomes positive but is less than one. Firms of such size will hire a mix of formal and informal workers. Finally, for an amount of total labor above $\overline{L}_z$ the probability $\lambda(L_{nf,z}, K_z)$ is one. In such a case, the firm will have an incentive to hire formal workers only. In terms of the model, the levels of labor $\underline{L}_z$ and $\overline{L}_z$ are exogenously given.

For the particular case where the firm chooses to hire a mix of informal and formal workers, the probability of detection $\lambda(L_{nf,z}, K_z)$ is increasing in both arguments with the additional properties $\lambda_{LL}(L_{nf,z}, K_z) > 0$ and $\lambda_{KK}(L_{nf,z}, K_z) \geq 0$. This means that larger firms face a higher probability of detection, with such probability increasing at a higher rate.

If a firm of intermediate size is discovered by the authority evading social security contributions, it faces a penalty θ per unit of labor. Such penalty must be relatively high in order to dissuade firms from evading these contributions. In particular, if a firm is discovered the penalty is such that $w_{nf} + \theta > w_f + \tau_n$. Overall, the average expected cost of hiring informal labor for a firm of intermediate size is given by $w_{nf} + \theta\lambda(L_{nf,z}, K_z)$.

Firms in the intermediate good sector z must also pay income and value-added taxes, denoted respectively by τ_π and $\tau_{c,z}$. This specification implies that firms in each sector face the same income tax, but the value-added tax may be different in each sector. As in the case of social security contributions, firms also have an incentive to evade income and value-added taxes. In particular, firms face an endogenous probability of detection $\hat{\lambda}$. To simplify the exposition, such probability is only a function of the physical

capital level K_z of the firm.[10] Hence, the *effective* tax rates faced by a firm in the intermediate good sector *z* are given by $\tau_\pi \hat{\lambda}(K_z)$ and $\tau_{c,z} \hat{\lambda}(K_z)$.

Following the same idea as for social security contributions, the probability of detection $\hat{\lambda}$ depends on some critical levels of physical capital in the firm. In particular, for a level of capital in the interval $[0, K_z^-]$ the probability of detection is zero. There is also an interval $[K_z^+, \infty)$ for which the probability of detection is one. For firms with a level of capital in the interval (K_z^-, K_z^+), the value of $\hat{\lambda}(K_z)$ is between zero and one. In such a case, the corresponding function $\hat{\lambda}(K_z)$ satisfies $\hat{\lambda}_K(K_z) > 0$ and $\hat{\lambda}_{KK}(K_z) \geq 0$ so that firms with a larger amount of capital face a higher and non-decreasing probability of detection. The critical levels of capital K_z^- and K_z^+ are determined endogenously in the model as described below.

The problem of a representative firm in the intermediate good sector *z* is thus to choose the amount of formal and informal labor $\{L_{f,z}, L_{nf,z}\}$ to maximize expected profits, given prices $\{p_z, w_f, w_{nf}\}$ and taxes $\{\tau_\pi, \tau_{c,z}, \tau_n\}$. The corresponding expected profit function may be written as:

$$\Pi_z^{\text{int}} = \left[1-\tau_\pi \hat{\lambda}(K_z)\right]\left[(1-\tau_{c,z}\hat{\lambda}(K_z))p_z A_z L_z^\alpha K_z^{1-\alpha} - (w_f + \tau_n)L_{f,z} - (w_{nf} + \theta\lambda(L_{nf,z}, K_z))L_{nf,z}\right] \quad (5)$$

2.2. The final good sector

The final good sector is composed of a large number of representative firms taking prices as given. Since the economy is small in international markets, the price of the final good is taken as exogenous in the model. Firms use the intermediate good *M*, labor input L_m, and a fixed factor A_m to produce final goods. The production function is of the Cobb-Douglas type:

$$y = \left[M(m_i, m_j)\right]^{\alpha_m} L_m^{\alpha_L} A_m^{\,1-\alpha_m-\alpha_L} \quad (6)$$

Where $0 < \alpha_m, \alpha_L < 1$. The function $M(m_i, m_j)$ is given by a composite of intermediate goods $\{m_i, m_j\}$ according to the following CES technology:

$$M(m_i, m_j) = \left[\gamma(m_i)^\mu + (1-\gamma)(m_j)^\mu\right]^{1/\mu} \quad (7)$$

[10] This assumption captures the idea that tax collections from both social security contributions and value-added taxes are performed by different government agencies (as it is the case in Mexico). However, the fact that each probability of detection depends on the amount of capital allows for some correlation between them.

With restrictions $-\infty \leq \mu \leq 1$, and $0 \leq \gamma \leq 1$. Parameter γ represents the weight of intermediate good m_i in the production of M. The elasticity of substitution between intermediate goods m_i and m_j is given by $1/(\mu - 1)$.

Similar to the case of firms in the intermediate sector, firms in the final good sector must also pay income and value-added taxes. However, these firms also have an incentive to evade taxes. In particular, let $\overline{\lambda}$ denote the rate of compliance on income taxes so that $1-\overline{\lambda}$ is the corresponding evasion rate. Thus the *effective* income tax rate faced by firms in this sector is given by $\tau_{\pi}\overline{\lambda}$. As for value-added taxes, let $\overline{\lambda}_z$ be the corresponding rate of compliance in sector *z*. If we let the value-added tax in the final good sector to be a weighted average of taxes in the intermediate good sector, the corresponding effective value-added tax rate is given by $\gamma\tau_{c,i}\overline{\lambda}_i + (1-\gamma)\tau_{c,j}\overline{\lambda}_j$.

To simplify, the rates of compliance $\overline{\lambda}_z$ and $\overline{\lambda}$ are exogenous to the firm but endogenous in the model. In particular, it is assumed that $\overline{\lambda}_z$ is inversely related to a measure for the size of informality in the intermediate good sector *z*, whereas $\overline{\lambda}$ is simply an average of compliance rates $\overline{\lambda}_z$. That is, the larger the informality in the intermediate good sector, the lower the rate of compliance (i.e., the higher the evasion rate) for a typical firm in the final good sector. This assumption implies that tax evasion of a firm in the final good sector is correlated to the informality of firms from which it buys intermediate goods, as in de Paula and Sheinkman (2008). This leads to an indirect transmission of tax evasion from the intermediate good sector to the final good sector.

The value-added tax in the model is collected by the credit method: the tax rate applies to each sale and each firm may receive a credit for the amount of taxes paid in the previous stages of production. Hence if the cost of the intermediate good (before taxes) is $p_z m_z$, the firm in the final good sector receives a tax credit by the amount $\tau_{c,z}\overline{\lambda}_z p_z m_z$. Thus tax evasion in the intermediate good sector *z* implies a trade-off for firms in the final good sector. On the one hand, higher informality in the intermediate good sector implies that taxes effectively paid by firms in the final good sector are lower. On the other hand, higher informality in the intermediate good sector means that a lower tax credit may be claimed by final good firms. In the extreme case where tax evasion in the intermediate good sector is zero, this leads to full tax compliance and the right to a full tax claim by firms in the final good sector.

In addition, firms must comply with contributions to social security but they are willing to avoid paying such taxes. As before, this creates an incentive for some firms to hire a mix of formal and informal labor, denoted

respectively by $L_{f,m}$ and $L_{nf,m}$, and for others to hire either formal or informal workers only. However, the probability $\tilde{\lambda}_m$ of being detected by the authority hiring informal workers is much simpler here: it does not depend on the size of the firm. Instead, such probability is determined endogenously from optimality conditions so that the marginal cost of formal and informal labor is the same. The advantage of such assumption is to make the transmission mechanism of tax evasion from intermediate to final good firms more transparent. Otherwise, the expected tax bill of final good firms would not only be a function of the size of informality in the intermediate good sector but also a function of their own size. The shortcoming of such assumption is that the model is only able to solve for labor demand L_m, leaving its composition between formal and informal labor undetermined.

The problem of the representative firm in the final good sector is thus to choose $\{m_i, m_j, L_{f,m}, L_{nf,m}\}$ to maximize expected profits Π^{fin}, taking prices $\{p_i, p_j, w_f, w_{nf}\}$ and taxes $\{\tau_\pi, \tau_{c,i}, \tau_{c,j}, \tau_n\}$ as given. Expected profits may be written as:

$$\begin{aligned}\Pi^{fin} = &\left(1-\tau_\pi\bar{\lambda}\right)\Big\{\left(1-\gamma\tau_{c,i}\bar{\lambda}_i-(1-\gamma)\tau_{c,j}\bar{\lambda}_j\right)\left[M(m_i,m_j)\right]^{\alpha_m}L_m^{\alpha_L}A_m^{1-\alpha_m-\alpha_L}\\ &-\left(1-\tau_{c,i}\bar{\lambda}_i\right)p_i m_i-\left(1-\tau_{c,j}\bar{\lambda}_j\right)p_j m_j-\left(w_f+\tau_n\right)L_{f,m}-\left(w_{nf}+\tilde{\lambda}_m\theta\right)L_{nf,m}\Big\}\end{aligned} \tag{8}$$

In this context, GDP may be defined as the gross value added in the final good sector.

2.3. Solution of the model

In the intermediate good sector *z*, the maximization problem (5) indicates that there are potentially three types of firms (*cf*. Guner *et al*., 2008):

(1) Firms with a level of capital K_z relatively low so that it is optimal for them to choose informal workers only, with the restriction $L_{nf,z}\left(w_{nf}, p_z, K_z\right) \le \underline{L}_z$.

