Sub-national Revenue Mobilization in Mexico

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Abstract

This paper estimates potential Mexican sub-national tax revenues using a stochastic frontier model. The results suggest that states are exploiting their current tax bases, particularly the payroll tax, appropriately. Mexican municipalities, however, have a low rate of tax collection compared to their potential, especially in relation to the property tax, which is their most important source of revenue and relatively simple to collect. Empirical evidence further suggests that tax collection efforts are strongly related to GDP per capita, and that some political economy factors can influence them. Political affiliation, for example, influences municipalities' tax collection effort more than that of states. The analysis of a scenario in which some VAT and PIT taxation powers are returned to the states suggests that a state surcharge on the VAT and PIT could increase states' own revenues. Without broadening the tax base and redefining the revenue-sharing allocation criteria, however, doing so would have a strong and adverse impact on the revenue distribution of sub-national governments.

1. Introduction

In the near future, Mexico will face one of the biggest fiscal challenges in its history: the need to diversify its tax revenue in order to decrease its high dependence on oil revenues. Oil revenues have financed the current level of public expenditures (including investments), which cannot be sustained without this source of financing. The high degree of uncertainty, oil price volatility, and ongoing depletion of oil reserves point to the urgency of finding alternative sources of revenue. Mexico is among the countries with the lowest tax revenue in proportion to GDP. Including oil revenues, Mexico collects only 17.4 percent of GDP. Moreover, excluding this non-renewable source, tax collection is about 10.3 percent, while the OECD average is 33.8 percent. Countries such as Denmark and Sweden collect more than 45 percent of their GDP, while a country like Poland, which has a GDP per capita more similar to Mexico's—collects 31.8 percent. Mexican revenue is low even when compared with other Latin American countries; Brazil collects 33.1 percent and Argentina 31.5 percent.[1]

This paper explores alternative methods for increasing tax revenue in Mexico. In particular, it focuses on the potential of sub-national units given the low degree of fiscal autonomy among them. In 2007, only 4 percent of total general government revenues were collected by states and municipalities. Among OECD countries, where sub-national revenues average about 22.6 percent of total revenues, only Ireland and Greece have lower shares of sub-national revenues (Figure 1). For some federal countries, such as Switzerland and Canada, the figure is close to 50 percent. The legal framework of the Mexican Fiscal Coordination Law published in 1997 has largely contributed to the increase in expenditure authority of states and municipalities without promoting tax collection responsibilities. This situation leaves local and Federal governments in a vulnerable position given the high dependency of oil prices. Some also argue that this disconnection between expenditure and collection increases the chances of mismanagement of public monies and diminishes the quality of government (Huntington 1991: 65).

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[1] OECD Revenue Statistics 2009 and CEPAL.http://websie.eclac.cl/sisgen/ConsultaIntegradaFlashProc.asp

Figure 1. Sub-national Revenue as a Percent of Total Revenue, 2007
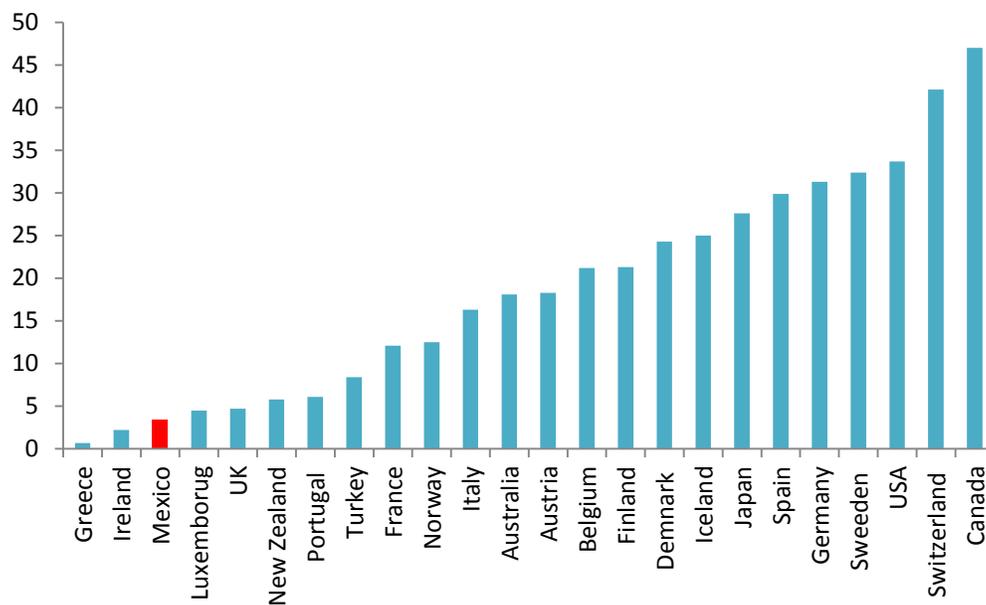
This paper uses a stochastic frontier analysis to determine the tax collection effort of states and municipalities in Mexico. This technique allows an estimation of the potential tax collection of fiscal units given certain characteristics. Tax collection effort is defined here as the ratio of observed tax collection to the potential collection at the efficiency frontier. The analysis shows that most states and municipalities underperform in tax collection effort given their economic and political characteristics, current fiscal authorities, and tax bases. However, even if states and municipalities were to exploit their total potential, states' total revenue would increase only by 6 percent, compared to 23 percent for the municipalities

These results suggest that state tax bases are relatively well-exploited, which suggests that the current tax system should be reformed in order to increase states' revenue. Scenarios of reforms for consumption, personal income and electricity taxes are shown here as various options for increasing fiscal revenue of Mexican states.

2. The Mexican Fiscal Challenge in Light of the Decline in Oil Production

In recent decades, Mexican public finances have been characterized by high dependence on the oil industry. As of December 2010, Mexico received one third of its total budgeted revenues from the oil industry. Twenty years ago, the situation was exactly the same. In 1990, the oil industry contributed 30 percent of the nation's total budgeted revenues.[2] Hence, Mexico has failed to reduce its vulnerability to the very volatile price of a single commodity. Furthermore, diversification of revenue sources has not been achieved despite diminished oil production capacity.

On the expenditure side, the enforcement in 1997 of a new Fiscal Coordination Law centralized most revenue-raising responsibilities in the federal government, while decentralizing a large portion of national expenditure to sub-national governments. In 1990, states and municipalities together spent 20 percent of the nation's total budget. Currently, their share of general government (GG) spending is 57 percent. The states control the largest part (46 percent) of this spending. Since 1990, states have gone from raising 32 percent of their total resources to generating only 8 percent on average. The amount of resources raised locally by municipalities has declined from 33 percent to 19 percent on average.[3]

Figure 2 illustrates the drastic loss of sub-national fiscal autonomy, while Figure 3 illustrates the increase in their share of the expenditures. As can be inferred from both figures, sub-national governments, and states in particular, have gained substantially greater expenditure authority without acquiring further revenue-generating responsibilities. The heavy dependence of the states on federal transfers has turned the federal government into their lender of last resort, with the attendant moral hazard and risks for the federal budget.

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[2] SHCP. Estadísticas Oportunas de Finanzas Públicas y Deuda Pública. México, 2010.
[3] IMCO. Índice de Competitividad Urbana 2010: Acciones urgentes para las ciudades del futuro. México, 2010.

**Figure 2. State Revenues Raised by the Federal Government, 1989-2008
(as percent of total)**
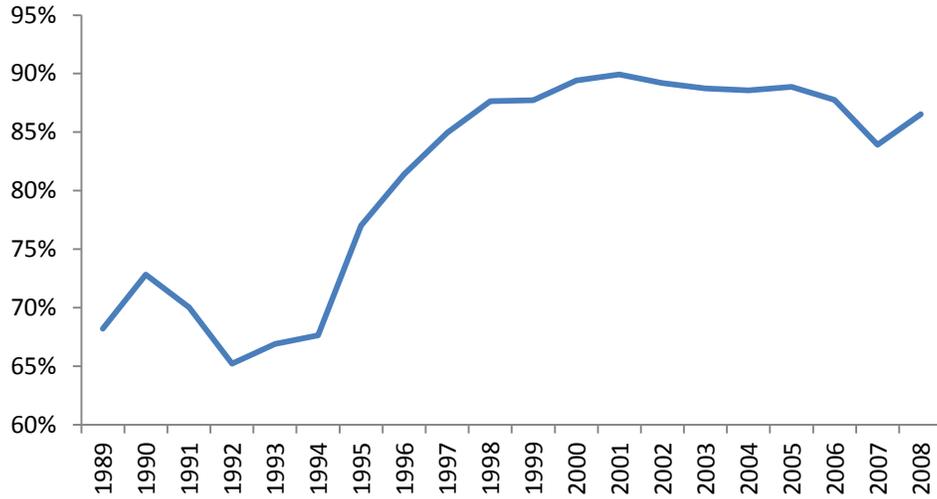
**Figure 3. Distribution of General Government Expenditures, 1989-2007
(as percent of total)**
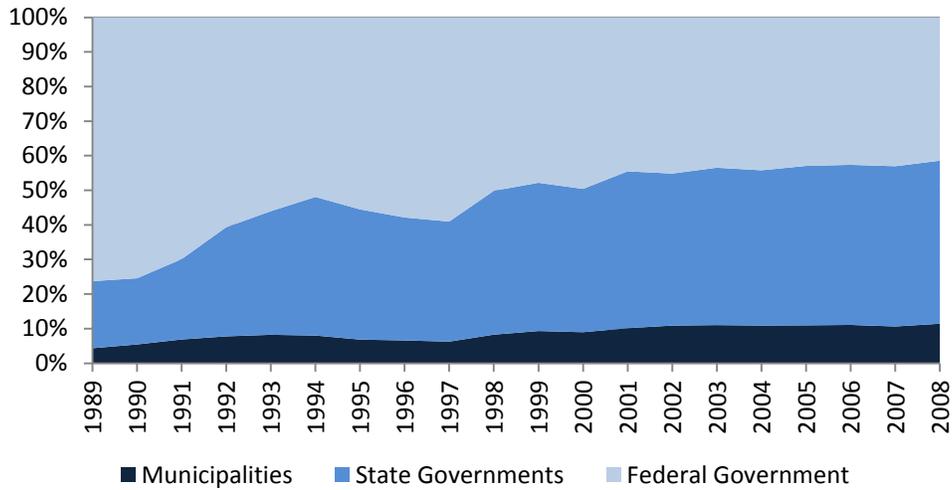
Only four out of 32 state governments in Mexico finance more than 10 percent of their expenditures (a low margin in itself) through own revenues. Table 1 ranks the 31 states plus the Federal District by their degree of fiscal autonomy (defined as local taxes, rights, royalties, and other local fees as a percentage of their total revenues).

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Table 1. Sub-national Fiscal Autonomy, 2009
(own revenues as percent of total revenues)

33.0%	Distrito Federal	6.9%	México	4.9%	Yucatán
19.2%	Chihuahua	6.7%	Jalisco	4.7%	Michoacán
15.2%	Nuevo León	6.3%	Tamaulipas	4.3%	Puebla
14.3%	Baja California Sur	6.0%	Veracruz	3.9%	Morelos
9.4%	Guanajuato	5.8%	Chiapas	3.5%	Guerrero
8.5%	Baja California	5.5%	Durango	3.5%	Nayarit
7.7%	Campeche	5.5%	Aguascalientes	3.4%	Tabasco
7.4%	Sinaloa	5.4%	San Luis Potosí	3.1%	Oaxaca
6.9%	Hidalgo	5.3%	Colima	2.6%	Tlaxcala

Source: IMCO with data from the states' budget laws.

If we consider that the federal government finances 92 percent of the state governments' budgets, and that 33 percent of federal revenues come from the oil industry while sub-national governments have little say on oil policies, the following question arises: how does oil dependence affect state governments? Using a straightforward calculation with the mathematical formulas from the Fiscal Coordination Law, and holding constant other variables,[4] a decrease in the price of a barrel of oil by US$2.00 should represent an average decrease of 0.74 percent in State revenues through federal transfers. However, given the requirement that federal transfers should be at least equivalent to the amount calculated the prior year, this reduction is entirely absorbed by the Federal government through spending cutoffs or increases in its debt, rather than passed on to the subnational governments.

Although, municipalities have significantly greater fiscal autonomy than states, as can be seen in Figure 4, the capacity of the third level of government to raise its own resources has also declined over time, and has been replaced by federal transfers. In 1989,

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[4] Daily oil barrel production, estimated annual oil barrel price, oil barrel exportation, USD-MXN exchange rate, revenue from the income tax, revenue from the value added tax, and revenue from the business tax.

municipalities raised 39 percent of their own revenues. By 2009, this had declined to an average of 19 percent, as they came to depend increasingly on federal or state transfers, which increased their vulnerability to unpredictable fluctuations in the oil market.

Figure 4. Federal and State Transfers to Municipalities, 1989-2009 as a Percent of Total Revenue
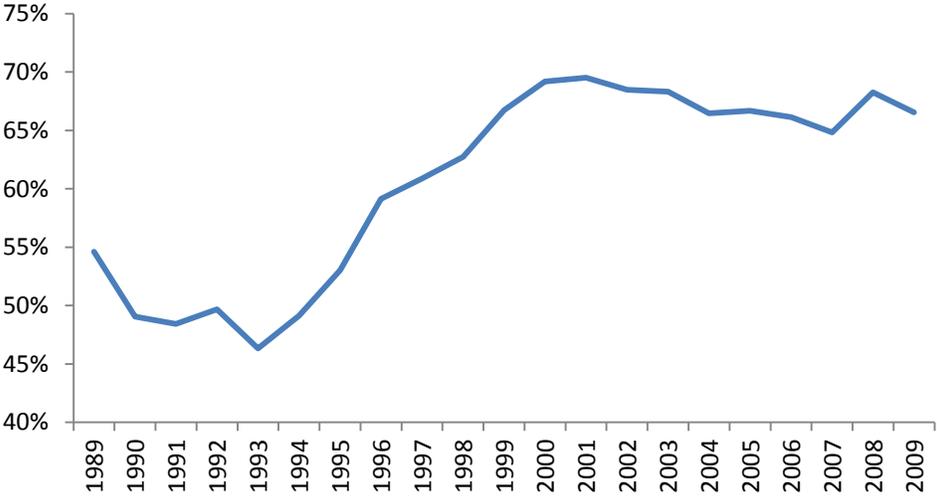
Source: IMCO with data from INEGI.

Mexico's Fiscal Coordination Law and its political structure make it virtually impossible to precisely identify the amount of oil revenues that are transferred to municipalities. The Fiscal Coordination Law allows each state to determine the mechanism for the distribution of federal transfers to its municipalities. Until 2010, for example, the state of Chihuahua lacked a formula for calculating such transfers. Instead, the amount to be transferred to each municipality was determined by a legislative decree. However, even if municipalities could be subject to some degree of uncertainty regarding their share of oil revenues, they are still protected by the restrictions stipulated in the Fiscal Coordination Law.