(2) Firms with a level of capital K_z relatively high, so that it is optimal for them to choose formal workers only, where labor demand satisfies $L_{f,z}\left(w_f, \tau_n, \tau_{c,z}, p_z, K_z\right) \ge \bar{L}_z$.

(3) Firms with an intermediate level of capital K_z choosing a mix of formal and informal workers, where total labor satisfies the condition $\underline{L}_z < L_{mix,z}\left(w_f, \tau_n, \tau_{c,z}, w_{nf}, p_z, K_z\right) < \bar{L}_z$.

This implies that there must be two critical levels for physical capital K_z in the intermediate good sector z, denoted by $\{K_z^-, K_z^+\}$ and the restriction $K_z^- < K_z^+$, so that:

(1) If $K_z \in [0, K_z^-]$, firms hire informal workers only.

(2) If $K_z \in [K_z^+, \overline{K}_z]$, firms hire formal workers only.

(3) If $K_z \in (K_z^-, K_z^+)$, firms hire a mix of formal and informal workers.

From the first-order conditions of a firm in the intermediate good sector, it may be shown that such critical levels $\{K_z^-, K_z^+\}$ are given by:

$$K_z^- = \left(\frac{w_{nf}}{\alpha A_z p_z} \right)^{\frac{1}{1-\alpha}} \underline{L}_z \text{, and } K_z^+ = \left(\frac{w_f + \tau_n}{(1-\tau_{c,z})\alpha A_z p_z} \right)^{\frac{1}{1-\alpha}} \overline{L}_z . \tag{9}$$

The specification of the problem implies that there are three labor demand functions, depending on the level of physical capital of the firm:

$$L_{nf,z} = \left(\frac{\alpha A_z p_z}{w_{nf}} \right)^{\frac{1}{1-\alpha}} K_z , \qquad K_z \in [0, K_z^-], \tag{10}$$

$$L_{f,z} = \left(\frac{(1-\tau_{c,z})\alpha A_z p_z}{w_f + \tau_n} \right)^{\frac{1}{1-\alpha}} K_z , \qquad K_z \in [K_z^{+.}, \overline{K}_z], \tag{11}$$

$$\text{And } L_{mix,z} = \left(\frac{(1-\tau_{c,z}\hat{\lambda}(K_z))\alpha A_z p_z}{w_f + \tau_n} \right)^{\frac{1}{1-\alpha}} K_z , \quad K_z \in (K_z^-, K_z^+). \tag{12}$$

In expression (10), the probability for a firm with capital size $K_z \in [0, K_z^-]$ of being detected by the authority hiring informal workers is zero. Thus it is optimal for firms of such capital size to hire informal workers only. The opposite is true for firms with capital size relatively large, namely $K_z \in [K_z^{+.}, \overline{K}_z]$. In such a case, total labor demand is composed of formal workers only as the probability of detection is one. This labor demand is given by expression (11). Finally, total labor demand for firms of intermediate capital size $K_z \in (K_z^-, K_z^+)$ is given by (12).

To determine the amount of informal workers demanded by a firm of capital size $K_z \in (K_z^-, K_z^+)$, a particular function for the probability of

detection $\lambda(L_{nf,z}, K_z)$ is needed. A function satisfying the conditions mentioned above is the following:

$$\lambda\left(L_{nf,z}, K_z\right) = \left(\frac{K_z}{K_z^+ - K_z^-}\right)\left(L_{nf,z}\right)^{\beta}, \tag{13}$$

With $\beta > 1$. From optimality conditions, the demand for informal workers may be written as:

$$L_{nf,z}^{mix} = \left[\left(\frac{w_f + \tau_n - w_{nf}}{\theta(1+\beta)}\right)\left(\frac{K_z^+ - K_z^-}{K_z}\right)\right]^{1/\beta} \tag{14}$$

Finally, the demand of formal workers for firms with capital size $K_z \in \left(K_z^-, K_z^+\right)$ is given by $L_{mix,z} - L_{nf,z}$, using expressions (12) and (14).

In addition, a function for the probability of being detected evading income and value-added taxes is needed. In particular, the function $\hat{\lambda}(K_z)$ takes the particular form:

$$\hat{\lambda}\left(K_z\right) = \left(\frac{K_z}{K_z^+ - K_z^-}\right),$$

So that this probability of detection is closely related to the function $\lambda(L_{nf,z}, K_z)$ described by (13).

Here it is important to emphasize that the elimination of one of the three taxes in the model does not imply that the size of informal labor goes to zero. For example, consider the case where social security contributions are eliminated so that $\tau_n = 0$, but value-added and income taxes are still in place. In such scenario, firms with capital size in the interval $\left[0, K_z^-\right]$ will remain evading taxes as their probability of detection is still zero. Labor demand from such firms will still be informal, even though social security contributions are eliminated.

Now consider the maximization problem of firms in the final good sector, as denoted by expression (8). In general, it may be shown that the relative demand of intermediate goods may be written as:

$$\frac{m_i}{m_j} = \left[\left(\frac{\gamma}{1-\gamma}\right)\left(\frac{1-\tau_{c,j}\bar{\lambda}_j}{1-\tau_{c,i}\bar{\lambda}_i}\right)\left(\frac{p_j}{p_i}\right)\right]^{\frac{1}{1-\mu}} \tag{15}$$

Expression (15) indicates that there are potentially two sources of distortions for the demand of intermediate goods: differences in the rates of compliance $\overline{\lambda}_z$, and differences in value-added taxes between sectors. First, consider the case where the rate of compliance in sectors *i* and *j* is the same. In such a case, a difference in value-added taxes between sectors will distort the relative demand of intermediate goods. Now consider the case where value-added taxes are equal between sectors $(\tau_{c,i} = \tau_{c,j})$. To the extent that $\overline{\lambda}_z$ is different in sectors *i* and *j*, the final good producer will face a distortion in relative prices. Of course, an evaluation of the magnitude of these distortions is needed in order to have a better idea about their relevance. As discussed in section 3, data suggests these distortions are relatively large.

Before closing this section, it is important to keep in mind that the economy faces two resource constraints: one for capital and one for labor. The constraint on capital is given by:

$$\overline{K} = \int_0^{\overline{K}_i} K_i f(K_i) dK_i + \int_0^{\overline{K}_j} K_j f(K_j) dK_j \,,$$

Where the first and second terms in the right side are total capital allocated to the intermediate good sector *i* and *j*, respectively.

Given that tax reform exercises below contemplate the elimination of social security contributions, a distinction can be made for the resource constraint on labor in each case. If social security contributions must be paid by firms ($\tau_n > 0$), it may be shown from equations (10) – (12) that the resource constraint on labor is given by:

$$\overline{L} = \sum_z \left(\frac{\alpha A_z p_z}{w^*} \right)^{\frac{1}{1-\alpha}} \int_0^{K_z^-} K_z f(K_z) dK_z$$

$$+ \sum_z \left(\frac{\alpha A_z p_z}{w^* + \tau_n} \right)^{\frac{1}{1-\alpha}} \left[\int_{K_z^-}^{K_z^+} \left(1 - \tau_{c,z} \hat{\lambda}(K_z)\right)^{\frac{1}{1-\alpha}} K_z f(K_z) dK_z \right]$$

$$+ \sum_z \left(\frac{(1-\tau_{c,z}) \alpha A_z p_z}{w^* + \tau_n} \right)^{\frac{1}{1-\alpha}} \left[\int_{K_z^+}^{\overline{K}_z} K_z f(K_z) dK_z \right] + L_m\left(\tau_{c,i}, \tau_{c,j}, \tau_n, \overline{\lambda}_i, \overline{\lambda}_j, w^*\right),$$

Where w^* represents the equilibrium wage rate. The first term in the right side is aggregate labor demand by informal firms in the intermediate good sector *z = i, j*, whereas the second and third terms are the aggregate labor demand functions by mixed and fully formal firms, respectively. As expected, labor demand by informal firms does not depend on social security

contributions. The final term in the right side is the labor demand function by firms in the final good sector, denoted by:

$$L_m\left(\tau_{c,i},\tau_{c,j},\tau_n,\overline{\lambda}_i,\overline{\lambda}_j,w^*\right)=\left\{\frac{\alpha_L\left[(1-\gamma\overline{\lambda}_i\tau_{c,i}-(1-\gamma)\overline{\lambda}_j\tau_{c,j}\right]\left[M(m_i,m_j)\right]^{\alpha_m}A_m^{1-\alpha_L-\alpha_m}}{w^*+\tau_n}\right\}^{\frac{1}{1-\alpha_L}} \quad (16)$$

On the other hand, if social security contributions are eliminated the resource constraint on labor translates into:

$$\overline{L}=\sum_z\left(\frac{\alpha A_z p_z}{w^*}\right)^{\frac{1}{1-\alpha}}\int_0^{K_z^-}K_z f(K_z)dK_z$$

$$+\sum_z\left(\frac{\alpha A_z p_z}{w^*}\right)^{\frac{1}{1-\alpha}}\left[\int_{K_z^-}^{K_z^+}\left(1-\tau_{c,z}\hat{\lambda}(K_z)\right)^{\frac{1}{1-\alpha}}K_z f(K_z)dK_z\right]$$

$$+\sum_z\left(\frac{(1-\tau_{c,z})\alpha A_z p_z}{w^*}\right)^{\frac{1}{1-\alpha}}\left[\int_{K_z^+}^{\overline{K}_z}K_z f(K_z)dK_z\right]+L_m\left(\tau_{c,i},\tau_{c,j},\overline{\lambda}_i,\overline{\lambda}_j,w^*\right)$$

Where the second term in the right side is simply the labor demand function (16) evaluated at $\tau_n=0$. Of course, the resource constraint on labor in each scenario determines the equilibrium wage rate w^* in the model, for given values of tax and compliance rates.

2.4. Government revenue

Now it only remains to describe the equations defining government revenue out of value-added taxes, income taxes and social security contributions. Consider first revenue out of value-added taxes. From the final good sector, such revenue is given by the expression:

$$\left(\gamma\tau_{c,i}\overline{\lambda}_i+(1-\gamma)\tau_{c,j}\overline{\lambda}_j\right)\left[M(m_i,m_j)\right]^{\alpha_m}L_m^{\alpha_L}A_m^{1-\alpha_m-\alpha_L}-\tau_{c,i}\overline{\lambda}_i p_i m_i-\tau_{c,j}\overline{\lambda}_j p_j m_j \quad (17)$$

As for the intermediate good sector, a distinction is needed between those firms facing a probability of detection between zero and one, and those firms that fully comply with their tax bill as the probability of being detected is equal to one. For a firm with a capital size $K_z\in\left(K_z^-,K_z^+\right)$, its expected tax bill is just $\tau_{c,z}\hat{\lambda}(K_z)p_z A_z\left[L_{mix,z}(K_z)\right]^{\alpha}K_z^{1-\alpha}$. Aggregating over firms in the interval $\left(K_z^-,K_z^+\right)$ and across sectors *i* and *j*, the corresponding revenue may be written as:

$$\tau_{c,i} p_i A_i \int_{K_i^-}^{K_i^+} \hat{\lambda}(K_i)\left[L_{mix,i}(K_i)\right]^{\alpha} K_i^{1-\alpha} f(K_i) dK_i + \tau_{c,j} p_j A_j \int_{K_j^-}^{K_j^+} \hat{\lambda}(K_j)\left[L_{mix,j}(K_j)\right]^{\alpha} K_j^{1-\alpha} f(K_j) dK_j \tag{18}$$

For firms with capital size $K_z \in \left[K_z^+, \overline{K}_z\right]$, their tax bill is just $\tau_{c,z} p_z A_z \left[L_{f,z}(K_z)\right]^{\alpha} K_z^{1-\alpha}$. Again, revenue from value-added taxes is obtained by aggregating over firms in the interval $\left[K_z^+, \overline{K}_z\right]$ and across sectors, namely:

$$\tau_{c,i} p_i A_i \int_{K_i^+}^{\overline{K}_i} \left[L_{f,i}(K_i)\right]^{\alpha} K_i^{1-\alpha} f(K_i) dK_i + \tau_{c,j} p_j A_j \int_{K_j^+}^{\overline{K}_j} \left[L_{f,j}(K_j)\right]^{\alpha} K_j^{1-\alpha} f(K_j) dK_j \tag{19}$$

Finally, total revenue from value-added taxes is given by the sum of expressions (17), (18), and (19).

Refer now to income taxes. Revenue from the final good sector may be written as $\tau_\pi \overline{\lambda} \Pi^{fin} / \left(1 - \tau_\pi \overline{\lambda}\right)$, where Π^{fin} is given by (8). Following the same argument as above, a distinction is needed for firms in the intermediate good sector. In particular, revenue from firms in the interval $\left(K_z^-, K_z^+\right)$ is just:

$$\tau_\pi \int_{K_i^-}^{K_i^+} \hat{\lambda}(K_i) \hat{\Pi}_{mix,i}^{\text{int}}(K_i) f(K_i) dK_i + \tau_\pi \int_{K_j^-}^{K_j^+} \hat{\lambda}(K_j) \hat{\Pi}_{mix,j}^{\text{int}}(K_j) f(K_j) dK_j \tag{20}$$

Here, $\hat{\Pi}_{mix,z}^{\text{int}}(K_z)$ represents gross profits (i.e., profits before paying income taxes) for a firm of capital size K_z using a mix of formal and informal labor. Correspondingly, income revenue from firms with capital size in the interval $\left[K_z^+, \overline{K}_z\right]$ is given by:

$$\tau_\pi \int_{K_i^+}^{\overline{K}_i} \hat{\Pi}_{f,i}^{\text{int}}(K_i) f(K_i) dK_i + \tau_\pi \int_{K_j^+}^{\overline{K}_j} \hat{\Pi}_{f,j}^{\text{int}}(K_j) f(K_j) dK_j \tag{21}$$

,

Where $\hat{\Pi}_{f,z}^{\text{int}}(K_z)$ are gross profits (*i.e.*, before paying income taxes) for a firm with a given capital size K_z. Thus, total revenue from income taxes is simply the sum of $\tau_\pi \overline{\lambda} \Pi^{fin} / \left(1 - \tau_\pi \overline{\lambda}\right)$, and expressions (20) and (21).

It remains to specify revenue from social security contributions. From the final good sector, such revenue may be expressed as $\tau_n L_m\left(\tau_{c,i}, \tau_{c,j}, \tau_n, \overline{\lambda}_i, \overline{\lambda}_j, w^*\right)$ with labor demand defined by (16). From equations (11), (12) and (14), the corresponding revenue from the intermediate good sector is written as:

$$\tau_n \left\{ \sum_z \left(\frac{\alpha p_z A_z}{w^* + \tau_n} \right)^{\frac{1}{1-\alpha}} \int_{K_z^-}^{K_z^+} \left(1 - \tau_{c,z} \hat{\lambda}(K_z)\right)^{1/(1-\alpha)} K_z f(K_z) dK_z \right.$$

$$\left. - \sum_z \int_{K_z^-}^{K_z^+} L_{nf,z}^{mix}(K_z) f(K_z) dK_z + \sum_z \left(\frac{(1-\tau_{c,z}) \alpha p_z A_z}{w^* + \tau_n} \right)^{\frac{1}{1-\alpha}} \int_{K_z^+}^{\overline{K}_z} K_z f(K_z) dK_z \right\}. \quad (22)$$

3. Simulating the model

This section evaluates a series of scenarios based on the tax reform proposal by Levy (2008) already mentioned in the introduction. The author points out that social security contributions in Mexico cause a sizable wedge between wages in the formal and informal sectors, thus creating an incentive for firms to evade these taxes. In such framework, Levy's proposal is to eliminate social security contributions and to provide simultaneously a universal health care system along with unemployment insurance. To finance this change in social policy, Levy (2008) aims at increasing government revenue mainly out of value-added taxes.

To study the effects of such proposal in terms of the model above, two changes in tax liabilities $\tau_{c,i}$ and τ_n are considered: an increase in the value-added tax rate to 15% for those goods not currently taxed, and the elimination of social security contributions (SSC). Given the widespread special treatments on value-added taxes in Mexico discussed in section 1, it is important to evaluate how economic agents would respond to a scenario where such special treatments are eliminated. On the other hand, the elimination of SSC may have significant effects on tax compliance by firms. For these reasons, the model provides an interesting setting to evaluate the impact of such changes in tax rates on government revenue.

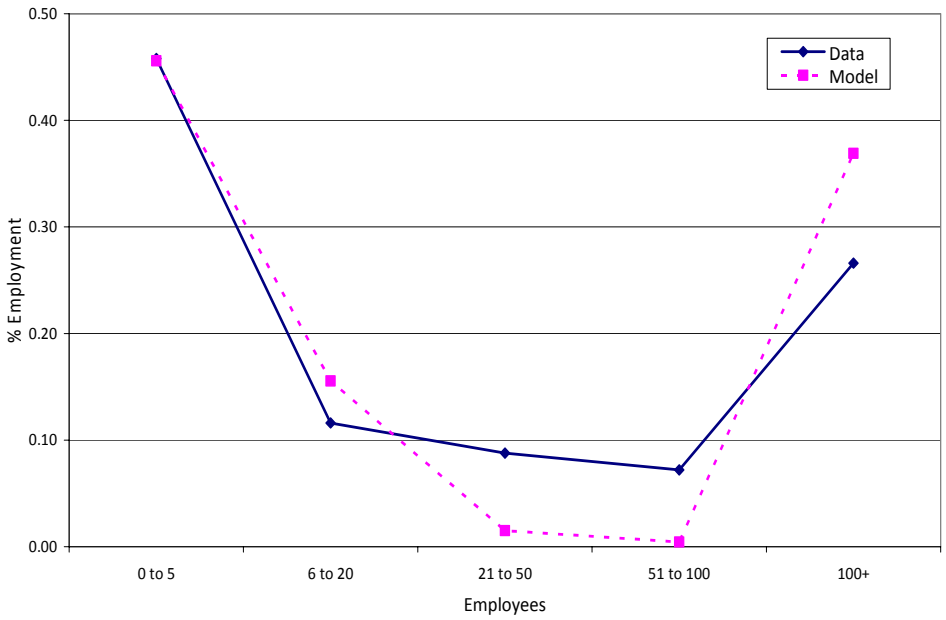
3.1. Relative price distortions in the data

Before discussing the results, this section illustrates the magnitude of price distortions in Mexican data, as captured by the demand of intermediate goods (15). In this regard, both the current tax law and data collected at the firm level suggest these distortions are large. As discussed in section 1, special treatments in the Mexican tax law imply that a large share of goods is essentially non-taxed (the "non-taxable" sector) whereas the remaining goods are taxed at a 10 or 15% rate (the "taxable" sector), depending on a geographical criterion. On the other hand, information from the 2004 Economic Census suggests there are sizable differences in employment shares

between the "non-taxable" and "taxable" sectors.[11] It turns out that they may reflect substantial differences in informality between sectors, as discussed next.