The Fiscal Coordination Law establishes that federal transfers to sub-national governments, regulated by a formula, cannot be reduced. Furthermore, the Fiscal Coordination Law dictates that federal transfers to states be at least the same as the amount calculated the prior year. The only reasons that federal transfers can decrease are: i) a fiscal crisis wherein the national income is less than the year before, in which case the state

governments would receive the same *proportion* of the total federal budget as the prior year, but a smaller quantity of funds; or ii) a decrease in the country or the state's population. Hence, as can be seen in Figure 5, federal transfers to sub-national governments are influenced little by decreases in oil revenue. As a matter of fact, from 1990 to 2010, federal transfers to sub-national governments grew by 194 percent. Total national revenue from oil grew at a much slower pace, 83 percent, in the same period.

As the situation stands today, the federal government passes almost all of its oil revenue to the sub-national governments. Indeed, from 1998 to 2003, revenue from oil alone would have been insufficient to cover federal transfers to sub-national governments (Figure 5). Additionally, under current circumstances, every reduction in oil prices is absorbed by the federal government. That means that, in the case of a US$2.00 reduction in oil prices, in order to fulfill restrictions of Fiscal Coordination Law, Federal government would have to offset a reduction of 0.49 percent in municipal revenues. Combined with the amount corresponding to states, this represents a reduction in the federal budget of 1 percent.

**Figure 5. Oil Revenue vs. Federal Transfers
(in constant MXN millions)**
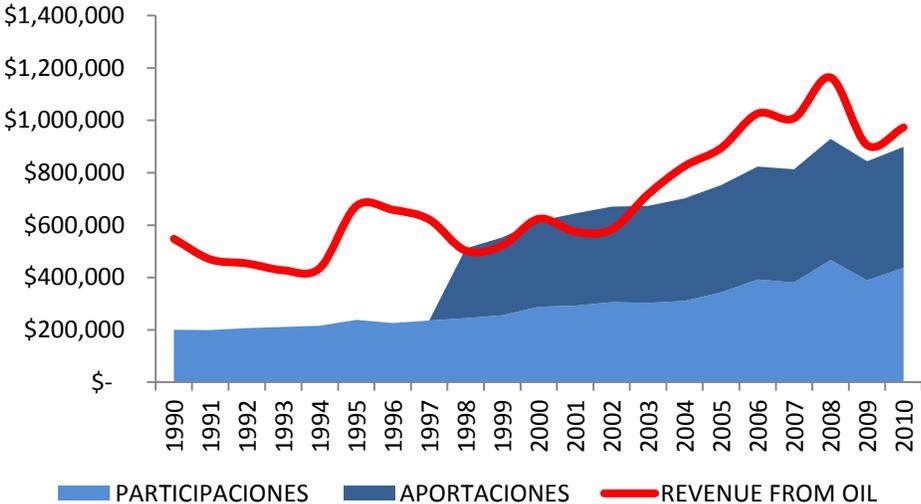
Source: IMCO with data from INEGI and the Treasury Ministry (SHCP).

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At first glance, such declines might not seem very drastic. However, history has shown that oil prices tend to fall by much more than US$2.00 (Table 2). For example, in 1998 the average price of oil per barrel was 34 percent less than the price assumed in the budget law. According to estimations by IMCO, using data from the economic criteria forecasts published by the central government and the Law on Hydrocarbons, a decline of US$10.00 in the budgeted price per barrel of oil would reduce the national budget by 5 percent. Figure 6 shows that the loss of revenue from such a decline would be equivalent to two-thirds of the total public debt. To offset this loss, the base for the value-added tax would have to be increased by 36 percent, or the rate would have to increase from 16 percent to 22 percent.

Table 2. Projected vs. Actual Oil Prices per Barrel,
1998-2008 Annual Averages

	Official Expected Oil Barrel Price (USD)	Year Average Oil Barrel Price (USD)	Difference (percent)
1998	$15.50	$10.18	-34
1999	$9.25	$15.57	68
2000	$15.00	$24.79	65
2001	$18.00	$18.61	3
2002	$15.50	$21.52	39
2003	$18.35	$24.77	35
2004	$20.00	$31.05	55
2005	$23.00	$42.71	86
2006	$36.50	$53.05	45
2007	$42.80	$61.63	44
2008	$49.00	$89.38	82

Source: IMCO with data from Pardinas (2009).

**Figure 6. Impact of a US$10.00 per Barrel Decrease in Price of Oil
on the Federal Budget, 2010 (in MXN millions)**

■ $10 USD Loss   ■ Revenue

Public Debt	Value Added Tax	Income Tax	Oil
63%	36%	27%	17%
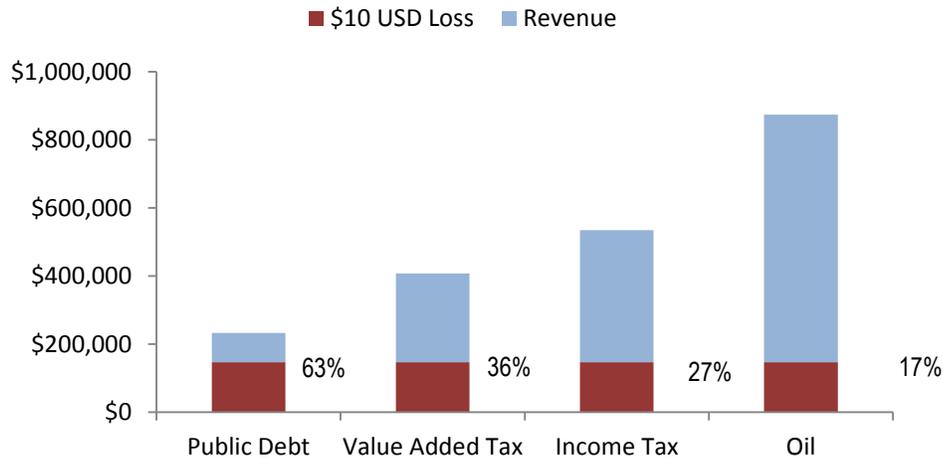
Source: IMCO with data from federal budget laws for 2010.
Note: Percentages represent the reduction of revenue due to a $10 USD loss.

Once the relationship between oil revenue and the Mexican governments' finances has been established and understood, a second question emerges. How feasible is a crisis scenario in the Mexican oil industry? The answer is that it is a latent possibility. Figure 7 illustrates the perilous recent history of Mexico's oil production. As of 2009, average daily production of oil has fallen by 23 percent from its peak in 2004 and is now at production levels similar to those observed in the early 1980s.

**Figure 7. Daily Crude Oil Production, 1990-2010
(in thousands of barrels)**
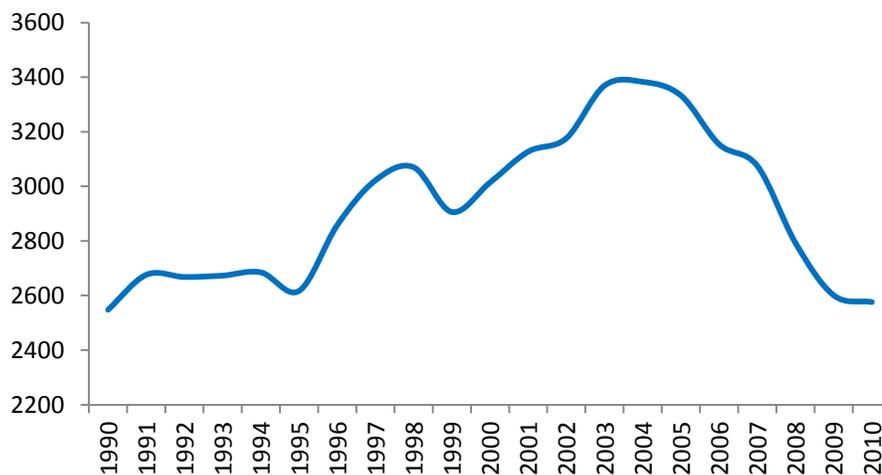
Source: IMCO with data from PEMEX.

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Estimates from the Mexican Institute of Competitiveness, based on a conservative calculation of the behavior of oil demand and the decrease in production from oil deposits, indicate that Mexico will become a net importer of crude oil by the year 2017 (Figure 8). From then on, oil revenue will likely be replaced by oil expenditures. Under that scenario, the Fiscal Coordination Law's prohibition on reducing transfers in nominal terms might not be sustainable; sub-national governments would be forced to find ways of raising revenues independently to replace dwindling federal transfers.

Figure 8. Crude Oil Production and Demand, 2005-2025
(in thousands of barrels)
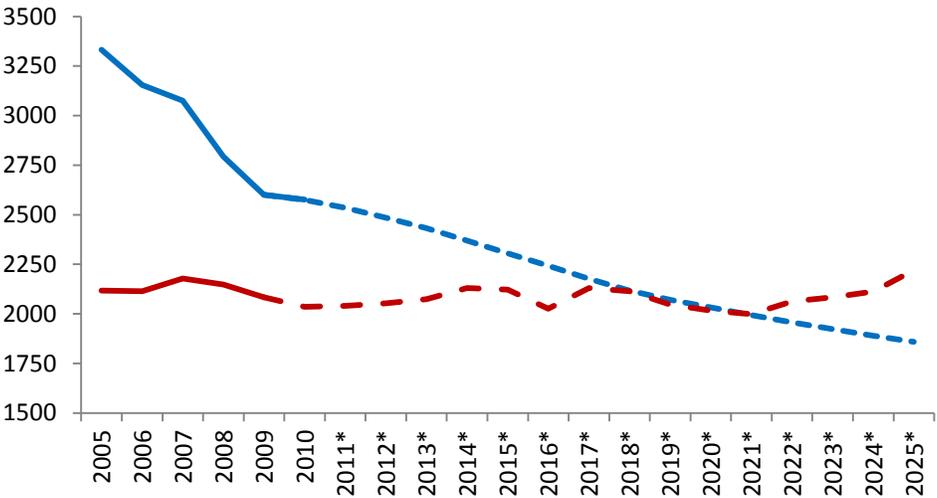
Source: IMCO estimates with data from PEMEX. *Estimated

3. Fiscal Autonomy of the States

Federal transfers to states are funded by federal taxes and royalties from oil revenues. They are of two types: revenue sharing (*Participaciones*) and special purpose grants (*Aportaciones*) which are earmarked for specific social services such as education, health and public safety. These transfers have a horizontal nature, which means that subnational units receive a pre-determined percentage of such transfers regardless of their individual contributions to the fund (*Recaudación Federal Participable*). The initial objective of this structure was to transfer resources from wealthier states to poorer states in order to promote

development. However, this structure has been counterproductive in regard to local tax collection.

Aside from taxes that only the central government can collect, there are a variety of taxes that can be introduced by state governments. However, each state decides the number, coverage of the base, and rate structure for each tax, thus determining the amount of potential revenue that could be raised.

Table 3. Number and Taxes of Each State for 2010

| State	Number of taxes	Payroll tax	Lodging tax	Tax on lotteries	Tax on acquisition of used motor vehicles	Tax on vehicle ownership	Leisure and entertainment tax	Others
Aguascalientes	7	*	*	*	*	*	*	*
Baja California	8	*	*	*			*	*
Baja California Sur	4	*	*	*				*
Campeche	7	*	*	*		*		*
Coahuila	7	*	*	*	*	*	*	*
Colima	7	*	*	*	*	*		*
Chiapas	7	*	*	*	*	*		*
Chihuahua	9	*	*	*	*			*
D.F.	7	*	*	*		*	*	*
Durango	6	*	*	*	*			*
Guanajuato	7	*	*	*	*			*
Guerrero	9	*	*	*		*	*	*
Hidalgo	7	*	*	*	*	*		*
Jalisco	8	*	*	*	*			*
México	4	*		*	*	*		
Michoacán	4	*	*	*	*			
Morelos	9	*	*	*	*	*	*	*
Nayarit	12	*	*	*		*	*	*
Nuevo León	4	*	*	*	*			
Oaxaca	8	*	*	*	*	*	*	*
Puebla	6	*	*	*	*	*		*
Querétaro	8	*	*	*	*	*	*	*
Quintana Roo	6	*	*		*			*

Table 3., continued

State	Number of taxes	Payroll tax	Lodging tax	Tax on lotteries	Tax on acquisition of used motor vehicles	Tax on vehicle ownership	Leisure and entertainment tax	Others
San Luis Potosí	7	*	*	*	*	*		*
Sinaloa	4	*	*	*	*			
Sonora	5	*		*				*
Tabasco	6	*	*	*	*			*
Tamaulipas	5	*	*	*				*
Tlaxcala	8	*	*	*	*	*	*	*
Veracruz	5	*	*	*	*			*
Yucatán	7	*	*	*	*	*		*
Zacatecas	5	*	*			*		*

Source: IMCO with data from State Revenue Acts.

Between 2000 and 2008, tax revenue represented 42 percent of own state revenues, while non-tax revenue (rights, land use, products, royalties, etc.) contributed the remaining 58 percent. The most important state tax is the payroll tax. In 2008, it represented 63.3 percent of the states' total tax revenue. Its importance lies in the breadth and stability of its tax base. This tax was introduced gradually across states, and since 2008, all states have collected it. However, the tax regime is not the same in all the states; the main source of variance is the difference in rates, which range between 1 and 2 percent.

Figure 9. Composition of States' Total Tax Revenue, 2008

4.4%
4.2%
28.1%
63.3%

■ Payroll tax   ■ Direct taxes (excluding payroll tax)   ■ Indirect taxes   ■ Other taxes
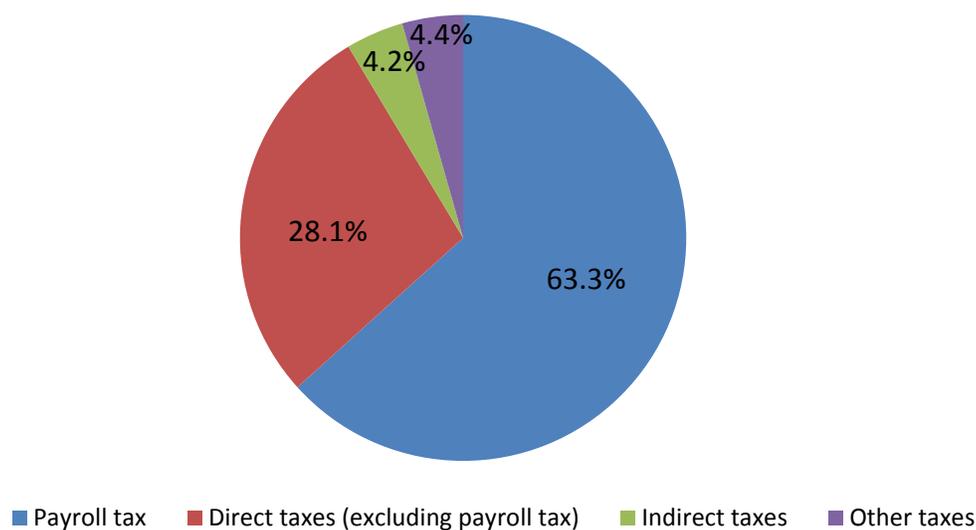
Source: IMCO with data from INEGI.

As in the case of tax revenues, non-tax revenues take a variety of forms, and their application varies across states. Among non-tax revenues, fees or *derechos* (mainly for public and private transportation, business or property registration, civil registration, and city services) are the most significant source of revenue, contributing 34 percent of local revenues. The rest of local revenues are generated by capital gains, tax penalties, and surcharges.