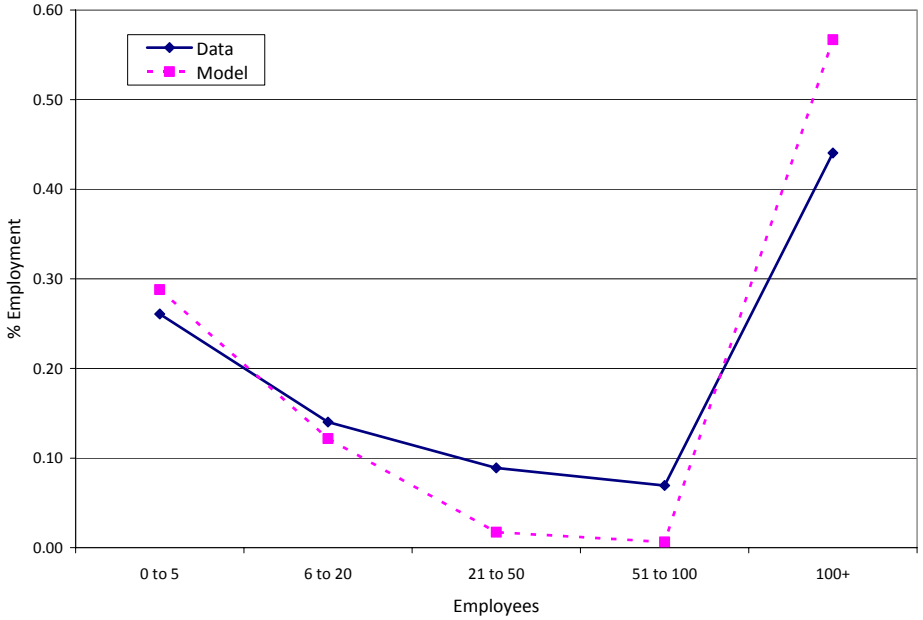
To estimate employment shares in these two sectors, firms in the 2004 Economic Census are first classified into either "taxable" or "non-taxable" sectors, according to the tax law criteria. Once this classification is done, the corresponding employment shares in each sector are estimated. Data shows that firms with 0 to 5 employees account for about 46% of total employment in the "non-taxable" sector. In contrast, this number is about 26% in the "taxable" sector. In contrast, firms with more than 100 employees account for 27% of employment in the "non-taxable" sector, whereas this fraction increases to 44% in the "taxable" sector (see Figures 1 and 2). Thus the distribution of employment varies significantly between sectors.

FIGURE 1. EMPLOYMENT SHARES IN THE "NON-TAXABLE" SECTOR



[11] The 2004 Economic Census misses some important features of economic activity in Mexico. In particular, the census excludes all activities in rural areas, activities from public organizations providing health and social assistance services, and urban transportation activities in mobile units like taxis and buses, among others. Also it excludes all firms that carry out their activities in an ambulatory fashion or with installations not permanently fixed to the ground. This means that commercial activities performed by firms in the streets are not included. For this reason, presumably the shares of employment for small-scale firms reported in Figures 1 and 2 below might be underestimated.

FIGURE 2. EMPLOYMENT SHARES IN THE "TAXABLE" SECTOR



These numbers suggest large differences in terms of informality between sectors. Levy (2008) compares registries for the number of workers and firms from the 2004 Economic Census to those from the social security agency in Mexico (IMSS). Data is classified by size as measured by the number of workers at the firm level. For firms with a relatively small number of workers, there are large discrepancies between the registries from the Economic Census and those from IMSS. As the number of workers reported by the Census is substantially larger than IMSS, this suggests that there is a large fraction of small firms that do not register their workers to IMSS in order to avoid paying for social security contributions. Levy (2008) estimates that about 84% of firms with a size of 0 to 2 workers are informal (in the sense that they do not pay social security contributions). Interestingly, these discrepancies decrease sharply as the size of the firm increases. In particular, only 4% of firms with a size of 500 workers or more are informal. Based on this information, Figures 1 and 2 suggest that the size of informality in the "non-taxable" sector may be larger than the "taxable" sector.[12] In terms of equation (15), these differences might cause a large distortion for the demand of intermediate goods.

[12] Ideally, the registries from IMSS could be disaggregated between "taxable" and "non-taxable" sectors. These registries could then be compared to those from the Economic Census in order to have an estimate for the size of informality in each sector. Unfortunately, this disaggregated data from IMSS is not publicly available to the best of our knowledge

3.2. Calibration

Whenever possible, parameters of the model are calibrated to replicate some features of Mexican data. For convenience, parameter values for the benchmark calibration are listed in Table 10.

TABLE 10. CALIBRATION FOR THE BENCHMARK MODEL

Parameter		Value	Target
Value-added tax in "food" sector	$\tau_{c,i}$	0	Set by Mexican tax law
Value-added tax in "non-food" sector	$\tau_{c,j}$	0.15	Set by Mexican tax law
Income tax	τ_n	0.28	Set by Mexican tax law
Tax on social security contributions	τ_n	$0.35w_f$	35% wedge between w_f and w_{nf}
Labor share in intermediate sector	a	0.65	Standard labor share in GDP
Technology level in intermediate sector z	A_z	0.8	Positive labor demand in intermediate sector z
Intermediate good share in final good's gross output	a_m	0.42	Share of intermediate goods in gross output in Mexican data
Labor share in final good sector	a_L	0.38	Consistent with the standard labor share in GDP
Share of m_i in intermediate good M	γ	0.38	Value-added share of "food" sector in Mexican data
Parameter related to the elasticity of substitution between m_i and m_j	μ	-4	Elasticity of substitution of –0.20
Lower bound on labor	$\underline{L}_z$	7	Taken from Levy (2008)
Upper bound on labor	$\overline{L}_z$	80	Taken from Levy (2008)
Fine if discovered hiring informal workers	θ	$0.5w_f$	Taken from Levy (2008)
Curvature parameter for probability of detection function	β	1.76	informal labor/total labor demand between 0.36 and 0.55
Price of intermediate good i	p_i	0.97	Taken from data
Price of intermediate good j	p_j	1.01	Taken from data
Mean capital in interm. sector i	$\tilde{\mu}_i$	0.36	Employment shares in sector i
Mean capital in interm. sector j	$\tilde{\mu}_j$	0.11	Employment shares in sector j
St. dev. capital in interm. sector i	σ_i	1.69	Employment shares in sector i
St. dev. capital in interm. sector j	σ_j	1.83	Employment shares in sector j

Consider first the parameters related to taxation. In terms of the model, the intermediate good sector i represents the "non-taxable" or "food" sector of the economy in the sense that food and other major items are not taxed in Mexico under the current law. This implies setting $\tau_{c,i} = 0$. Following this argument, the intermediate good sector j in the model represents the "taxable" or "non-food" sector of the economy. In 2009, the statutory tax

rate in such goods was 15%. Therefore, $\tau_{c,j}$ is set to 0.15.[13] On the other hand, the income tax rate τ_{π} is set to 0.28. This was the corresponding statutory tax rate in 2009.[14] Based on evidence by Levy (2008), the tax rate on social security contributions, τ_n, is set to 35% of the wage rate in the formal sector.

The next series of parameters are related to technology. For the case of intermediate goods, a is set to 0.65. This value for the labor share is consistent with the results for Mexico provided by García-Verdú (2005). In addition, the levels of technology A_i and A_j are even out so that differences in results do not arise from differences in technologies between sectors. They are set so that labor demand in each sector z is not negative along the simulations. For the technology in the final good sector, the parameter a_m is set to 0.42. This is the average share of intermediate goods in gross output, according to Mexican data reported by the National Statistics Institute (INEGI) for the period 2003–2007. As a reference, Mendoza and Yue (2008) use a value for this parameter of 0.43. The parameter α_L is calibrated so that the labor share *in value added*, $\alpha_L/(1-\alpha_m)$, matches the 65% labor share above.

There is no readily available information for the weight γ of intermediate good m_i in expression (7). As a proxy, the value-added tax base for zero-rated and exempt goods over the value-added tax base assuming no special treatments is used. Information from Table 7 suggests this value is around 0.38. To the best of our knowledge, there are no estimates available in the literature for the elasticity of substitution between "taxable" and "non-taxable" intermediate goods. Presumably, this elasticity of substitution is relatively low. For the benchmark parameterization, μ is set to –4 so that the corresponding elasticity of substitution is –0.20. Finally, the fixed factor A_m is set to match the share of government revenue out of value-added taxes in terms of GDP, which is about 4% in Mexican data.

The next series of parameters are related to the probability for a firm of being caught evading taxes, as specified by expressions (4) and (13). The lower and upper levels of labor, $\underline{L}_z$ and $\overline{L}_z$ respectively, are set following the observations in Levy (2008). The author emphasizes that such levels depend on a series of factors. However, based on data from the Economic Census 2004 and IMSS registries, Levy infers that the lower bound $\underline{L}$ is around seven workers, whereas the upper bound $\overline{L}$ is between 80 and 90 workers. In the parameterization of the model, no differences between the lower and upper levels of labor between "taxable" and "non-taxable" sectors is assumed, so

[13] In 2009, the statutory tax for such goods in the border Mexican states was 10%. The model abstracts from this issue and simply sets $\tau_{c,j}$ to 15%. On the other hand, recent changes in the fiscal law have been approved by the Congress. Starting 2010, the tax rate on taxable items has been raised to 16%. The corresponding tax rate for the border Mexican states has been raised to 11%. This change in the tax law and its implication on total government revenue out of value-added taxes is explored in detail in section 3.4.

[14] Starting 2010, this tax rate has been increased to 30% by law.

that $\underline{L}_i = \underline{L}_j$ and $\overline{L}_i = \overline{L}_j$. Thus the lower bound of labor in both sectors is set to 7 workers, whereas the upper bound is set to 80 workers.

Based on the estimates of Levy (2008), the penalty θ imposed by the authority if a firm is caught evading social security contributions is set to 50% of the labor wage in the formal sector. The parameter β in the technology of detection (13) is fixed to 1.76. This number yields a share of informal workers over labor demand of 55% in the "taxable" sector and of 36% in the "non-taxable" sector. These percentages are within the intervals at the aggregate level reported by Levy (2008) and Leal (2009). In particular, Levy (2008) estimates that the fraction of the economically active population classified as informal was 58% in 2006. Using a different data source, Leal (2009) reports a share of informal employees (defined in terms of non-enrolment with IMSS) of 31% for the third quarter of 2002. The author claims no significant changes over time for this number.

Next, estimates for prices and wages are needed. For the price of intermediate goods, a price index for both "taxable" and "non-taxable" sectors at producer's prices is constructed using information from Banco de México. First, items at the most disaggregated level are classified into either "taxable" or "non-taxable" according to the Mexican tax law. Next, the corresponding price index is constructed using the weights provided by Banco de México. Data for the period December 2003 – July 2009 show that the price index of the "taxable" sector is 4% larger than the corresponding index for the "non-taxable" sector on average.[15] Taking the price of the final good as the numeraire, this implies setting $p_i = 0.97$ and $p_j = 1.01$. As for wages in the formal and informal sectors, evidence from Levy (2008) suggests that wages in both sectors are approximately equal. For this reason, the simulation assumes $w_f = w_{nf}$. In the model, the labor endowment $\overline{L}$ is set so that the equilibrium wage rate is equal to one under the benchmark.

It remains to define the distribution function for capital K_z in each sector. This is important as the distribution of physical capital is crucial to determine government revenue (see equations 18 to 22). As labor demand in the intermediate good sector is a function of capital, it is possible to derive employment shares from the model given a distribution function for capital in each sector. Following Guner *et al*. (2008), these functions must be chosen so that employment shares from the model can roughly match the corresponding shares in the data reported in Figures 1 and 2.

As in Guner *et al*. (2008), the log of physical capital K_z is assumed to be a (truncated) normal distribution with mean $\tilde{\mu}_z$ and variance σ_z^2. This distribution accounts for most of the employment in each intermediate sector

[15] The series start in December, 2003 since Banco de México changed the basket of goods used to estimate the producer's price index since that date on.

z, with a total mass $1-f_{z,\max}$. The remaining distribution of employment can be accounted for by selecting a top value for physical capital, $K_{z,\max} > \overline{K}_z$, and its corresponding fraction, $f_{z,\max}$. Hence, the distribution of physical capital has two parts: the bottom side, which accounts for most of the employment, is defined by a log-normal distribution whereas the top side is captured by an extreme value of physical capital. This approach helps to replicate in an easier way the share of employment for the upper tail of the distribution. Under the benchmark, the corresponding mass $f_{z,\max}$ in the "taxable" and "non-taxable" sectors is 6.6e-6 and 1.9e-5, respectively. The estimates for $\tilde{\mu}_z$ and σ_z^2 are reported in Table 9.

Figures 1 and 2 compare the employment shares obtained from the model to those observed in the data. Even though the model underestimates the labor shares in the middle of the distribution in each sector, it does a fair job in replicating the general features found in the data.

Overall, the calibration listed in Table 10 yields a VAT revenue/GDP ratio of 4.0% under the benchmark, which is roughly consistent with the findings in the first part of the paper. Under the same calibration, the model is able to estimate the evasion rate of value-added taxes as a share of GDP. To perform this exercise, the rates of compliance $\overline{\lambda}_i$ and $\overline{\lambda}_j$ are set to 1 so that a measure of VAT revenue/GDP can be obtained under full compliance. In such hypothetical scenario, the VAT revenue/GDP ratio in the model increases to 6.0%. This implies an evasion rate of 2.0/6.0 = 0.33 in value-added taxes under the benchmark case. Again, this rate is consistent with the numbers provided in section 1.

On the other hand, both the corporate income tax revenue/GDP ratio and the revenue from social security contributions (SSC) as a share of GDP are slightly larger in the benchmark model than in the data. For this reason, an adjustment factor is applied to these numbers so that the corporate income tax revenue/GDP ratio is 1.9% and the SSC revenue/GDP ratio is 2.8% under the benchmark (see Revenue Statistics, OECD 2009).[16] It is important to remark that these adjustments do not affect the optimality conditions of the model whatsoever.

[16] The OECD does not present disaggregated data on revenue out of taxes on income and profits for Mexico. The ratio of such revenue in terms of GDP was 5% in 2007. The value of 1.9% presented above implies that about 38% of taxes on income and profits in Mexico were paid by corporations.

3.3. Results

As a preliminary step, first it is useful to look at the effects of each tax reform on the labor market. Table 11 presents the composition of labor demand for alternative tax reform scenarios under partial equilibrium, namely assuming no changes in the wage rate w_f. As a reference, the first two rows in part A present the shares of formal and informal labor in each intermediate sector under the benchmark. As already mentioned, the shares of formal and informal labor in the final good sector are undetermined.

TABLE 11. COMPOSITION OF LABOR DEMAND UNDER PARTIAL EQUILIBRIUM

Type of labor	Intermediate good sector *i*	Intermediate good sector *j*	Final good sector
A. Benchmark			
Formal (%)	45	64	-
Informal (%)	55	36	-
Total (%)	100	100	100
B. VAT reform only ($\tau_{c,i}$ = 0.15)			
Labor demand relative to benchmark	1.00	1.00	0.93
Of which			
Formal (%)	45	64	-
Informal (%)	55	36	-
C. VAT reform + elimination of SSC (τ_n = 0)			
Labor demand relative to benchmark	1.66	1.91	2.02
Of which			
Formal (%)	69	83	-
Informal (%)	31	17	-
D. VAT reform + elimination of SSC + full compliance			
Labor demand relative to benchmark	1.66	1.91	1.81
Of which			
Formal (%)	100	100	-
Informal (%)	0	0	-

Notes: $\tau_{c,i}$ and τ_n are the value-added tax rate in the intermediate good sector *i* and the tax rate on social security contributions, respectively. SSC denotes social security contributions.

The first tax reform exercise assumes an increase in the value-added tax rate from zero to 15% in the intermediate sector *i*. As a result, labor demand in the intermediate good sector is not affected by the increase in the VAT rate (see equations 10 to 12), as denoted by the first row of Table 11, section B. Thus the composition of labor also remains unaffected in each intermediate sector. However, from (16) it is clear that labor demand in the final good sector must fall. Under such scenario, this fall is about 7% relative to the benchmark case.

The next tax reform exercise increases the VAT rate to 15% in the intermediate sector *i*, and simultaneously eliminates social security

contributions ($\tau_n = 0$). Such measure increases labor demand in all sectors (see equations 11, 12 and 16). From a partial equilibrium perspective, these effects are enormous: labor demand increases between 66 and 102% relative to the benchmark case. In addition, the elimination of social security contributions changes the composition of labor in the intermediate good sector. In particular, the share of formal labor in sectors *i* and *j* increases from 45 to 69%, and from 64 to 83%, respectively. The last row in part C of Table 10 is the share of informal labor in each intermediate sector. This amount of labor is demanded by firms evading value-added and income taxes, with capital size in the interval $\left[0, K_z^-\right]$.

The last part of Table 11 presents the same tax reform exercise as in part C but assuming full tax compliance. Under partial equilibrium effects, labor demand from the intermediate good sector does not change in absolute terms (relative to part C) as these labor demands do not depend on compliance rates $\overline{\lambda_z}$. However, now all labor is classified as formal in the sense that there are no firms evading either income or value-added taxes. On the other hand, labor demand in the final good sector must fall (relative to the scenario in part C) as full tax compliance implies an increase in the effective VAT rates faced by firms in such sector (see equation 16).

Of course, the numbers in Table 11 are merely illustrative in the sense that general equilibrium effects are ignored, in particular the effect on wages due to changes in labor demand. Once general equilibrium effects are taken into account, the effects of tax reforms on labor demand should be lower. In this regard, an important issue is to measure the equilibrium wage rate w^* in terms of a price index. A natural candidate is the producer's price index. However, the disadvantage is that sales and value-added taxes are not taken into account in such index by construction. In terms of the model, this would imply that the producer's price index would remain constant even after changes in tax rates.

For this reason, an alternative is to construct a consumer's price index consistent with the model. Let expression (7) to represent the consumer's basket of goods. A standard cost-minimization problem yields the consumer's price index P:

$$P = \left\{\gamma^{1-\eta}\left[p_i(1+\tau_{c,i})\right]^{\eta} + (1-\gamma)^{1-\eta}\left[p_j(1+\tau_{c,j})\right]^{\eta}\right\}^{1/\eta},$$

Where $\eta \equiv \mu/(\mu-1)$. Notice that P is now a function of value-added tax rates, so a tax reform involving changes in such taxes can have an impact on P.