The tax on vehicle ownership deserves special mention because of recent legislative changes. This tax is collected by the central government according to the vehicle registry of each state. However, the revenue raised by this tax is returned to the state where the vehicle is legally registered. In 2008, revenues from this tax represented 1.8 percent of total states' revenues, but this share varies among the states (Figure 10). This tax has been in place since 1961, but in 2012, a federal decree removing it will take effect. However, the decree allows the states to adopt it as a local tax.

**Figure 10. Tax on Vehicle Ownership
as a Percent of Total Revenue, 2008**
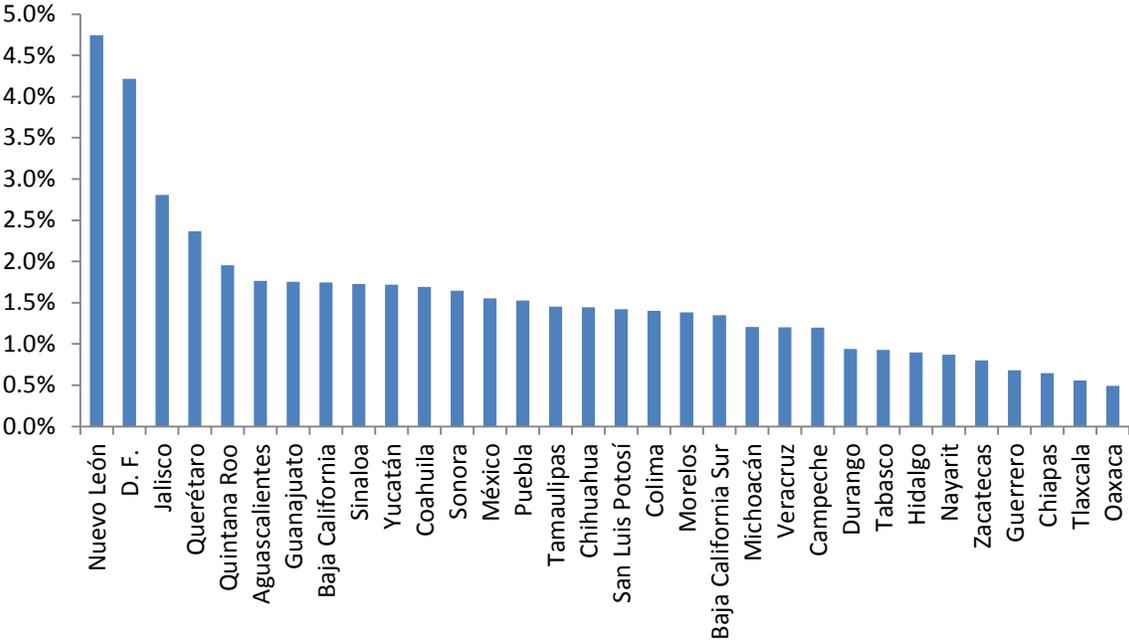
Source: IMCO with data from the Ministry of the Treasury and INEGI.

4. Determinants of the Fiscal Effort of Mexican States: A Stochastic Frontier Analysis

Most of the literature on fiscal effort consists of empirical studies. In this section we will propose a stochastic frontier model for taxation capacity that will allow us to measure the revenue-collecting effort of Mexican states, defined as the ratio of observed tax collection to the potential collection at the efficiency frontier. Such frontiers establish a potential tax collection given the fiscal unit economic characteristics and legal framework.

This exercise involving two procedures has been recognized as a useful but inconsistent one mainly because of the underlying independence assumption. Battese and Coeli (1985) proposed the model that will be used in this working paper to address that issue.

In order to estimate the maximum likelihood estimators of the parameters, the stochastic frontier estimation method consists of three steps:

1. First, we obtain the function Ordinary Least Squares estimators (OLS) that produces parameters $\beta_i, i \neq 0.$ All parameters will be unbiased with the exception of the intercept β_0.

2. Using the β_i, $i \neq 0$ parameters and the β_0 and σ^2 parameters adjusted according to the corrected ordinary least squares formula proposed by Coelli (1995), a two-stage grid search of the γ parameter is conducted. If there is any other parameter, it is set to zero in this stage.

3. To obtain the maximum likelihood estimators we use the values selected in the grid search as starting values in an iterative maximization procedure. Since we will use the software Frontier 4.1, this procedure will be the Davidon-Fletcher-Powell Quasi-Newton method.

In order to explain the differences among states regarding government effort in tax collection, the model includes some economic variables such as GDP per capita, the share of industrial output in GDP, a coefficient of income inequality, and a measure of the informal economy, which does not pay payroll taxes or fees for services (water, electricity, etc.). We include fiscal variables, such as the share of central government transfers in total revenue and public investment expenditure. We also consider political variables, such as

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the governor's political affiliation, and institutional variables, such as corruption and a good governance index.

Given these assumptions, the model specification for the tax collection potential (the stochastic frontier for total state tax revenues per capita) is the following:

$$ln(TPC_{it}) = \beta_0 + \beta_1(EAP_{it}) + \beta_2(GDPPC_{it}) + \varepsilon_{it}, \tag{1}$$

Similarly, we define the payroll tax function as follows:

$$\ln(PTPW_{it}) = \beta_0 + \beta_1(EAP_{it}) + \beta_2(GDPPC_{it}) + \varepsilon_{it}, \tag{2}$$

where:

TPC_{it} = Tax collection per capita in state i in year t

$PTPW_{it}$ = Payroll tax collection per worker in state i in year t

EAP_{it} = Economically active population (in both the formal and informal sector) as share of total population of state i in year t

$GDPPC_{it}$ = GDP per capita in state i in year t

ε_{it} = Error term defined as follows:

$$\varepsilon_{it} = (V_{it} - U_{it}), \tag{3}$$

where the V_{it} are random variables, which are assumed to be independent and identically distributed (iid) $N(0, \sigma_V{}^2)$ and independent of the U_{it} that are non-negative random variables, assumed to account for technical inefficiency[5] in revenue raising and to be iid as truncations at zero of the $N(\mu_{it}, \sigma_U{}^2)$ distribution where $\mu_{it} = z_{it}\delta$ and z_{it} is a $p \times 1$ vector of variables which may influence the effort of a local government and δ is a $1 \times p$ vector of parameter to be estimated. The panel of data need not be complete.

With the calculation of the maximum likelihood estimator in mind, we will replace $\sigma_V{}^2$ and $\sigma_U{}^2$ with $\sigma_V{}^2 + \sigma_U{}^2 = \sigma^2$ and we define $\gamma = \frac{\sigma_U{}^2}{\sigma_V{}^2 + \sigma_U{}^2}$ as did by Battese and Corra

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[5] Through this document the term "efficiency" will be substituted for "effort" since it makes more sense when talking about government tax collection.

(1977). Note that $\gamma \in (0,1)$ and thus this range can be searched to provide a good starting value for use in an iterative maximization process.

Given the assumptions stated above regarding the error term, for (1) we define:

$$\mu_{it} = \delta_0 + \delta_1(PP_{it}) + \delta_2(GDPI_{it}) + \delta_3(TI_{it}) + \delta_4(CGGI_{it}) + e_{it},$$

Similarly, for (2) we define:

$$\mu_{it} = \delta_0 + \delta_1(IR_{it}) + \delta_2(GDPI_{it}) + \delta_3(CGGI_{it}) + \delta_4(IQJI_{it}) + \delta_5(PP_{it}) + e_{it},$$

where:

$GDPI_{it}$ = Share of industrial GDP in the GDP of state i in year t

IQJ_{it} = Institutional Quality of Justice Index in state i in year t[6]

PP_{it} = Dummy that is 1 if the governor of state i in year t belongs to the political party of the president and is 0 otherwise

IR_{it} = Informality rate in state i in year t

$CGGI_{it}$ = Corruption and Good Government Index of state i in year t

TI_{it} = Transparency Index of state i in year t

e_{it} = Error term

For both models, observations are for eight years (from 2001 to 2008). For (1) we use a balanced panel with 256 observations, while for (2) we use an unbalanced panel with 216 observations, since during this period some states did not have a payroll tax and they implemented it gradually.

Ex ante, for both functions we expect a positive sign in the two independent variables, since the greater the economically active population or the economy's output per capita, the higher revenues should be. We also expect a positive sign for institutional quality of justice and for the transparency index, since the greater the government

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[6] Consejo Coordinador Financiero, "Ejecución de Contratos Mercantiles e Hipotecas en las Entidades Federativas Mexicanas."

accountability perceived by the citizens, the more willing they are likely to be to pay taxes. For the share of industrial GDP a positive sign is also expected, since it is easier to collect from this sector. If the governor has the same political affiliation as the president, a negative relation is expected, since we assume they would be favored with discretionary transfers. Moreover, negative signs are expected for the informality rate and the corruption and good governance index.

In order to determine if a stochastic frontier function is required, we tested the significance of the γ parameter. For both models, the result determined that the null hypothesis (that γ equals zero) would be rejected, indicating that $\sigma_U{}^2$ is not zero, and hence the U_{it} should not be removed.

5. Analysis of Empirical Estimates

The robust variable of the model (1) is the GDP per capita, while for the effort measure of this model, the industrial contribution to the total output and the corruption index were significant and with the expected sign.

Table 4. Maximum Likelihood Estimators for the State Revenue Model

	Coefficient	Standard-error	t-ratio	P-value
beta 0	-13,99	0,87	-16,17	0,000***
beta 1	0,68	1,39	0,49	0,627
beta 2	1,72	0,11	16,31	0,000***
delta 0	-1,32	0,66	-1,99	0,047**
delta 1	0,25	0,22	1,10	0,271
delta 2	7,61	1,08	7,03	0,000***
delta 3	-0,00	0,01	-0,76	0,445
delta 4	-0,12	0,04	-2,87	0,004***
sigma-squared	0,87	0,17	5,13	0,000***
gamma	0,94	0,03	32,57	0,000***

*** Significant 99%. ** Significant 95%. * Significant 90%.
Source: Authors' calculations.

Table 5. Mexican States' Tax Collection Effort, 2001-2008 (percent)

State	2001	2002	2003	2004	2005	2006	2007	2008
Aguascalientes	9.5	10..8	11.8	13.5	18.4	34.3	56.4	55.5
Baja California	53.7	61.6	65.6	68.1	69.0	70.0	74.7	76.5
Baja California Sur	50.5	37.1	47.8	50.9	76.1	83.3	86.0	85.8
Campeche	0.8	0.9	0.9	1.1	1.3	1.5	2.1	2.3
Chiapas	27.5	30.5	66.4	79.9	81.3	84.9	89.1	91.0
Chihuahua	77.0	78.8	79.0	77.9	79.5	80.6	82.3	82.6
Coahuila	20.7	22.4	19.9	20.2	22.4	21.7	24.3	26.7
Colima	10.8	11.8	12.0	12.1	49.3	55.4	61.4	60.4
Distrito Federal	88.5	88.5	89.1	88.5	90.4	89.5	89.1	89.9
Durango	33.0	36.4	38.5	35.0	38.7	64.9	67.9	67.8
Guanajuato	10.2	8.7	7.4	9.0	59.5	68.4	73.1	78.1
Guerrero	79.4	80.6	83.9	72.6	87.1	89.5	89.1	91.1
Hidalgo	28.6	29.4	47.1	50.4	55.5	66.2	65.0	80.6
Jalisco	44.9	47.6	49.2	50.3	53.4	54.7	57.4	60.7
México	72.9	82.5	81.9	79.8	79.8	83.4	91.2	91.6
Michoacán	16.9	19.2	45.6	45.6	56.1	65.4	68.7	64.4
Morelos	17.3	20.3	21.3	21.9	28.9	29.9	53.3	72.7
Nayarit	55.5	76.7	79.4	85.1	85.8	81.7	89.3	89.5
Nuevo León	33.7	35.7	36.1	35.3	37.1	36.5	35.6	39.2
Oaxaca	10.9	27.7	38.8	36.9	47.7	61.6	61.8	66.8
Puebla	36.6	46.9	51.2	48.2	48.0	65.1	73.3	75.0
Querétaro	12.6	15.1	14.6	14.1	61.8	74.1	74.0	77.5
Quintana Roo	52.2	53.9	62.4	67.0	65.5	66.9	72.1	79.4
San Luis Potosí	19.1	19.0	22.2	35.2	35.8	36.9	46.8	61.3
Sinaloa	33.2	35.2	38.1	37.8	41.0	46.4	47.2	60.3
Sonora	53.1	59.1	49.8	48.8	54.6	50.6	57.4	59.5
Tabasco	6.2	6.9	7.8	7.9	8.4	8.5	8.3	7.5
Tamaulipas	43.5	45.0	45.9	41.4	43.7	50.8	49.2	52.9
Tlaxcala	49.8	58.8	66.2	65.9	74.4	75.6	74.4	79.2
Veracruz	43.8	71.3	66.2	67.7	69.5	67.1	66.0	68.5
Yucatán	44.0	46.6	52.2	48.6	51.9	62.8	59.0	63.7
Zacatecas	58.3	66.0	67.5	65.8	73.4	75.7	79.8	80.9

Source: Authors' calculation.

On average, tax collection effort increased by 29.5 percentage points between 2001 and 2008, from 37.3 percent to 66.8 percent, while average tax collection per capita increased by 68.9 percent from MXN 221 in 2001 to MXN 374 in 2008. Using this

information and that provided by the model showing a positive relation between GDP and tax collection, we can assume that growth in tax revenue is largely due to Mexico's economic growth before the 2008 crisis and to increased government tax effort during this period.[7]

For illustrative purposes, we will divide the states into three groups. In the first one we will include those states whose average effort within this period is between the mean and one standard deviation ($\mu \pm \sigma$), in the second one we will include those states whose average effort is below one standard deviation ($\mu - \sigma$), and in the third one we will include those states with average effort above one standard deviation ($\mu + \sigma$).

Figure 11. Spatial Distribution of Effort, 2001-2008 Average
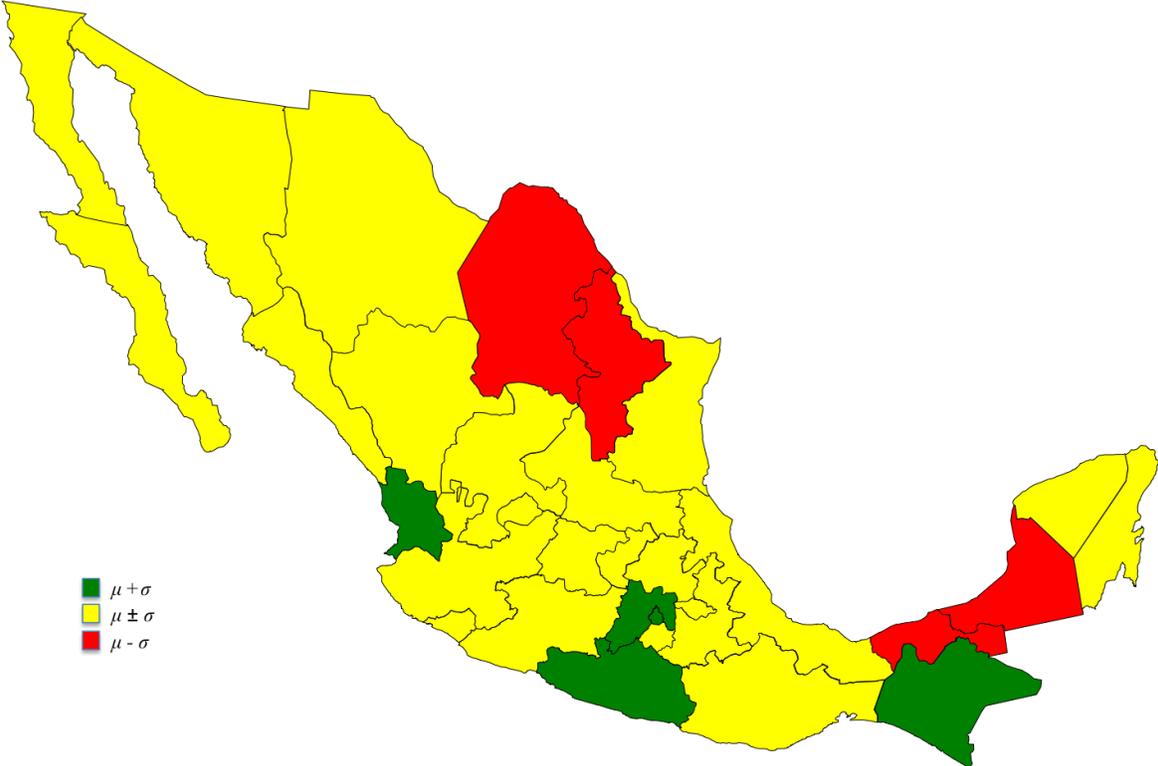
Source: Authors' compilation.

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[7] Between 2001 and 2008, the Mexican economy recorded cumulative real growth of 21 percent.

For a deeper analysis, we will divide Mexican states into four groups (Figure 12).[8] This division will allow us to distinguish between those states that have low tax collection per capita because of their lack of effort from those which have low tax revenue because of their narrow and limited tax base. Moreover, this distinction will also allow us to distinguish between those states whose tax collection per capita is high because they make an efficient tax effort from those which have high tax collection per capita because of favorable economic conditions rather than collection efforts.

Figure 12. Mexican States' Collection Effort vs. Tax Collection per Capita, 2008
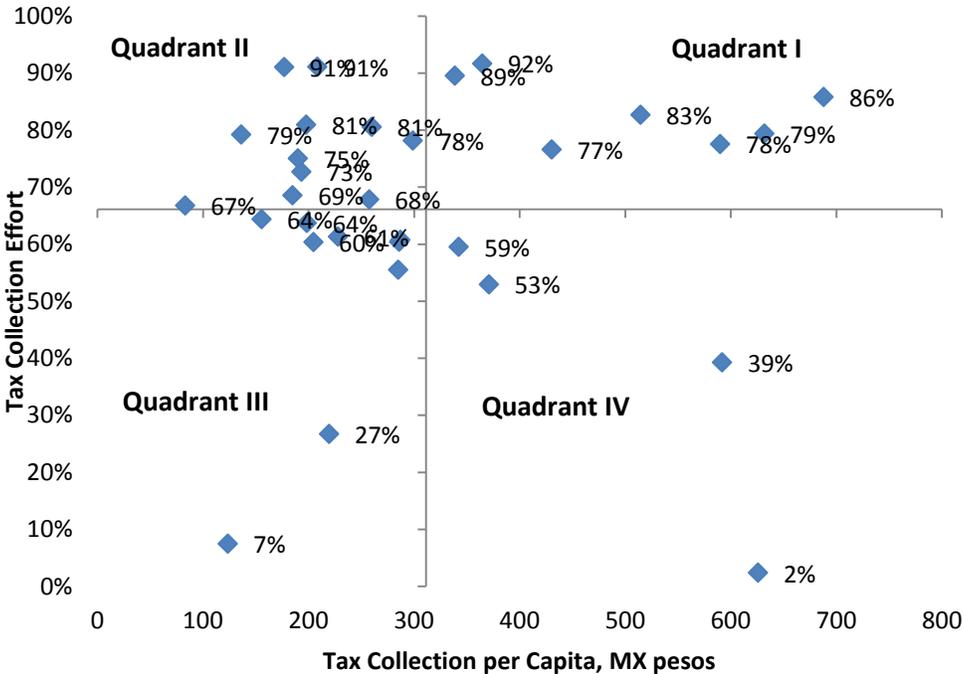
Source: Authors' calculations.

There is no surprise in regard to the states in Quadrants I and III, since we assume a direct relation between effort and tax revenues. States in Quadrant II are those whose tax collection effort is large, but they are not collecting much revenue from taxes. Quadrant II includes Durango, Guerrero, Jalisco, Puebla, Tlaxcala, Veracruz, Yucatán, and Zacatecas. The causes may be different for each state and may include issues such as ill-defined tax

bases, many special regimes, or many exemptions, which restrict their possibility frontier. The recommendation for these states is to promote structural changes in their taxation systems.

On the other hand, Campeche,[9] Nuevo Leon, Sonora, and Tamaulipas are in quadrant four: despite their low tax effort, they have a high tax collection per capita. These states have a high potential for improvement since they seem to be exploiting their tax base correctly. For Campeche, this phenomenon is caused by the large contribution of oil production to its total output. For the other cases, this might be due to the large number of firms that have decided to locate their logistics centers there because of its convenient geographic location, thus facilitating tax collection with little effort. A hypothetical flight of capital from the state could leave these states in dire financial straits since more than 10 percent of total revenue is own revenue. But at the same time, additional tax collection effort by the government could generate significant additional revenue.

Figure 12. Mexican States' Effort and Tax Collection per Capita, 2008

■ *High TCE and high TRPC*
■ *High TCE and low TRPC*
■ *Low TCE and high TRPC*
■ *Low TCE and low TRPC*
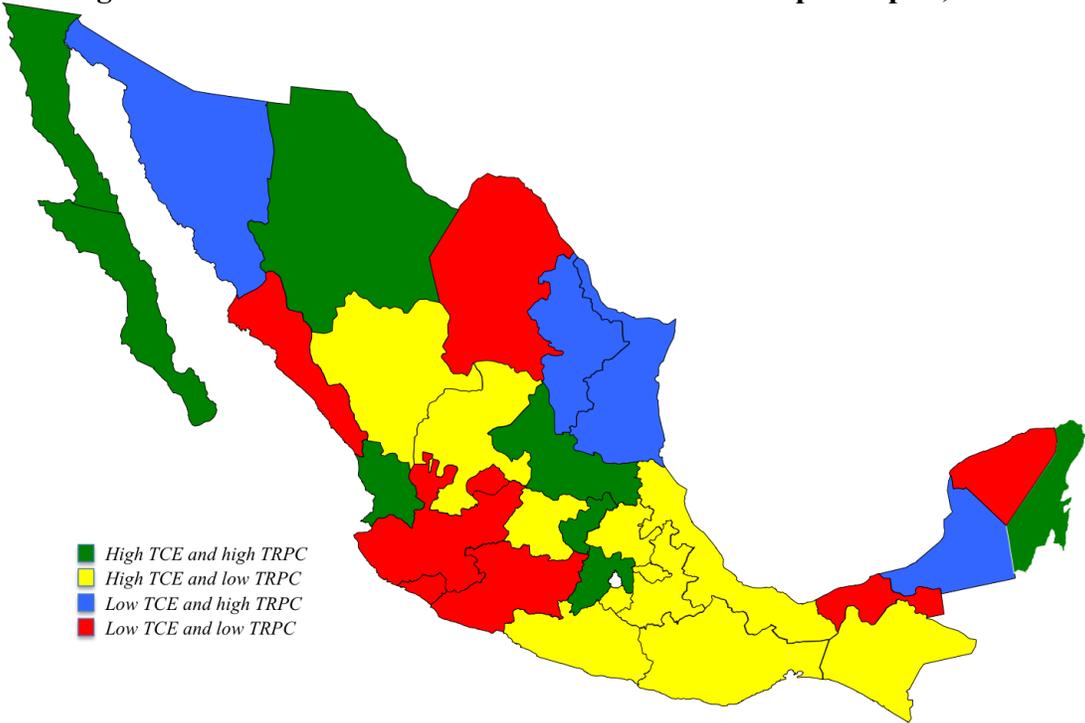
Source: Authors' compilation.
Note: TCE refers to tax collection effort while TRPC refers to tax revenue per capita.

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[9] From here on, the analysis will not consider this state unless otherwise specified, since almost 85 percent of its total output is due to oil.

With respect to the results of the model defined in (2) for the payroll tax function, the results point in the same direction as those obtained for the total revenue function. Once again, the robust variables include GDP per capita and for this model's error term almost all the variables were significant (except the corruption index) and with the expected sign.

Table 6. Maximum Likelihood Estimators for the Payroll Tax Model

	Coefficient	Standard-error	t-ratio	P-value
beta 0	-13.13	0.96	-13.72	0.000[***]
beta 1	-2.00	1.28	-1.56	0.119
beta 2	1.76	0.10	16.82	0.000[***]
delta 0	-5.21	0.98	-5.32	0.000[***]
delta 1	-8.08	1.98	-4.09	0.000[***]
delta 2	8.17	0.85	9.60	0.000[***]
delta 3	-0.05	0.03	-1.54	0.124
delta 4	1.46	0.32	4.62	0.000[***]
delta 5	-1.39	0.38	-3.62	0.000[***]
sigma-squared	0.48	0.07	6.91	0.000[***]
gamma	0.66	0.06	11.10	0.000[***]

[***] Significant 99%. [**] Significant 95%. [*] Significant 90%
Source: Authors' calculations.

As before, we compute the effort of Mexican states in payroll tax collection. The results are shown in Table 7.

Table 7. Mexican States' Effort for Payroll Tax Collection, 2001-2008 (percent)

State	2001	2002	2003	2004	2005	2006	2007	2008
Aguascalientes	N/A	N/A	N/A	N/A	N/A	63	87	90
Baja California	N/D	89	89	88	88	87	88	89
Baja California Sur	76	78	82	85	89	91	91	89
Campeche	2	2	2	2	2	2	3	4
Chiapas	89	90	94	94	94	93	92	92
Chihuahua	85	84	86	86	84	82	86	87
Coahuila	N/D	N/D	46	43	48	36	39	44
Colima	N/A	N/A	N/A	N/A	79	77	82	85
Distrito Federal	92	92	92	92	93	91	90	92
Durango	59	63	65	62	67	68	72	74

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Table 7., continued

State	2001	2002	2003	2004	2005	2006	2007	2008
Guanajuato	N/A	N/A	N/A	N/A	90	87	88	89
Guerrero	92	N/D	90	88	92	91	91	92
Hidalgo	76	72	80	77	81	73	74	84
Jalisco	92	92	93	92	92	90	91	92
México	N/D	N/D	91	90	91	89	92	92
Michoacán	N/D	N/D	87	89	91	91	90	90
Morelos	N/A	N/A	N/A	N/A	N/A	N/A	89	92
Nayarit	87	91	93	93	93	69	81	85
Nuevo León	87	88	87	75	74	59	64	75
Oaxaca	N/D	82	87	86	89	84	85	89
Puebla	N/D	89	89	88	88	91	92	92
Querétaro	N/A	N/A	N/A	N/A	87	90	88	89
Quintana Roo	87	87	88	88	87	83	89	90
San Luis Potosí	69	67	68	87	88	82	85	88
Sinaloa	83	84	85	84	84	80	80	84
Sonora	N/D	N/D	N/D	N/D	N/D	65	N/D	N/D
Tabasco	19	16	18	17	15	12	11	9
Tamaulipas	80	79	80	77	77	75	79	83
Tlaxcala	90	91	93	92	95	94	94	94
Veracruz	91	93	91	90	90	90	89	89
Yucatán	86	91	90	90	91	93	92	90
Zacatecas	81	82	82	78	78	80	81	80

Source: Authors' calculation. N/A corresponds to cases in which the payroll tax was not yet implemented in the state. N/D corresponds to cases in which there was no official information available.

Table 7 shows that considerable effort is made to collect this tax in most states, and has grown from 76.2 percent in 2001 to 81.1 percent in 2008, on average.

Using the data provided in Tables 5 and 7, we can divide the states into four groups.

Figure 13. Total Tax Collection Effort vs. Payroll Tax Collection Effort, 2008[10]
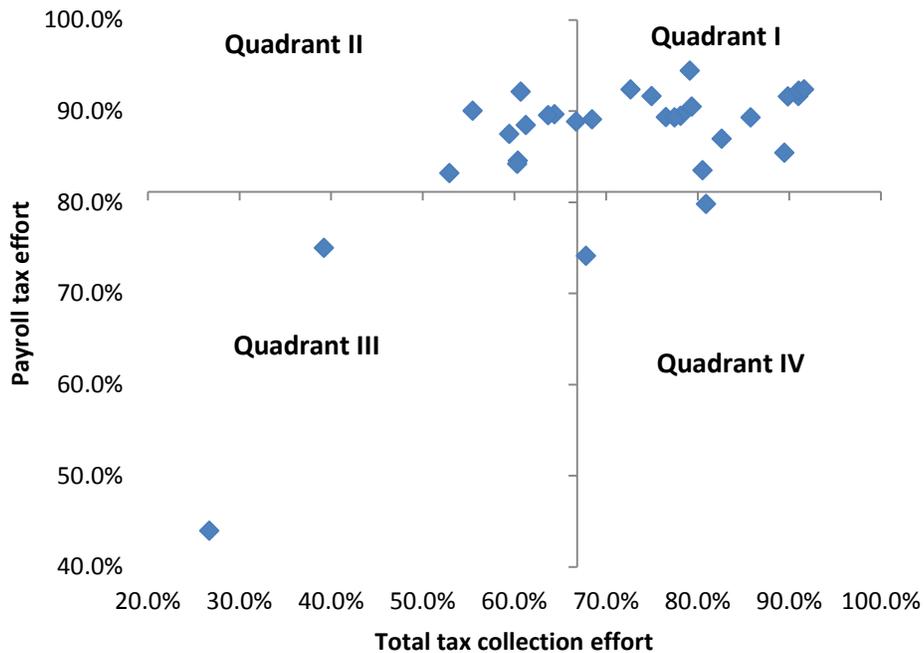
In Quadrant II are states such as Colima, Guanajuato, and Querétaro. They implemented payroll taxes in 2005 as a source of sub-national revenue. The results suggest that implementation of the payroll tax was successful, since their payroll tax collection effort is high. However, the results also suggest that they overestimate its potential. These three states are among the 10 with the lowest share of payroll tax in total revenue. These states have room for improvement and can focus on the collection of other taxes so they can increase their revenue. Also in this quadrant is Mexico City, which, although it has different taxation powers and is exploiting the payroll tax efficiently, still has significant opportunities for improvement in the collection of other taxes.

In quadrant four are states such as Durango and Zacatecas, which are also among those states where the contribution of the payroll tax to total revenue is lowest. The results suggest that even though these states are efficient in general with respect to total tax collection, they have not managed payroll taxes properly, focusing their efforts instead on

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[10] Data for Sonora correspond to 2006, the latest available data.

the collection of all other taxes. States in quadrants one and three have the expected behavior: we expected a positive correlation between the effort in total tax collection and effort regarding payroll tax collection.

For both models, it was surprising that employment was not a significant variable. In the results of (1), EAP has a positive but not significant sign. This may suggest that policies should be focusing on creating better-remunerated jobs rather than more low value-added positions. The result of (2) is even more interesting, since it shows a negative relationship between payroll tax and employment that is very close to the significance zone. Some authors state that the payroll tax is a burden on a productive factor (labor) that discourages the use of this factor in the formal sector. Even though this is a relevant and quite important issue, it is beyond the scope of this project and requires further research.