Table 12 presents the effect of the tax reform scenarios already discussed in Table 11 on several variables of interest in general equilibrium. Under the

benchmark, the equilibrium wage rate w^* is 1 and the consumer's price index is 2.13. This yields a value of 0.47 for our measure of real wage w^*/P. Along the simulations, the rate of tax compliance $\overline{\lambda}_z$ is measured as one minus the share of informal labor $L_{nf,z}$ demanded by firms with capital size in the interval $\left[0, K_z^-\right]$ over total labor demand L_z in sector *z*. Under the benchmark, the compliance rates in the "non-taxable" and "taxable" sectors are 48 and 67%, respectively. This implies that the effective tax rate $\tau_{c,j}\overline{\lambda}_j$ faced by firms in the final good sector is 10%.

TABLE 12. EFFECTS OF FISCAL REFORMS ON EFFECTIVE TAX RATES AND WAGES

Variable of interest	Benchmark	Value-added tax reform only ($\tau_{c,i}$ = 0.15)	Value-added tax reform + elimination of social security contributions (τ_n = 0)	Value-added tax reform + elimination of social security contributions + full compliance
w^*	1	0.97	1.29	1.23
P	2.13	2.27	2.27	2.27
w^*/P	0.47	0.43	0.57	0.54
$\overline{\lambda}_i$	0.48	0.49	0.62	1.00
$\overline{\lambda}_j$	0.67	0.68	0.78	1.00
$\tau_{c,i}\overline{\lambda}_i$	0	0.07	0.09	0.15
$\tau_{c,j}\overline{\lambda}_j$	0.10	0.10	0.12	0.15

Notes: In the Table, *w** is the equilibrium wage rate, and *P* is the consumer's price index. $\overline{\lambda}_z$ represents the rate of compliance in the value-added tax associated to the intermediate good sector *z* =*i* ,*j*, faced by firms in the final good sector. $\tau_{c,z}$ and τ_n are the value-added tax rate in the intermediate good sector *z* and the tax rate on social security contributions, respectively. The term $\tau_{c,z}\overline{\lambda}_z$ is the effective value-added tax rate paid by firms in the final good sector.

Consider the first tax reform exercise, which involves an increase in $\tau_{c,i}$ from zero to 15%. The decrease in labor demand L_m discussed in Table 11 causes a fall in the equilibrium wage rate to 0.97. Simultaneously, the consumer's price index increases to 2.27 so that the real wage rate w^*/P falls by 8.5%. The fall in the wage rate w^* decreases the share of informal labor slightly in each intermediate sector, so that the rates of compliance $\overline{\lambda}_i$ and $\overline{\lambda}_j$ just barely change. However, the effective tax rate $\tau_{c,i}\overline{\lambda}_i$ increases to 7%.

The situation is different once social security contributions are eliminated. Since there is perfect labor mobility, the new equilibrium wage rate w^* must be equal in both informal and formal sectors. Thus $w^* = w_f = w_{nf}$. The large increase in labor demand already discussed in Table 11 leads to an increase in the equilibrium wage rate to 1.29. In real terms, the wage w^*/P increases by 21% relative to the benchmark. The fall in informal labor as a result of eliminating social security contributions increases the compliance rates $\overline{\lambda}_i$ and $\overline{\lambda}_j$ to 62 and 78%, respectively. These compliance rates are less than one as there are still some small firms evading taxes. The corresponding effective tax rates also increase to 9 and 12%.

The last column presents a situation assuming full compliance of tax obligations in addition to the tax reforms analyzed in previous columns. The new equilibrium wage rate w^* is lower, as labor demand L_m falls. However, the real wage is still 15% larger than its benchmark value. By assumption, the effective compliance rates are now 15% each.

Now it is time to explore what happens to government revenue in general equilibrium. Table 13 presents the results for GDP and the three sources of revenue under the same tax reform exercises reported in Tables 11 and 12. The numbers in absolute terms are presented relative to their corresponding benchmark values. The second column presents government revenue for each category under the benchmark. In such a case, total revenue as a share of GDP is equal to 8.7%.

TABLE 13. GDP AND REVENUE UNDER ALTERNATIVE FISCAL REFORM SCENARIOS (RELATIVE TO BENCHMARK)

Variable	Benchmark	Value-added tax reform only ($\tau_{c,i}$ = 0.15)	Value-added tax reform + elimination of social security contributions (τ_n = 0)	Value-added tax reform + elimination of social security contributions + full compliance
GDP	1.0	1.00	1.01	1.01
A. Value-added tax				
Revenue	1.0	1.36	1.61	2.20
Revenue/GDP (percentage)	4.0	5.4	6.4	8.8
Gap explained (percentage)	-	30	21	49
B. Corporate income tax				
Revenue	1.0	0.99	1.16	1.59
Revenue/GDP (percentage)	1.9	1.9	2.2	3.0
Gap explained (percentage)	-	-2	29	73
C. Social Security Contributions				
Revenue	1.0	0.99	0.00	0.00
Revenue/GDP (percentage)	2.8	2.7	0.0	0.0
D. Total				
Revenue	1.0	1.16	1.00	1.37
Revenue/GDP (percentage)	8.7	10.0	8.6	11.8

Notes: $\tau_{c,i}$ and τ_n represent the value-added tax rate in the intermediate good sector *i* and the tax rate on social security contributions, respectively. The row "gap explained" estimates the percentage by which each alternative scenario marginally contributes to explain the gap between the revenue/GDP ratio under full reform and full compliance, and the revenue/GDP ratio under the benchmark. The table only presents corporate income tax revenue, as the model excludes personal income taxes.

If the tax rate $\tau_{c,i}$ increases to 15%, revenue out of value-added taxes increases by 36%. In terms of GDP, this represents an increase of 1.4 percentage points relative to benchmark. Simultaneously, revenue out of corporate income taxes and social security contributions just change slightly. This reflects the small change in the rates of compliance due exclusively to changes in $\tau_{c,i}$, as discussed above. In such scenario, total revenue in terms of GDP increases to 10%.

If social security contributions are eliminated in addition to the increase in the tax rate $\tau_{c,i}$, the higher rates of compliance induce a further increase in revenue out of both value-added and corporate income taxes. In particular, value-added tax revenue as a share of GDP increases by one percentage point, whereas corporate income taxes in terms of GDP increase by 0.3 percentage

points. Under such scenario, the corresponding VAT productivity (i.e., the VAT revenue/GDP ratio per percentage point of the VAT rate) would be 43% (=6.4/15), which implies a larger VAT productivity in Mexico relative to the averages observed in OECD and Latin America countries (see Table 2). On the other hand, the share of total revenue/GDP decreases to 8.6% due to the elimination of social security contributions. This number is slightly lower than its benchmark value.

The last column illustrates the case where full tax compliance is assumed in addition to the tax reforms considered. Under such hypothetical scenario, the VAT revenue/GDP ratio would increase to 8.8%. This number implies a gap of about 4.8 percentage points between the "ideal" and the observed VAT revenue/GDP ratio.[17] The numbers in Table 13 suggest that about 50% of such gap would be closed under a tax reform contemplating both an increase in the tax rate $\tau_{c,i}$ and the elimination of social security contributions. On the other hand, the "ideal" revenue out of corporate income taxes would be 3% of GDP. Overall, the share of total revenue/GDP would increase further to 11.8% under full compliance.

In summary, the results from Tables 12 and 13 are compelling. In particular, the model suggests that a tax reform aimed at imposing a uniform value-added tax rate of 15% while simultaneously eliminating social security contributions would leave the ratio of total revenue/GDP nearly unchanged. At the same time, real wages would increase by roughly 21% as a result of large shifts in labor demand.

3.4. Evaluation of recent changes to the tax law

Recently, the Mexican Congress has approved a series of changes to the tax law in order to increase government revenue. Among these changes, the value-added tax rate on goods already taxed has been increased from 15 to 16% starting 2010.[18] In this section, the one percentage point increase in the tax rate is incorporated into the model to evaluate the expected increase in revenue from value-added taxes.

Table 14 presents the impact of an increase in $\tau_{c,j}$ on the equilibrium wage rate and the rates of compliance under alternative scenarios. The third

[17] There is a substantial difference between the "ideal" VAT revenue/GDP ratio found here and the "ideal" ratio reported in section 1. There are several reasons why this might be so. For example, the model presented in section 2 does not take into account the different VAT rates existing between the border Mexican states and the rest of the country. The model also abstracts from the special tax treatment applied to micro retailers (REPECOs). Most important, the estimates reported in section 1 assume no change in firm's behavior and abstract from general equilibrium effects.

[18] Starting 2010, the income tax rate has been increased from 28 to 30% for workers earning more than a predetermined level of income. In terms of the model, changes in the income tax rate do not affect either the size of informality or the decision of firms in the final good sector. In fact, the income tax rate acts like a lump sum tax in the model.

column assumes the only change in policy is the increase in the tax rate of the intermediate good *j* to 16%. The fourth column assumes that, in addition to the increase in the tax rate, the extra revenue is used by the government to allocate larger subsidies to the informal sector. Under such policy, the previous gap of 35% between wages in the formal and informal sectors is now arbitrarily increased to 40%. This implies setting $\tau_n = 0.4 w_f$.