6. Revenue Potential for Mexican States

What would happen if all states operated with 100 percent effort? In the following section we will use the data obtained before to discuss a hypothetical scenario facing Mexican states if they could raise all of the potential revenue.

First, we define the Fiscal Autonomy Index (FAI) as follows:

$$FAI = \frac{OR_{it}}{TR_{it}}, \tag{4}$$

where

$TR_{it} =$ Total revenue of state i in year t

$OR_{it} =$ Own revenue of state i in year $t,$ including not only tax revenue but other local revenue as well.

The FAI tells us what proportion of total revenue is contributed by sub-national governments. For this analysis, we will use 2008 data. Since no state has tax collection that is 100 percent efficient, the potential FAI will be greater than the actual one. The potential autonomy index will be computed by using potential tax collection in both total revenue and own revenue.

Figure 14. Fiscal Autonomy Index, 2008
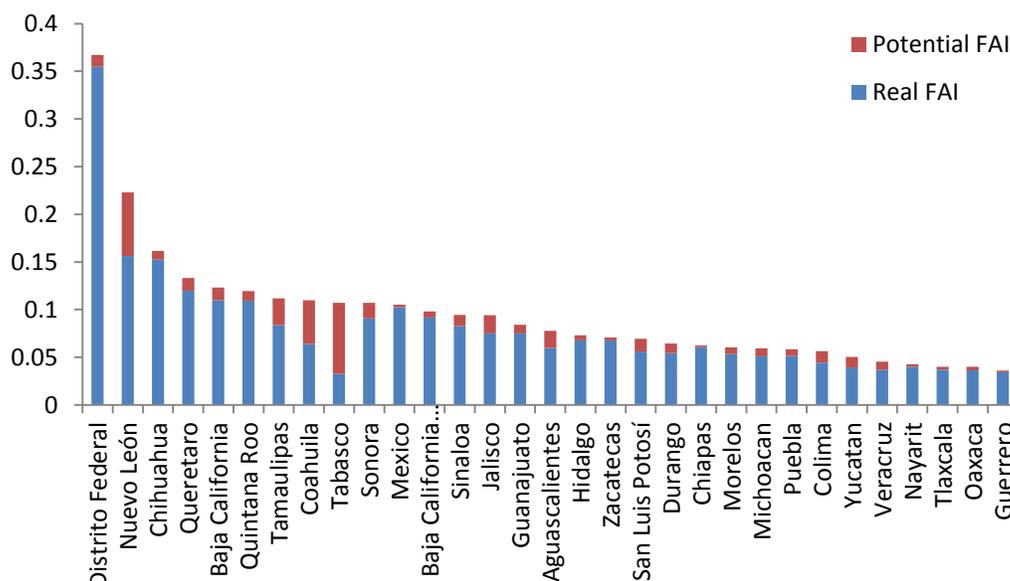
Source: Authors' calculations.

Even if the potential is raised, fiscal autonomy will not increase significantly. The FAI average would rise from 8.0 percent to 11.1 percent, suggesting that the weight of central government transfers would remain very high. This is even more worrisome if we exclude Mexico City and Campeche, since without them the average would only rise from 7.1 to 8.6 percent.

If we sort Mexican states according to their degree of fiscal autonomy and compare the actual situation with the potential one, the state that would benefit the most in relative terms is Tabasco, climbing almost 20 places,[11] followed by Coahuila and Tamaulipas, advancing eight and three places, respectively. In the other direction, changes would not be so dramatic, since those states that would fall in ranking would only do so by one or two places.

At first, this would not create much additional revenue for the states, but given that an important percentage of *Participaciones* distributed to the states depends on its own tax collection efforts, those states for whom revenue increases more significantly would be

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[11] Tabasco is also one of the most important oil producers in the country, which is why, as in the case of Campeche, the results are overstated.

rewarded in the next central government transfer allocation through the revenue-sharing mechanism.

Even if all states raised their potential revenue and considering the situation faced by Tabasco, the last three states would stay the same. This suggests that their dependence on central government transfers would remain the same, as if they had made no extra effort at all.

On average, states' own revenue would only increase by 11.5 percent, and the share of states' own revenue in total tax revenue would increase from 41.2 to 56.1 percent. Improving states' efforts with their current tax bases would not be sufficient to substantially strengthen the states' public finances.

Figure 15. Share of Potential Tax Revenue in Potential States' Own Revenue
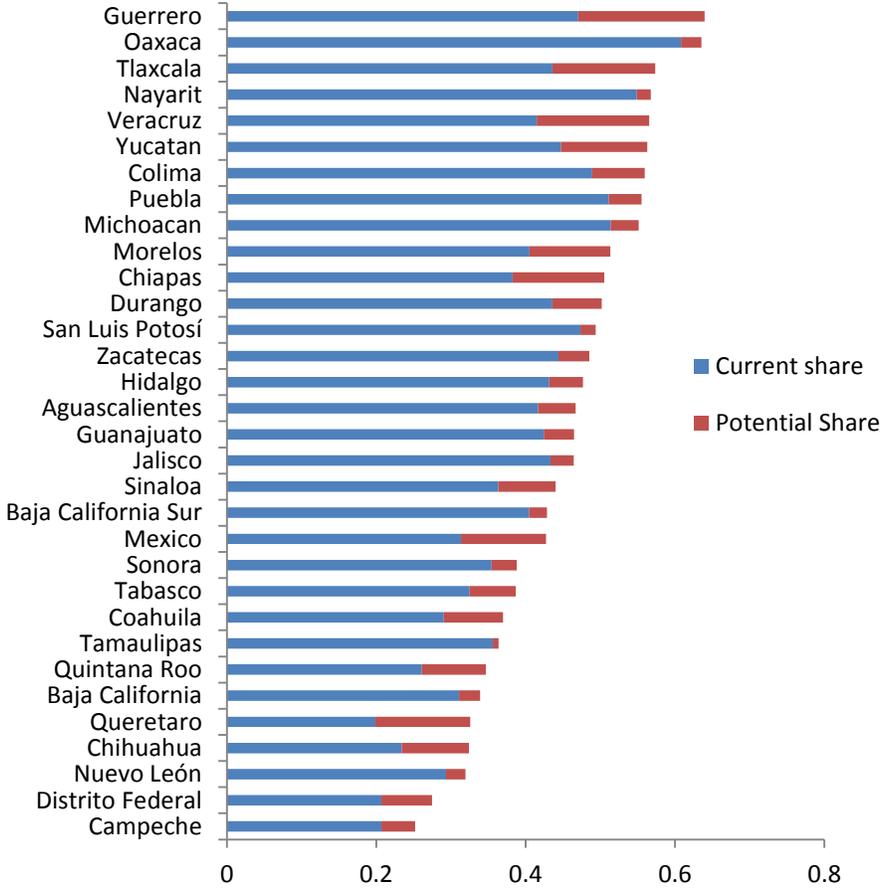
Source: Authors' calculations.

Table 8. Increase in States' Own Revenue Assuming 100 Percent Effort, 2008

State	Increase (%)
Aguascalientes	33.32
Baja California	13.60
Baja California Sur	7.84
Campeche	1795.14
Chiapas	2.58
Chihuahua	6.83
Coahuila	79.64
Colima	28.57
Distrito Federal	5.51
Durango	19.75
Guanajuato	13.15
Guerrero	5.39
Hidalgo	8.77
Jalisco	28.03
México	3.25
Michoacán	17.34
Morelos	14.37
Nayarit	7.14
Nuevo León	54.89
Oaxaca	9.90
Puebla	14.53
Querétaro	12.99
Quintana Roo	10.51
San Luis Potosí	25.63
Sinaloa	15.42
Sonora	19.98
Tabasco	256.01
Tamaulipas	37.75
Tlaxcala	8.18
Veracruz	23.62
Yucatán	29.15
Zacatecas	4.88

Source: Authors' calculation.

Moreover, under the assumption of 100 percent effort by all states, the increase in the states' total revenue would be negligible.

Table 9. Increase in Total State Revenue Assuming 100 Percent Effort, 2008

State	Increase (%)
Aguascalientes	2.0
Baja California	1.5
Baja California Sur	0.7
Campeche	134.7
Chiapas	0.2
Chihuahua	1.0
Coahuila	5.1
Colima	1.3
Distrito Federal	2.0
Durango	1.1
Guanajuato	1.0
Guerrero	0.2
Hidalgo	0.6
Jalisco	2.1
México	0.3
Michoacán	0.9
Morelos	0.8
Nayarit	0.3
Nuevo León	8.6
Oaxaca	0.4
Puebla	0.7
Querétaro	1.6
Quintana Roo	1.1
San Luis Potosí	1.4
Sinaloa	1.3
Sonora	1.8
Tabasco	8.4
Tamaulipas	3.2
Tlaxcala	0.3
Veracruz	0.9
Yucatán	1.1
Zacatecas	0.3

Source: Authors' calculations.

We can see that most of the states would increase their total revenue by less than 2 percent. In fact, the average increase would be 5.8 percent but, if Mexico City and Campeche are excluded, this average would be reduced to 1.7 percent. Moreover, even if

we assume a 100 percent effort and include Campeche's figures, total own revenues would grow by 33.7 percent, but total revenues would only grow by 3.5 percent.

The results suggest that state tax bases are in general being relatively well exploited, especially the payroll tax base. The empirical evidence shows that the performance of government institutions regarding revenue collection is generally acceptable. By comparing the real and potential revenue of Mexican states, we can observe that there is not much room for improvement in terms of tax collection. Given the current tax bases, even if they could achieve their potential, the benefits would be very limited and would not provide much in terms of total state revenues.

7. The Fiscal Autonomy of Municipalities[12]

Fiscal centralism in Mexico has experienced historical ups and downs. In the late nineteenth and early twentieth centuries, sub-national governments, both states and municipalities, were relatively more important vis-à-vis the central government. In 1900, municipal revenue exceeded 1 percent of GDP, but in the 1930s and 1940s, after the first National Tax Convention, it decreased to about 0.5 percent of GDP.[13] The ratio of municipal revenue has remained at this level for almost 70 years, and today it is actually close to 0.4 percent of GDP (Figure 16). Mexico is at the bottom relative to OECD countries, where the average revenue collection at this level of government is nearly 3 percent of GDP.[14]

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[12] For this section, Mexico City is excluded from the analysis unless otherwise specified.
[13] Díaz-Cayeros (2006: 37).
[14] OCDE, Revenue Statistics 1965-2007.

**Figure 16. Central Government, State and Municipal Tax Revenues
(as percent of GDP, 1990-2007)**
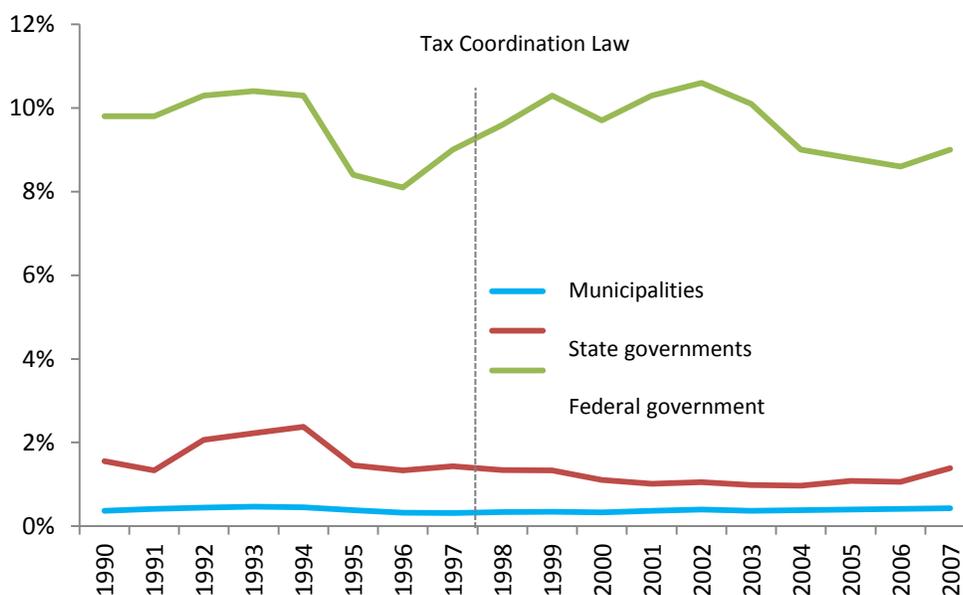
The main sources of municipal revenue are:

- Exploitation of capital assets
- Contributions enacted through local laws
- Fees for the provision of public services
- Central government transfers

Municipalities have no authority to decide which taxes to levy, although some authority in this area is granted by local laws approved by state congresses. Municipalities cannot create taxes and collect them on their own, but they can administer the revenue sources that have been decided by local congresses. State revenue acts and state tax codes regulate municipal tax bases.

Two of the pillars of municipal revenues are property taxes and water rights. Between 2001 and 2008, property taxes accounted for almost 57 percent of municipal tax revenues and more than 27 percent of own municipal revenues.

Figure 17. Composition of Own Municipal Revenues
(average, 2001-2008)

Property tax ■ Other taxex ■ Rights ■ Products ■ Exploitations ■ Contributions
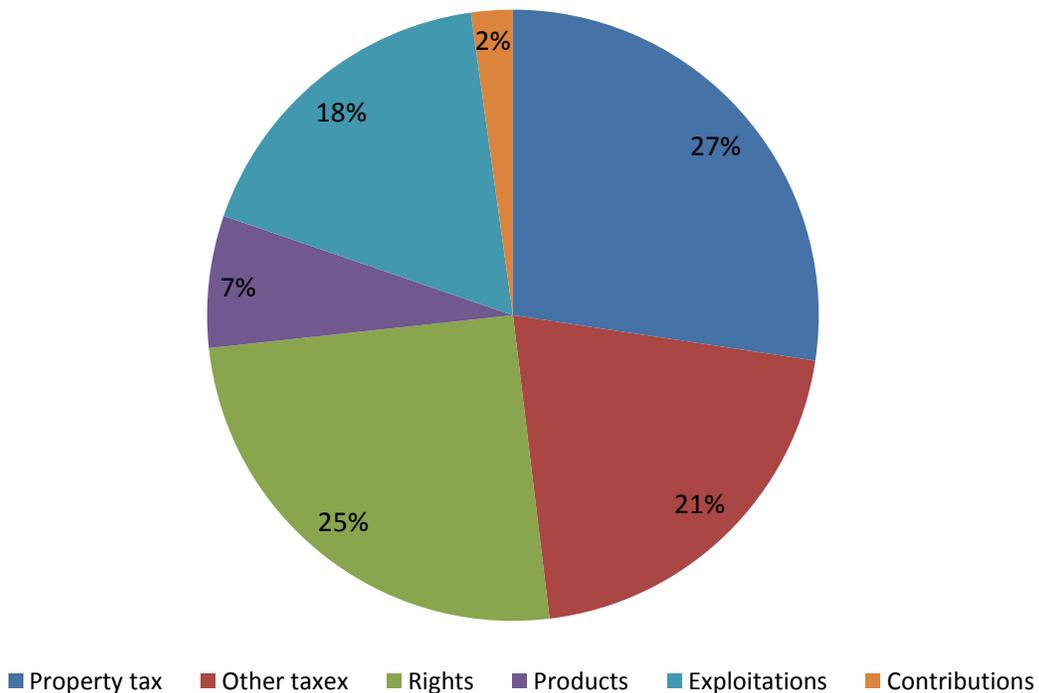
Source: IMCO with data from INEGI.

The expenditure decentralization policy has influenced property tax collection. Rising central government transfers sapped incentives to collect taxes. In 2008, the central government tried to reverse the situation by including economic efficiency criteria in the revenue-sharing formula. Internationally, in 2008, Mexico was the OECD country with the lowest property tax collection rate as a percentage of GDP.

Figure 18. Property Tax as Percent of GDP, 2008
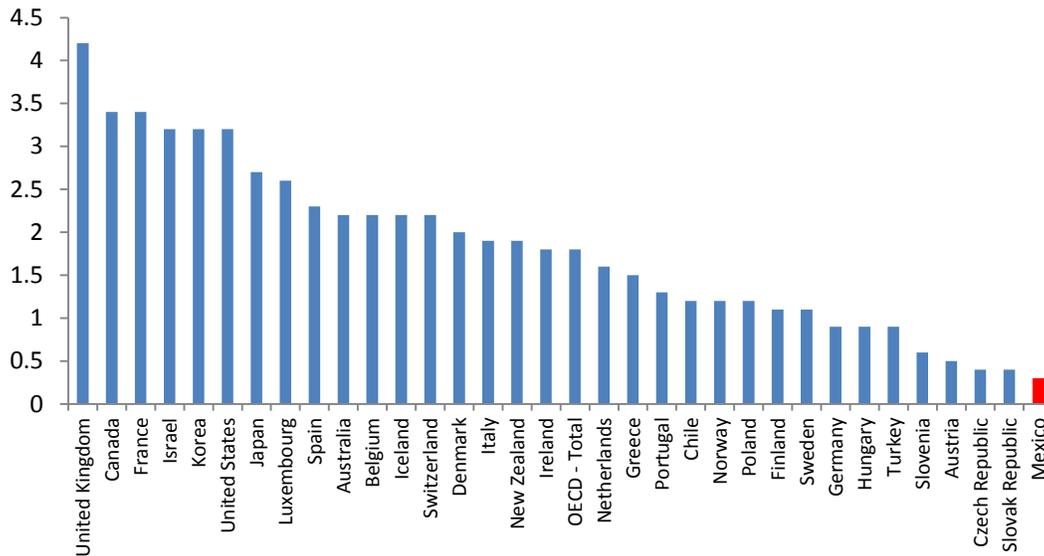
Source: OECD revenue statistics.

Cadastral updates have significantly improved property tax collection. With the changes in the agricultural legislation in 1992 and the updating of property values, the share of property tax in total revenue reached 10 percent in 1994. However, it fell back to previous levels subsequently, following the increase in federal transfers.

Figure 19. Share of Property Tax in Total Revenue

Source: IMCO with data from INEGI.

34
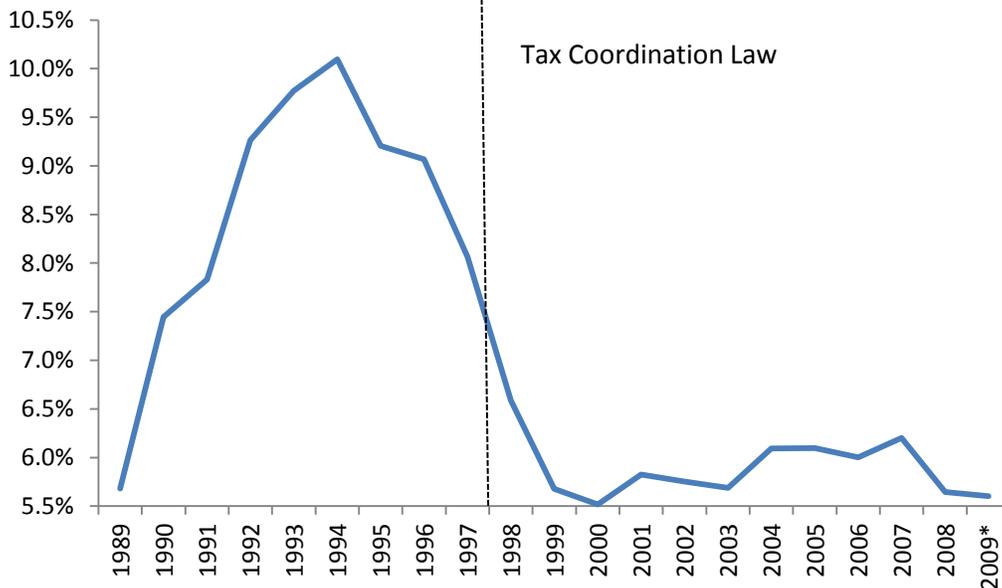
In 2008, 537 of the 2,456 municipalities (22 percent) did not levy property taxes or did not report doing so. Eighty percent of all property tax revenue was collected by only 105 municipalities (4 percent). In fact, only 29 of the more than 2,400 municipalities collect more than 50 percent of their total revenue; the rest depend on transfers from their states or the central government.

**Figure 20. Distribution of Own Municipal Revenues
as a Percent of Total Expenditure, 2008**

1561	439	208	135	66	20	9
0% - 9%	10% - 19%	20% - 29%	30% - 39%	40% - 49%	50% - 59%	more than 60%
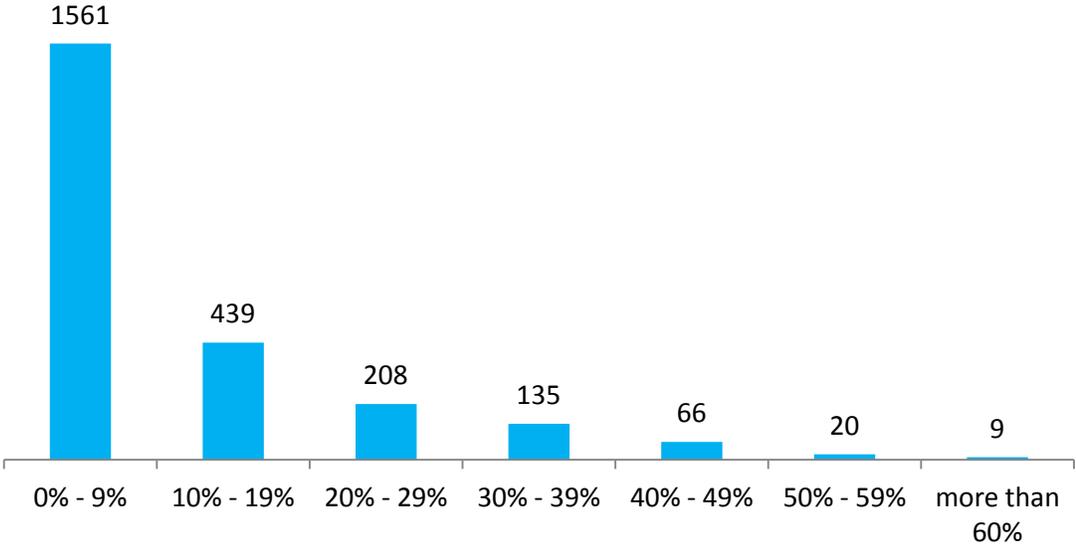
Source: IMCO using data from INEGI.

Municipalities have a potential margin in revenue capacity that has not been fully exploited. These are property taxes and water rights. However, land records and the tap-water infrastructure would need to be updated. Even if not intended to become a source of income, water rights should cover at least the cost of provision, to avoid giving rise to deficits.

Given municipalities' limited access to credit, the share of debt in total revenues chas remained below 10 percent and has followed a downward trajectory. There is a possibility to raise resources through debt, but the rules and circumstances under which debt can be incurred would need to be established, since even in local laws, different criteria are applied with respect to municipal debt contracting.

Added to this, municipalities have another issue to solve. Mayors in Mexico serve only three-year terms, one of the shortest in Latin America, and immediate re-election is prohibited. This situation causes inefficiencies because the learning curve is long, and in their short terms, mayors and tax administrators do not have enough time to develop needed skills. Moreover, they have little incentive to undertake projects with only long-term payoffs.

Figure 21. Local Government Terms and the Possibility of Reelection
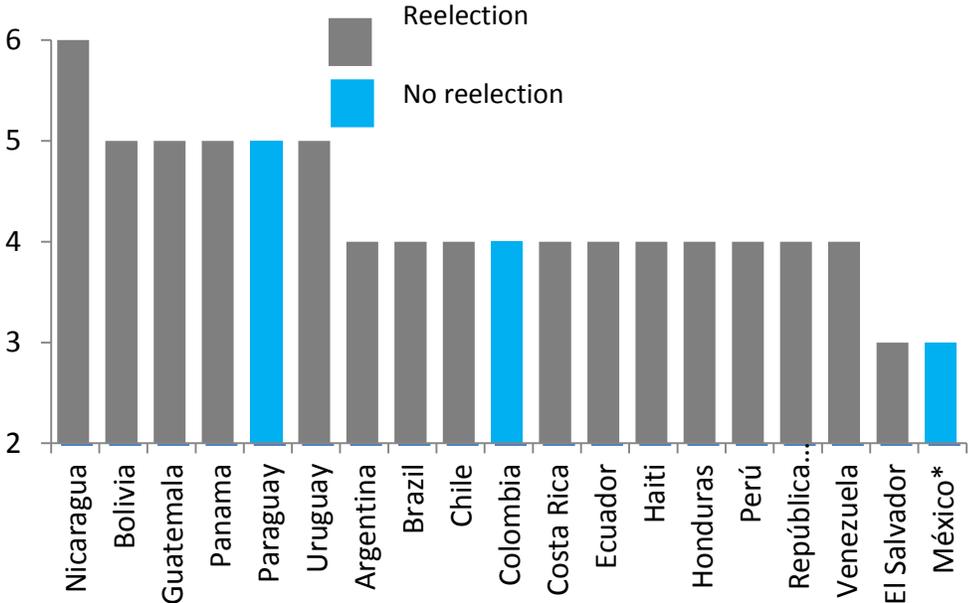
*In Coahuila, local government terms were lengthened to four years in 2006.
Source: Pardinas (2009).

8. Fiscal Effort in Mexican Municipalities: A Stochastic Frontier Analysis

Following the same methodology used in the sections above for Mexican states, we carried out a stochastic frontier analysis for both total own-source revenues and property tax revenues of Mexican municipalities. Since the information for municipalities is more limited and certain information is not available for all of them, the results will be reported as averages.

The literature on fiscal effort in municipalities is scarce, and most of the studies consider the sums by state of both total tax revenue and property tax, so that a more

accurate and complete panel can be used. However, we prefer not to do this since such analyses assume perfect cooperation agreements between municipalities of the same state and do not consider some differences among municipalities of the same state (political affiliation, for example) or the particular situations of each municipality (if they are rural or not, or if they are coastal, at borders or inside the Mexican territory, for example). Despite these potential problems, our methodology will allow us to report municipal efficiencies grouped by state as well as on average.

As we did for states, we define the own municipal revenues function as follows:

$$ln(TPC_{i,t}) = \beta_0 + \beta_1(EDR_{i,t}) + \beta_2\, ln(GDPPC_{i,t}) + \varepsilon_{i,t}, \tag{5}$$

Similarly, we define the property tax function as follows:

$$ln(PTPC_{i,t}) = \beta_0 + \beta_1(EDR_{i,t}) + \beta_2\, ln(GDPPC_{i,t}) + \varepsilon_{i,t}, \tag{6}$$

where:

TPC_{it} = Tax collection per capita in municipality i in year t

$PTPC_{it}$ = Property tax collection per capita in municipality i in year t

EDR_{it} = Economic Dependency Ratio defined as the share of 0-14 years and over 64 years population of 15-64 in municipality i in year t

$GDPPC_{it}$ = GDP per capita in municipality i in year t

As done earlier and given the assumptions of the previous sections, for (5) and (6) we define:

$$\mu_{it} = \delta_0 + \delta_1(MCI_{it}) + \delta_2(PP_{it}) + e_{it},$$

where:

MCI_{it} = Molinar Concentration Index[15] in the municipality i in year t

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[15] The Molinar Concentration Index is a measurement of effective number of political parties in a party system (Molinar, 1991). This index is defined as follows:

PP_{it} = Dummy that is 1 if the major of the municipality i in year t belongs to the political party of the state's governor and is 0 otherwise

e_{it} = Error term

For both models, observations are for three years (from 2006 to 2008), and we use a balanced panel with 1,071 observations from 357 municipalities (Appendix 1).[16]

Ex ante, for both models we expect a similar behavior: a negative relationship of the economic dependency ratio with tax collection because, the bigger the ratio, the greater the pressure on potential workers to support those who cannot work, and a positive relationship between GDP per capita and tax collection, as we expected for the states' model. For the political concentration index we expect a positive sign, since a more competitive political environment may force elected mayors to be more efficient. For the political party of the mayor, we expect that municipalities with mayors belonging to the same political party as the governor collect less since, as in the states' case, they can be favored with discretionary transfers.

As in the case of the states, the γ parameter proved to be non-zero for both models, pointing to the significance of the effort component in the model's total variance.

9. Results and Estimations Analysis for Mexican Municipalities

First of all, results may overestimate the real effort, since the municipalities selected are the ones with stronger economic activity and for which information is available.

For the model defined in (5), all variables for both the stochastic frontier and the effort measure are robust and with the expected sign. Central government transfers, GDP per capita, and the economic dependency ratio had the expected sign.

$$NP = 1 + N \frac{\left(\sum_{i=1}^{n} P_i^2\right) - P_1^2}{\sum_{i=1}^{n} P_i^2}$$

where

$$N = \frac{1}{\sum_{i=1}^{n} P_i^2}$$

[16] In 2008, these municipalities contributed with 87 percent of total tax revenue and 85 percent of total property tax revenue. Moreover, together they accounted for 66 percent of GDP and 57 percent of the population.

Table 10. Maximum Likelihood Estimators for the Own Municipal Revenues Function

	Coefficient	Standard-error	t-ratio	P-value
beta 0	6.95	0.66	10.6	0.000***
beta 1	-6.86	0.54	-12.7	0.000***
beta 2	0.24	0.05	5.2	0.000***
delta 0	-46.86	11.78	-4.0	0.000***
delta 1	3.86	0.73	5.3	0.000***
delta 2	-17.49	3.97	-4.4	0.000***
sigma-squared	61.87	15.20	4.1	0.000***
gamma	0.99	0.00	349.2	0.000***

*** Significant 99%. ** Significant 95%. * Significant 90%
Source: Authors' calculations.

Municipalities are collecting only almost half of their potential. Between 2006 and 2008, municipal tax collection effort grew by only 1 percent, from 45 percent in 2006 to 46 percent in 2008.[17] However, the effort varies among types of municipalities.

Table 11. Municipal Effort (percent)

	2006	2007	2008
Total (average)	45	43	46
Border (average)	62	62	62
Port (average)	57	58	58
Inland (average)	44	42	45

Source: Authors' calculations.

Table 11 shows that border and port municipalities show significantly more effort in tax collection than inland ones.

As above, an analysis grouping municipal tax collection effort can be made by state. Table 12 summarizes the results.