TABLE 14. EFFECTS OF RECENT CHANGES TO THE TAX LAW ON LABOR SHARES AND WAGES

Variable of interest	Benchmark	Value-added tax reform only ($\tau_{c,j}$ = 0.16)	Value-added tax reform + larger subsidies to informal labor ($\tau_n = 0.4 w_f$)
w^*	1	0.99	0.98
w^* / P	0.47	0.46	0.46
$\overline{\lambda}_i$	0.48	0.49	0.46
$\overline{\lambda}_j$	0.67	0.67	0.65

See the notes in Table 11.

The third column illustrates that the increase in the tax rate to 16% would have minor effects on the variables of interest, including a fall of about 2% in real wages. On the other hand, larger subsidies to informal labor would decrease the rates of compliance $\overline{\lambda}_z$, thus increasing evasion rates in the model.

Finally, Table 15 presents the effects of such policies on revenue out of value-added tax and GDP. The increase of one percentage point in $\tau_{c,j}$ leads to an increase in the VAT revenue/GDP ratio from its benchmark value of 4 to 4.3%. If such policy is combined with subsidies to informal labor, the final effect is such that the revenue/GDP ratio would slightly decrease to 4.2%. However, it is interesting to note that under such scenario, GDP would decrease in absolute terms relative to its benchmark value. If GDP under the benchmark is used instead, the corresponding revenue/GDP ratio would decrease further from 4.2% to its initial 4% value.

TABLE 15. VALUE-ADDED TAX REVENUE AND GDP UNDER RECENT CHANGES TO THE TAX LAW (RELATIVE TO BENCHMARK)

Variable	Benchmark	Value-added tax reform only ($\tau_{c,j}$ = 0.16)	Value-added tax reform + larger subsidies to informal labor ($\tau_n = 0.4w_f$)
Revenue	1.0	1.07	1.00
GDP	1.0	1.00	0.96
Revenue/GDP (percentage)	4.0	4.3	4.2

See the note in Table 12.

Conclusions

This paper has presented an evaluation of Levy's (2008) proposal from a revenue perspective. Abstracting from changes in the behavior of economic agents, data from national accounts suggests that the elimination of special treatments in value-added taxes would increase the VAT revenue/GDP ratio from its current level of 3.8% to a number around 6.8%. Once changes in firm's behavior are taken into account in a general equilibrium context with tax evasion, the model suggests that Levy's proposal would leave government revenue as a share of GDP nearly unchanged, even after taking into account the fall in revenue from social security contributions. In addition, such proposal might increase real wages by approximately 21% as a result of large shifts in labor demand due to the elimination of social security contributions. Given that labor endowment is fixed in the model, this number could be interpreted as an upper bound.

It is important to remark that the model abstracts from several important issues. First, this is a static model so important dynamic effects are ignored. For example, the set of tax policies considered might have an important effect on capital accumulation and thus on growth. Second, the model does not take into account the decisions faced by households. In this regard, it would be interesting to evaluate how household might change their behavior when faced with higher value-added taxes on "food" goods. Also, it might be interesting to analyze how a policy that eliminates social security contributions might affect the labor supply decision of households.

Annexs

ANNEX A. TABLE A1

Total Supply

	2003	2004	2005	2006
Taxes on G & S				
VAT	259167	291147	327182	390735
Import duties	27000	29680	26977	31832
Other taxes to products (excises, etc)	132517	101099	71841	60974
Subsidies to products	-25654	-31715	-30436	-81898
Total Taxes to G & S	393030	390211	395564	401643
Prodution at market prices				
Production at basic values	12425075	14181023	15447467	17342108
Total Taxes to G & S	393030	390211	395564	401643
Prodution at market prices	12818105	14571233	15843031	17743751
Total Supply				
Prodution at market prices	12818105	14571233	15843031	17743751
Imports (CIF)	2026188	2432995	2641655	3037584
Total Supply	14844293	17004228	18484686	20781335

Source: National Accounts System, INEGI, www.inegi.gob.mx

Millions of pesos

ANNEX B. TABLE B1

Total Demand

	2003	2004	2005	2006
Intermediate Demand	5,262,302	6,013,942	6,667,772	7,500,530
Effective Final Consumption	5,936,600	6,594,508	7,133,806	7,795,018
Gross Fixed Capital Formation	1,430,894	1,689,012	1,868,294	2,166,920
Inventory variation	298,733	438,925	384,843	547,315
Exports	1,915,766	2,281,359	2,507,353	2,902,868
Total Demand	*14,844,294*	*17,017,747*	*18,562,067*	*20,912,650*
Private domestic final consumption				
Private Consumption	5,042,755	5,673,612	6,141,414	6,714,263
Net acquisitions in foreign markets	-35,084	-43,929	-46,500	-44,392
Private domestic final consumption	5,077,839	5,717,541	6,187,914	6,758,654
Domestic Final Consumption				
Private Consumption	5,042,755	5,673,612	6,141,414	6,714,263
Government Consumption	893,844	920,896	992,392	1,080,755
Domestic Final Consumption	5,936,600	6,594,508	7,133,806	7,795,017
Domestic Final Consumption excluding VAT collection				
Domestic Final Consumption	5,936,600	6,594,508	7,133,806	7,795,017
VAT	259,167	291,147	327,182	390,735
Domestic Final Consumption excluding VAT collection	5,677,433	6,303,361	6,806,624	7,404,282

Source: National Accounts System, INEGI, www.inegi.gob.mx

Millions of pesos

ANNEX C.

IMPUESTOS GENERALES AL CONSUMO (% DEL PIB), 2006

PAÍSES OCDE		PAÍSES América Latina	
EUA	2.2	Panamá	1.0
Japón	2.6	Argentina	4.0
Suiza	3.9		
Australia	4.0	*México*	*4.2*
México	*4.2*	Brasil	4.9
		Paraguay	5.4
Corea	4.5	Ecuador	5.4
Canadá	4.7	Guatemala	5.4
Turquía	5.5	Costa Rica	5.4
Luxemburgo	5.7	Perú	5.6
Alemania	6.3	Colombia	5.7
Italia	6.3	Venezuela	6.6
España	6.4	El Salvador	7.0
República Checa	6.6	Nicaragua	7.3
Reino Unido	6.7	Chile	7.4
Holanda	7.3	Bolivia	8.8
Bélgica	7.4	Uruguay	9.1
Francia	7.5		
Grecia	7.5	**Promedio**	5.8
República Eslovaca	7.6	**Coef. Var.**	0.34
Austria	7.7		
Irlanda	7.9		
Noruega	8.0		
Polonia	8.1		
Finlandia	8.6		
Portugal	8.9		
Nueva Zelanda	9.0		
Suecia	9.2		
Hungría	9.8		
Dinamarca	10.2		
Islandia	11.3		
Promedio	6.85		
Coef. Var.	0.32		

Fuente: OCDE Revenue Statistics 1965-2007 y CEPAL.

TASAS GENERALES DEL IMPUESTO AL CONSUMO, 2006

PAÍSES OCDE		PAÍSES América Latina	
Japón	5.0	Panamá	5.0
Canadá	7.0	Paraguay	10.0
Suiza	7.5	Ecuador	12.0
Australia	10.0	Guatemala	12.0
Corea	10.0	Bolivia	13.0
Nueva Zelanda	12.5	Costa Rica	13.0
		El Salvador	13.0
México	*15.0*	Venezuela	14.0
Luxemburgo	15.0	*México*	*15.0*
Alemania	16.0		
España	16.0	Nicaragua	15.0
Turquía	17.0	Colombia	16.0
Reino Unido	17.5	Chile	19.0
Grecia	18.0	Perú	19.0
Holanda	19.0	Brasil	20.0
Portugal	19.0	Argentina	21.0
Francia	19.6	Uruguay	23.0
Austria	20.0		
Italia	20.0	**Promedio**	15.0
Bélgica	21.0	**Coef. Var.**	0.31
Irlanda	21.0		
Finlandia	22.0		
Polonia	22.0		
República Checa	22.0		
República Eslovaca	23.0		
Noruega	24.0		
Islandia	24.5		
Dinamarca	25.0		
Hungría	25.0		
Suecia	25.0		
Promedio	17.88		
Coef. Var.	0.32		

Fuente: OCDE Revenue Statistics 1965-2007 y CEPAL.