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[17] According to the model, municipalities experienced a decrease in their effort level during 2007 in such way that they registered an effort equivalent to 43 percent.

Table 12. Municipal Tax Collection Effort Grouped by State
(percent)

State	2006	2007	2008
Aguascalientes	69.6	71.6	67.6
Baja California	65.2	65.0	67.0
Baja California Sur	71.6	72.2	72.8
Campeche	45.7	45.3	46.0
Coahuila	60.6	61.2	58.8
Colima	49.9	51.6	55.2
Chiapas	40.9	36.9	37.7
Chihuahua	60.0	64.4	65.1
Durango	58.4	58.6	60.3
Guanajuato	60.7	61.0	61.2
Guerrero	60.4	59.5	57.8
Hidalgo	48.0	47.7	48.2
Jalisco	65.8	66.0	65.9
México	48.2	50.4	50.7
Michoacán	54.8	54.4	51.3
Morelos	60.4	61.3	62.1
Nayarit	60.7	61.7	60.7
Nuevo León	66.8	65.3	65.1
Oaxaca	10.2	17.3	24.2
Puebla	32.2	19.6	21.0
Querétaro	72.0	73.5	73.4
Quintana Roo	73.5	73.9	71.0
San Luis Potosí	51.4	55.1	54.1
Sinaloa	64.2	65.4	66.1
Sonora	61.9	62.9	65.3
Tabasco	28.2	28.4	29.4
Tamaulipas	52.6	52.7	53.3
Tlaxcala	19.2	6.5	17.7
Veracruz	41.3	39.0	41.7
Yucatán	40.5	36.8	42.6
Zacatecas	50.8	49.9	47.0

Source: Authors' calculations.

With respect to the results of model (6), all the variables are robust and with the expected signs.

Table 13. Maximum Likelihood Estimator for the Property Tax Function

	Coefficient	Standard-error	t-ratio	P-value
beta 0	5.91	0.53	11.2	0.000[***]
beta 1	-4.99	0.43	-11.5	0.000[***]
beta 2	0.19	0.04	5.1	0.000[***]
delta 0	-46.19	14.78	-3.1	0.002[***]
delta 1	2.18	0.63	3.5	0.001[***]
delta 2	-21.67	5.66	-3.8	0.000[***]
sigma-squared	68.52	20.43	3.4	0.001[***]
gamma	0.99	0.00	510.6	0.000[***]

[***] Significant 99%. [**] Significant 95%. [*] Significant 90%
Source: Authors' calculations.

The data show that between 2006 and 2008, the property tax collection effort did not grow significantly. Moreover, the results are quite similar to those we get for the total municipal tax revenue. This likely reflects both the fact that the property tax is the one with the heaviest weight in municipal tax revenues and that the specifications are the same for both equations.

As for total tax revenue, property tax revenue varies among different types of municipalities.

Table 14. Municipal Property Tax Effort 2006-08
(percent)

	2006-2008
Total (average)	53
Border municipalities (average)	61
Port municipalities (average)	60
Inland municipalities (average)	52

Source: Authors' calculations.

Again, it seems that border and port municipalities make a more significant effort than inland ones. However, this effort did not improve during the three years analyzed.

Grouping by state, we can detect where municipal effort is weakest. Table 15 shows the average effort between 2006 and 2008.

Table 15. Property Tax Effort Grouped by State 2006-08
(percent)

State	2006	2007	2008
Aguascalientes	64.3	63.2	59.8
Baja California	61.0	60.6	66.7
Baja California Sur	65.8	65.9	68.4
Campeche	48.0	47.1	45.9
Coahuila	58.7	55.1	56.5
Colima	56.3	57.6	60.1
Chiapas	23.2	11.7	10.6
Chihuahua	66.2	64.8	66.8
Durango	58.7	58.2	60.0
Guanajuato	67.9	68.1	61.9
Guerrero	57.3	54.2	48.2
Hidalgo	51.6	49.5	51.0
Jalisco	66.1	66.4	66.6
México	48.7	52.6	52.8
Michoacán	56.0	57.9	63.5
Morelos	50.6	57.4	57.3
Nayarit	58.2	59.0	65.9
Nuevo León	67.6	65.5	60.8
Oaxaca	9.4	15.3	22.5
Puebla	32.9	20.1	27.1
Querétaro	71.4	73.9	71.2
Quintana Roo	76.0	74.9	57.9
San Luis Potosí	47.0	51.7	59.6
Sinaloa	67.2	67.8	66.9
Sonora	54.3	63.1	55.3
Tabasco	25.6	25.9	33.9
Tamaulipas	56.3	51.5	48.3
Tlaxcala	21.1	6.0	21.5
Veracruz	43.9	41.3	43.0
Yucatán	19.6	20.8	32.3
Zacatecas	47.2	46.5	27.4

Source: Authors' calculations.

Note that three of the four most inefficient states are among those with the largest number of municipalities, such as Oaxaca (570), Puebla (217), and Chiapas (119).

By combining Tables 12 and 15, we can distinguish by state between municipalities that exploit other taxes in addition to the property tax from those that rely on the property tax exclusively for financing.

Figure 22. Property Tax Collection Effort vs. Municipal Tax Collection Effort 2006-2008 (grouped by state)
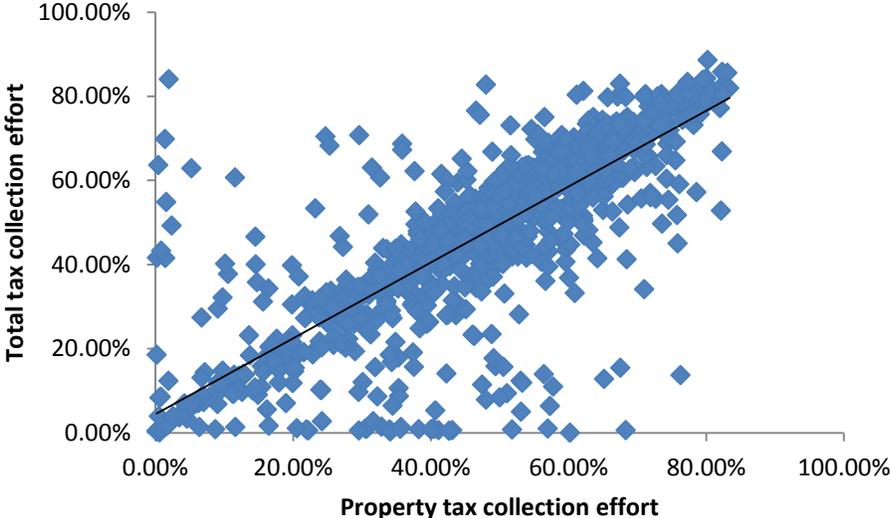
Source: Authors' calculations.

Figure 23 supports the evidence that most municipal governments rely exclusively on the property tax (in the best-case scenario) and do not properly exploit other tax bases. However, it also draws attention to the case of Chiapas where, although the property tax collection effort was 15.1 percent, total tax collection effort averaged 38.5 percent from 2006 to 2008.

**Figure 23. Composition of Municipal Tax Revenues in Chiapas,
(average 2006-2008)**

■ Property tax ■ Transfer of title (real state) ■ Services provision ■ Other taxes
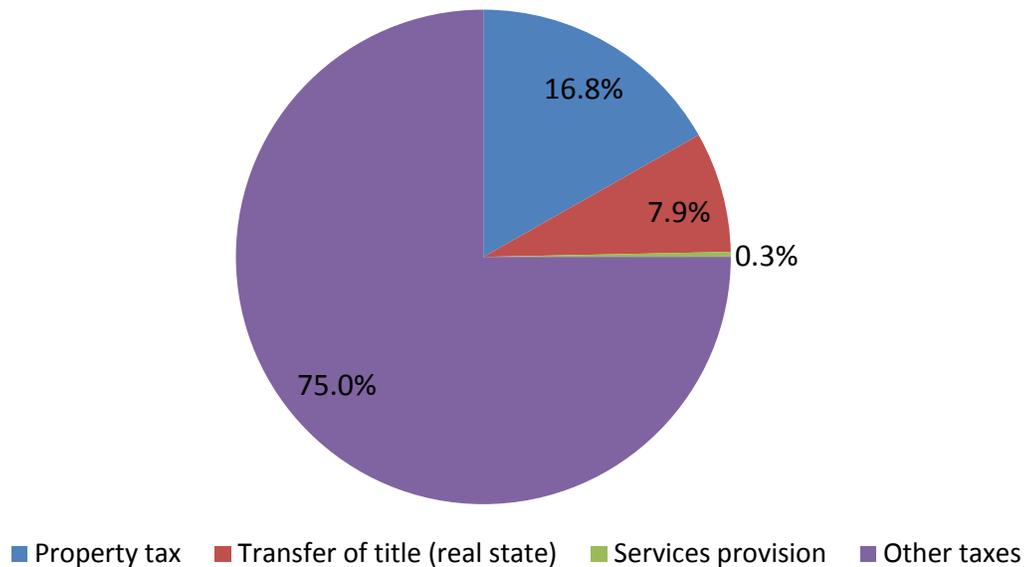
Source: IMCO using data from INEGI.

Figure 24 shows that municipalities in the state of Chiapas exploited other tax bases in addition to the property tax. However, it is not possible to know which taxes those were, is since they reported this revenue as "other taxes."

10. Revenue Potential for Mexican Municipalities

This section will attempt to answer the same question asked with respect to state revenues. What would happen if all municipalities operated at 100 percent effort? The data obtained previously will be used to discuss a hypothetical scenario facing Mexican municipalities if they could increase their potential revenue.

Table 16. Increase in Own Municipal Revenue Grouped by State
Assuming a 100 Percent Effort, 2008

State	Increase (%)
Aguascalientes	54
Baja California	95
Baja California Sur	78
Campeche	71
Coahuila	81
Colima	58
Chiapas	112
Chihuahua	85
Durango	57
Guanajuato	78
Guerrero	86
Hidalgo	102
Jalisco	56
México	110
Michoacán	63
Morelos	95
Nayarit	81
Nuevo León	94
Oaxaca	148
Puebla	172
Querétaro	86
Quintana Roo	77
San Luis Potosí	82
Sinaloa	81
Sonora	93
Tabasco	122
Tamaulipas	99
Tlaxcala	183
Veracruz	102
Yucatán	129
Zacatecas	54

Source: Authors' calculations.

Table 17 shows that own municipal revenues could be significantly increased if all of the potential tax revenue could be collected. Under this scenario, eight states could more than double their own revenues. Furthermore, total municipal revenue could also be significantly increased.

Table 17. Increase in Total Municipal Revenue Grouped by State,
Assuming 100 Percent Effort, 2008

State	Increase (%)
Aguascalientes	12
Baja California	36
Baja California Sur	42
Campeche	8
Coahuila	20
Colima	16
Chiapas	5
Chihuahua	28
Durango	11
Guanajuato	16
Guerrero	17
Hidalgo	14
Jalisco	19
Mexico	22
Michoacán	10
Morelos	24
Nayarit	18
Nuevo León	29
Oaxaca	12
Puebla	22
Querétaro	23
Quintana Roo	31
San Luis Potosí	11
Sinaloa	28
Sonora	27
Tabasco	11
Tamaulipas	14
Tlaxcala	15
Veracruz	12
Yucatán	20
Zacatecas	8

Source: Authors' calculations.

Unlike the case of the states, if municipalities exploited their potential tax bases, their revenues would increase significantly: total own municipal revenue would rise by 108 percent and total municipal revenue by 23 percent.

Regarding the property tax, if all municipalities operated at 100 percent effort, Mexico could jump four places from the bottom of the ranking of OECD countries, collecting the equivalent of 0.65 percent of GDP. However, even assuming a 100 percent effort, Mexico would still be far below the OECD average (1.8 percent).

Figure 24. Potential Property Tax as a Percentage of GDP, 2008
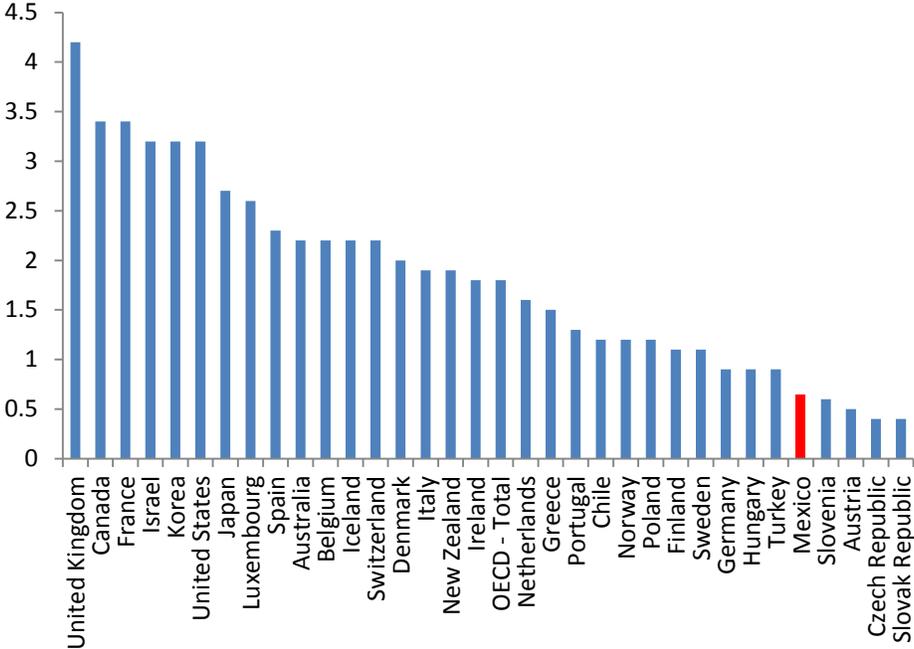
Figure 24 shows a clear need to update cadastral values and to invest in land regularization if Mexico wants to improve its ranking within the OECD.

The conclusion reached by the municipal analysis is the opposite of the one reached for the states. The result suggests that municipal tax bases are not being fully exploited. Even the property tax, which is the most important and the easiest to collect, has a poor collection rate. The empirical evidence shows that the performance of municipal government institutions regarding revenue collection is deficient. By comparing the real and potential revenues of Mexican municipalities, it is evident that there is huge scope for improvement in terms of tax collection.

11. More Taxing Authority to the States

11.1 The Case of the VAT

The value-added tax (VAT) is a tax levied by the central government which represents an important share of non-oil tax revenues. Under the current tax coordination scheme, all VAT collection (along with other sources of federal revenue) is deposited in a fund known as *recaudación federal participable (RFP).* This fund is redistributed among the states according to certain criteria specified in the fiscal coordination law.

This section examines the implications of allowing the states to share the VAT base with the federal government. Under a tax scheme that allows both a federal and state rate for the VAT, own state revenues would increase.[18] However, if the total VAT rate is not allowed to rise, and the tax base is not extended, transfers under the *participaciones* would be smaller and some states' total revenue would decline, while some others' revenue would rise depending on their revenue potential under the VAT.