ANNEX D

	Sector Manufacturero			
	P. Tasa Cero	P.Exentos	P. IVA Formal	P. IVA Informal
Carnes y lácteos	0.978	0.000	0.021	0.002
Preparación de frutas y legumbres	1.000	0.000	0.000	0.000
Molienda de trigo	1.000	0.000	0.000	0.000
Molienda de maíz	1.000	0.000	0.000	0.000
Beneficio y molienda de café	1.000	0.000	0.000	0.000
Azúcar	1.000	0.000	0.000	0.000
Aceites y grasas comestibles	1.000	0.000	0.000	0.000
Alimentos para animales	0.000	0.000	0.916	0.084
Otros productos alimenticios	1.000	0.000	0.000	0.000
Bebidas alcohólicas	0.000	0.000	0.986	0.014
Cerveza y malta	0.000	0.000	0.987	0.013
Refrescos y aguas	0.099	0.000	0.764	0.137
Tabaco	0.000	0.000	0.981	0.019
Otros textiles	0.000	0.000	0.676	0.324
Prendas de vestir	0.000	0.000	1.000	0.000
Cuero y Calzado	0.000	0.000	0.781	0.219
Papel y Cartón	0.000	0.000	0.941	0.059
Imprentas y editoriales	0.000	0.961	0.039	0.000
Petróleo y derivados	0.000	0.000	1.000	0.000
Productos farmacéuticos	0.991	0.000	0.009	0.000
Jabones, detergentes y cosméticos	0.000	0.000	0.898	0.102
Electrodomésticos, Aparatos electrónicos,etc.	0.000	0.000	0.936	0.064
Otras manufacturas	0.011	0.005	0.928	0.056

Participación dentro del gasto en todos estos bienes

Electricidad, agua y suministro de gas por ductos al consumidor final	0.05754
Sector manufacturero	0.60963
Transportes, correos y almacenamiento	0.06182
Servicios profesionales, científicos y técnicos	0.10071
Servicios educativos	0.08945
Servicios de salud y de asistencia social	0.03056
Servicios de esparcimiento culturales y deportivos, y otros servicios recreativos	0.03550
Servicios de alojamiento temporal y de preparación de alimentos y bebidas	0.01479

Participación dentro del gasto (Desglose de Sector Manufacturero)	
Alimentos,bebidas y tabaco	0.29460
Otros textiles	0.00441
Prendas de vestir	0.05287
Cuero y Calzado	0.02640
Papel y Cartón	0.00883
Imprentas y editoriales	0.01407
Pétroleo y derivados	0.05316
Productos farmaceuticos	0.01606
Jabones, detergentes y cosméticos	0.02130
Electrodomésticos	0.01267
Otras manufacturas	0.10525

ANNEX E

Total Demand: Adjusted for special treatments				
	2003	**2004**	**2005**	**2006**
Intermediate Demand	5,262,302	6,013,942	6,667,772	7,500,530
Effective Final Consumption	5,936,600	6,594,508	7,133,806	7,795,018
Gross Fixed Capital Formation	1,430,894	1,689,012	1,868,294	2,166,920
Inventory variation	298,733	438,925	384,843	547,315
Exports	1,915,766	2,281,359	2,507,353	2,902,868
Total Demand	14,844,294	17,017,747	18,562,067	20,912,650
Private domestic final consumption				
Private Consumption	5,042,755	5,673,612	6,141,414	6,714,263
Net acquisitions in foreign markets	-35,084	-43,929	-46,500	-44,392
Private domestic final consumption	5,077,839	5,717,541	6,187,914	6,758,654
Domestic Final Consumption				
Private Consumption of taxed items	**2,882,439**	**3,243,037**	**3,510,432**	**3,837,873**
Government Consumption	893,844	920,896	992,392	1,080,755
Domestic Final Consumption	3,776,283	4,163,933	4,502,825	4,918,627
Adjusted Domestic Final Consumption excluding VAT collection				
Adjusted Domestic Final Consumption	3,776,283	4,163,933	4,502,825	4,918,627
VAT collection	259,167	291,147	327,182	390,735
Adjusted Domestic Final Consumption net of V	3,517,116	3,872,786	4,175,643	4,527,892
Source: Own calculations based on National accounts and ENIGH, INEGI				

ANNEX F

ZERO-RATED & Exempt					
Period	**2003**	**2004**	**2005**	**2006**	**2007**
ZERO-RATED & Exempt	**2054251065**	**2229186679**	**2369696833**	**2565572832**	**2783849729**
Agricultura	285751473	301921914	298569422	330798863	365878851
Edificación Residencial	90959100.9	106467346.8	113390418.9	134125597.2	144852282.6
Elaboración de alimentos para animales	5890926	6411430	6502293	6960981	8076892
Molienda de granos y de semillas oleaginosas	21631805	24560029	24540938	25057440	29612678
Elaboración de azúcar, chocolates, dulces y similares	22275341	24364785	25987462	26949990	28987693
Conservación de frutas, verduras y guisos	14154201	16373431	17547224	19436105	22532502
Elaboración de productos lácteos	35130219	39942225	42074841	45425834	50522689
Matanza, empacado y procesamiento de carne de ganado y aves	53633636	58479143	65504366	64845253	72190839
Preparación y envasado de pescados y mariscos	3135358	3846448	4329337	4163550	4241645
Elaboración de productos de panadería y tortillas	116088219	125140223	132239861	143594268	160325239
Otras industrias alimentarias	29469592	32743493	34271993	36021879	38687373
Industria de las bebidas	60945876	66300975	74223534.6	82634607	87030349.2
Aserrado y conservación de la madera	11037457	11013753	11597709	12128157	13152848
Fabricación de fertilizantes, pesticidas y otros agroquímicos	2773233	3019814	3512214	3687758	4119189
Fabricación de productos farmacéuticos	54784870	58859658	61567163	65943111	73604646
Fabricación de maquinaria y equipo para las actividades agropecuarias, para la construcción y para la industria extractiva	2847488.4	3596187	4311189	4592254.2	5233765.8
Transporte terrestre de pasajeros, excepto por ferrocarril	218213710	238214789	248655341	262932031	279913493
Compañías de fianzas, seguros y pensiones	15590812.77	17131163.79	23531313.78	16949106.33	20192473.86
Servicios educativos	376383616	399764075	437008576	474715940	513970721
Servicios médicos de consulta externa y servicios relacionados	131596065	144805681	155158236	168329011	181081412
Edición de publicaciones y de software, excepto a través de Internet	24950609.6	26125088.8	27362497.6	29292636.8	32619549.6
Servicios postales	1950093	2199551	2391603	2423745	2601229
Museos, sitios históricos, jardines botánicos y similares	2973267	2855545	2965648	3238500	3923300
Hogares con empleados domésticos	39374496	41300255	43524980	46275517	50506959
Actividades del gobierno	63423960.4	66841896.8	71586504.6	78061583.6	83998483.8
Servicios inmobiliarios	369285639.5	406907779	437342167.5	476989114	505992626
Source: Own Calculations based on NAS, INEGI					

References

Agha, Ali and Jonathan Haughton (1996), "Designing VAT Systems: Some Efficiency Considerations", *The Review of Economics and Statistics* 78 (2), 303-308.

Bird, Richard (1992), *Tax Policy and Economic Development*, Johns Hopkins University Press, Baltimore Maryland.

De Paula, Áureo and José A. Sheinkman (2008), "The Informal Sector", Penn Institute for Economic Research *Working Paper* 08-018.

Erard, Brian and Feinstein Jonathan (1994), "The Role of Moral Sentiments and Audit Perceptions in Tax Compliance", Public Finances no. 49.

Fortin, Bernard, Nicolas Marceau and Luc Savard (1997), "Taxation, Wage Controls and the Informal Sector", *Journal of Public Economics* 66, 293–312.

García-Verdú, Rodrigo (2005), "Factor Shares from Household Survey Data", *Working Paper* 2005-05, Banco de México.

Gollin, Douglas (2006), "Do Taxes on Large Firms Impede Growth? Evidence from Ghana", *manuscript*, Williams College.

Guner, Nezih, Gustavo Ventura and Yi Xu (2008), "Macroeconomic Implications of Size-Dependent Policies", *Review of Economic Dynamics* 11, 721–744.

Hernández, Fausto and Andrés Zamudio (2003), "Estimaciones de la evasión del IVA en México: Hacia una primera caracterización", *manuscript* SAT, www.sat.gob.mx México D.F.

Hsieh, Chang-Tai, and Peter J. Klenow (2009a), "Misallocation and Manufacturing TFP in China and India", *Quarterly Journal of Economics* 124 (4), 1403–1448.

_____(2009b), "Resource Misallocation in Mexico", *manuscript*.

Keen, Michael and Stephen Smith (2007), "VAT Fraud and Evasion: What Do We Know and What Can Be Done?", IMF *Working Paper* 07/31.

Leal, Julio (2009), "Effects of Incomplete Enforcement on Labor Productivity", *manuscript*, Arizona State University.

Levy, Santiago (2008), *Good Intentions, Bad Outcomes: Social Policy, Informality and Economic Growth in Mexico*, Brookings Institution Press.

Lucas, Robert E., (1978), "On the Size Distribution of Business Firms", *Bell Journal of Economics* 9 (2), 508-523.

Martín del Campo, Erik (1998), "Estimación de la base y la evasión fiscal del IVA en México", *Gaceta de Economía* ITAM 3, 203-218.

Mathews, Kent (2003), "VAT Evasion and VAT Avoidance: Is There a European Laffer Curve?", *International Review of Applied Economics* 17 (1), 105–114.

Mendoza, Enrique G. and Vivian Z. Yue (2008), "A Solution to the Default Risk-Business Cycle Disconnect", NBER *Working Paper* 13861.

Organization for Economic Co-operation and Development (2009), Revenue Statistics.

Plaza, Ramón (1981), *Contabilidad Social*, UNAM, México D.F.

Restuccia, Diego and Richard Rogerson (2008), "Policy Distortions and Aggregate Productivity with Heterogeneous Establishments", *Review of Economic Dynamics* 11 (4), 707–720.

Smith, Kent (1992), "Reciprocity and Fairness: Positive Incentives for Tax Compliance", in Joel Slemrod, *Why People Pay Taxes: Tax Compliance and Enforcement*, University of Michigan Press.

Spicer M. and Lee Becker (1980), "Fiscal Inequity and Tax Evasion: An Experimental Approach", *National Tax Journal* 33 (2), 171-175.

Trigueros, Ignacio (2001), "Anexo de estimación de evasión de IVA. Análisis de la finanzas públicas en México", edición especial de la *Gaceta de Economía*, ITAM.

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