This two-rate scheme can be proposed in many ways. Trigueros and Fernández (2001)[19] proposed a scheme in which the federal rate is fixed at 12 percent and the states are allowed to apply a tax rate up to 6 percent. This scheme also sets a limit of 25 percent for fiscal credits, so that the central government does not lose a large amount of resources, and consumers would be subject to rates between 12 percent (when local governments do not exercise the option to tax) and 15 percent (when local governments decide to tax at a rate of 6 percent).[20]

For the sake of simplicity, we will assume that there is no net negative balance of interstate credits and the VAT rate is split into a federal rate of 12 percent and a state rate of 3 percent.[21] We also assume that the amount of federal VAT and the rest of the *participaciones* are allocated to states at the same rate observed for central government transfers in the year analyzed. Implicitly we are assuming that all states are as effective as

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[18] In the case where some states have negative VAT balance, which means they have to refund a higher amount than what they received in taxes at the end of the fiscal year, their own revenue would decrease because the state will absorb a part of the subsidy instead of sharing all tax burdens with other states.

[19] The authors favor a comprehensive reform, including expanding the VAT base, among other measures. However, they assess the impact of this reform on the federal budget, not on sub-national ones.

[20] The maximum rate for the local tax is fixed at 6 percent because a higher rate would result in an equivalent VAT rate above 15 percent due to the limit in tax credits.

[21] We selected the rate of 15 percent since there was no complete information for 2010 to perform this exercise with a rate of 16 percent. The special regime of border areas is not considered since there are no disaggregated data available at that level.

the central government at VAT collection and that the VAT base is the same. However, given that some states could be more effective than others, it would make sense if the federal government is responsible for collecting the state VAT surcharge while still allowing the states to choose the rate charged.

Considering the scenario described above, it is not of interest to study the case in which all states choose not to implement a VAT surcharge, since to allocate a smaller fund without having other revenue sources will reduce the total revenue of all states. We will focus our study on the case in which all states decide to implement a 3 percent surcharge on 12 percent of the federal VAT rate. Table 18 summarizes the effect of this surcharge on the own revenue of each state.

Table 18. Change in Own Revenue with a Local VAT Rate of 3 Percent, 2008

State	Change (%)
Aguascalientes	92.4
Baja California	75.6
Baja California Sur	25.0
Campeche	42.2
Coahuila	44.0
Colima	848.4
Chiapas	5.6
Chihuahua	27.6
Distrito Federal	109.2
Durango	2.7
Guanajuato	16.9
Guerrero	20.8
Hidalgo	11.5
Jalisco	52.7
México	22.7
Michoacán	36.5
Morelos	39.1
Nayarit	22.6
Nuevo León	74.8
Oaxaca	14.3
Puebla	16.4
Querétaro	6.2
Quintana Roo	24.7
San Luis Potosí	-10.3

Table 18., continued

State	Change (%)
Sinaloa	17.1
Sonora	32.6
Tabasco	26.8
Tamaulipas	533.3
Tlaxcala	2.4
Veracruz	202.0
Yucatán	50.5
Zacatecas	16.9

Source: Authors' calculations.

The increases would be largest in states such as Colima, Distrito Federal, Tamaulipas, and Veracruz, which make the largest contribution to the total VAT collection and already have a large collection of this tax. Table 19 shows the impact of the proposed reform on states' total revenues.

Table 19. Change in Total Revenues with a Local VAT Rate of 3 Percent, 2008

State	Change (%)
Aguascalientes	-3.3
Baja California	0.0
Baja California Sur	-5.8
Campeche	-4.4
Coahuila	-5.0
Colima	29.3
Chiapas	-8.5
Chihuahua	-3.4
Distrito Federal	32.8
Durango	-8.4
Guanajuato	-7.0
Guerrero	-8.1
Hidalgo	-8.0
Jalisco	-4.1
México	-4.3
Michoacán	-7.1
Morelos	-6.8
Nayarit	-7.6
Nuevo León	3.7

Table 19., continued

State	Change (%)
Oaxaca	-8.5
Puebla	-7.8
Querétaro	-7.5
Quintana Roo	-4.7
San Luis Potosí	-9.4
Sinaloa	-7.2
Sonora	-4.6
Tabasco	-8.2
Tamaulipas	36.0
Tlaxcala	-8.3
Veracruz	-1.0
Yucatán	-6.9
Zacatecas	-7.3

Source: Authors' calculations.

The information in both tables clearly shows that a measure intended to increase the fiscal autonomy of states results in a net loss of revenue for most of them. Table 19 shows that with this distribution agreement, only four of the 32 states would be favored, 27 would be negatively affected, and one state would remain the same. In fact, this information provides evidence that, with shares in total VAT collection of 49.3 percent, 16.1 percent, and 6 percent, respectively. Distrito Federal, Tamaulipas, and Nuevo León are supporting the other states.

Figure 25. Fiscal Autonomy Index with a Local VAT Rate, 2008

Source: Authors' calculations.

51
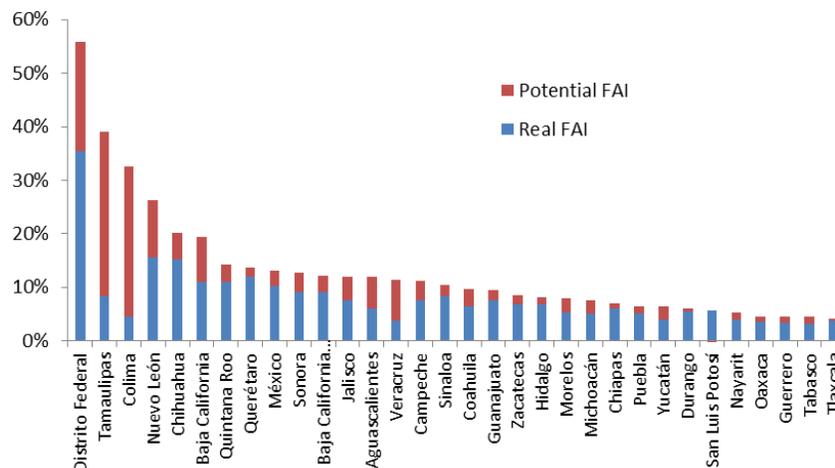
Figure 25 illustrates the FAI defined in (4) for this tax proposal. As mentioned earlier, the average value of the fiscal autonomy index increases by 5.2 percent, from 8 percent to 13.2 percent. However, total revenues of those states that are harmed would decrease by 6.4 percent on average. On the other hand, the total revenues of favored states would increase by 25.5 percent on average.

The variance in the impact of a VAT surcharge across states reflects both their current dependence on central government transfers and their share in *participaciones*. Under this proposal, states would strive to reduce tax evasion and/or levy the surcharge at a higher rate if they do not want to see their financial position undermined, since the new local nature of a percentage of the VAT revenue would cause a 9.4 percent reduction in the *participaciones*.

Moreover, for this exercise it is also possible to consider an extension of the tax base.[22] We will show the effect of two proposals for a tax base extension combined with the above-mentioned surcharge.

The first one was proposed in 2011[23] by a senator from the Institutional Revolutionary Party (PRI) and includes taxing products such as meat in natural state, dry pasta, sugar, salt, oil, and tuna, among others. Table 20 summarizes the changes in own state revenues.

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[22] In order to perform this exercise, extra assumptions should be made: we will assume that the entire tax is paid by the final consumer and changes in consumptions patterns arising from changes in tax rates will not be considered. This assumption also implies no budget constraints.

[23] We do not consider the whole reform, just the exempt basket proposed and the new products to be taxed. Since there was no information for expenditure during 2010 when this research was conducted, we modeled the changes in the base for 2008 and kept the prevailing rate of 15 percent in that year. The full initiative is available at http://www.senadorbeltrones.com/prensa/noticias/10-de-marzo-iniciativa-de-reforma-hacendaria-del-gppi

**Table 20. Change in Own Revenue with a Local VAT Rate of 3 Percent
Considering the PRI's 2011 Proposal, 2008**

State	Change (%)
Aguascalientes	96.1
Baja California	78.3
Baja California Sur	27.1
Campeche	44.4
Coahuila	46.8
Colima	853.5
Chiapas	7.9
Chihuahua	28.8
Distrito Federal	109.7
Durango	6.5
Guanajuato	19.6
Guerrero	25.8
Hidalgo	13.6
Jalisco	55.9
México	24.5
Michoacán	40.3
Morelos	44.1
Nayarit	27.5
Nuevo León	76.2
Oaxaca	18.5
Puebla	20.1
Querétaro	8.2
Quintana Roo	26.4
San Luis Potosí	-6.0
Sinaloa	21.2
Sonora	35.0
Tabasco	29.6
Tamaulipas	536.0
Tlaxcala	4.7
Veracruz	208.4
Yucatán	56.5
Zacatecas	19.3

Source: Authors' calculation.

Again, we should know the impact of the measure on states' total revenues to assess whether or not to apply it. Changes in total revenue are shown in Table 21.

Table 21. Change in Total Revenue with a Local VAT Rate of 3 Percent
**Considering the PRI's 2011 Proposal, 2008**

State	Change (%)
Aguascalientes	-2.2
Baja California	1.1
Baja California Sur	-4.8
Campeche	-3.5
Coahuila	-4.0
Colima	30.4
Chiapas	-7.5
Chihuahua	-2.4
Distrito Federal	33.6
Durango	-7.4
Guanajuato	-5.9
Guerrero	-7.0
Hidalgo	-7.0
Jalisco	-3.1
México	-3.4
Michoacán	-6.0
Morelos	-5.7
Nayarit	-6.6
Nuevo León	4.8
Oaxaca	-7.5
Puebla	-6.7
Querétaro	-6.5
Quintana Roo	-3.7
San Luis Potosí	-8.3
Sinaloa	-6.0
Sonora	-3.7
Tabasco	-7.2
Tamaulipas	37.1
Tlaxcala	-7.3
Veracruz	0.1
Yucatán	-5.8
Zacatecas	-6.3

Source: Authors' calculations.

Considering the local surcharge of 3 percent and an extension of the VAT base as proposed by the PRI, on average six states would increase their total revenue by 17.8 percent, while 26 states would reduce theirs by 5.6 percent. Even though this reform would

increase the total VAT collection by almost 3 percent, the redistributable funds would be 8.5 percent lower than the current ones.

Figure 26. Fiscal Autonomy Index with a Local VAT Rate Considering the PRI's 2011 Proposal, 2008
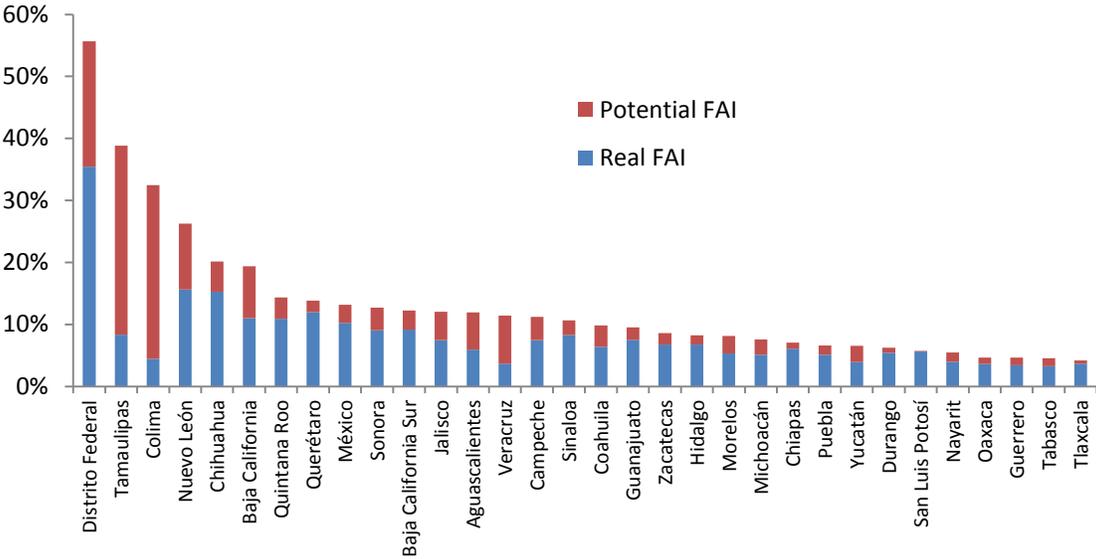
Under this scenario, the average value of the FAI would be 13.3 percent, only 0.1 percent higher than in the previous scenario, where no changes to the tax base were made. Furthermore, this scenario increases own state revenues by 79 percent and total revenues by 1 percent. Note that the increase of total revenues is quite similar to that which would be obtained by raising tax collection to its full potential.

Similar to the last scenario, we propose another variation applying VAT to the products that currently are not taxed and meet one of the following requirements: i) foods that went through any refining process, or ii) consumption by high-income sectors is more frequent than by low-income sectors. Changes in own revenue are summarized in Table 22.

**Table 22. Changes in Own Revenue with a Local VAT Rate of 3 Percent
Considering the IMCO's Exempt Basket Proposal, 2008**

State	Change (%)
Aguascalientes	109.3
Baja California	87.8
Baja California Sur	33.7
Campeche	49.0
Coahuila	55.1
Colima	865.4
Chiapas	12.6
Chihuahua	33.5
Distrito Federal	112.8
Durango	13.9
Guanajuato	28.7
Guerrero	36.1
Hidalgo	19.9
Jalisco	67.2
México	31.0
Michoacán	49.1
Morelos	58.2
Nayarit	37.2
Nuevo León	83.2
Oaxaca	29.4
Puebla	30.8
Querétaro	15.0
Quintana Roo	35.4
San Luis Potosí	4.4
Sinaloa	30.2
Sonora	40.7
Tabasco	38.3
Tamaulipas	544.3
Tlaxcala	16.5
Veracruz	223.3
Yucatán	72.1
Zacatecas	24.3

Source: Authors' calculation.

Note that the increases in own revenue under the three scenarios are very similar, suggesting that the behavior of total revenue would not differ much from that of the previous cases. As before, changes in states' total revenues are shown in order to have a

complete picture of the situation. Table 23 shows the impact of this exempt basket proposal on state revenues.

Table 23. Change in Total Revenues with a Local VAT Rate of 3 Percent Considering IMCO's Exempt Basket Proposal, 2008

State	Change (%)
Aguascalientes	1.5
Baja California	4.9
Baja California Sur	-1.5
Campeche	-0.6
Coahuila	-0.9
Colima	33.7
Chiapas	-4.3
Chihuahua	0.8
Distrito Federal	36.7
Durango	-4.1
Guanajuato	-2.5
Guerrero	-3.8
Hidalgo	-3.6
Jalisco	0.4
México	-0.6
Michoacán	-2.6
Morelos	-2.0
Nayarit	-3.4
Nuevo León	8.5
Oaxaca	-4.1
Puebla	-3.3
Querétaro	-2.9
Quintana Roo	-0.3
San Luis Potosí	-4.8
Sinaloa	-2.4
Sonora	-0.6
Tabasco	-3.9
Tamaulipas	40.6
Tlaxcala	-4.1
Veracruz	3.4
Yucatán	-2.2
Zacatecas	-3.2

Source: Authors' calculations.

By reducing exemptions, total VAT collection would increase by almost 11 percent. However, given the tax scheme proposed, shared revenues would be reduced by 5.4 percent. Under this proposal, on average the total revenue of 23 states would be reduced by 2.7 percent, while four states would increase their revenue by 14.5 percent.

Figure 27. Fiscal Autonomy Index with a Local VAT Rate Considering IMCO's Exempt Basket Proposal, 2008
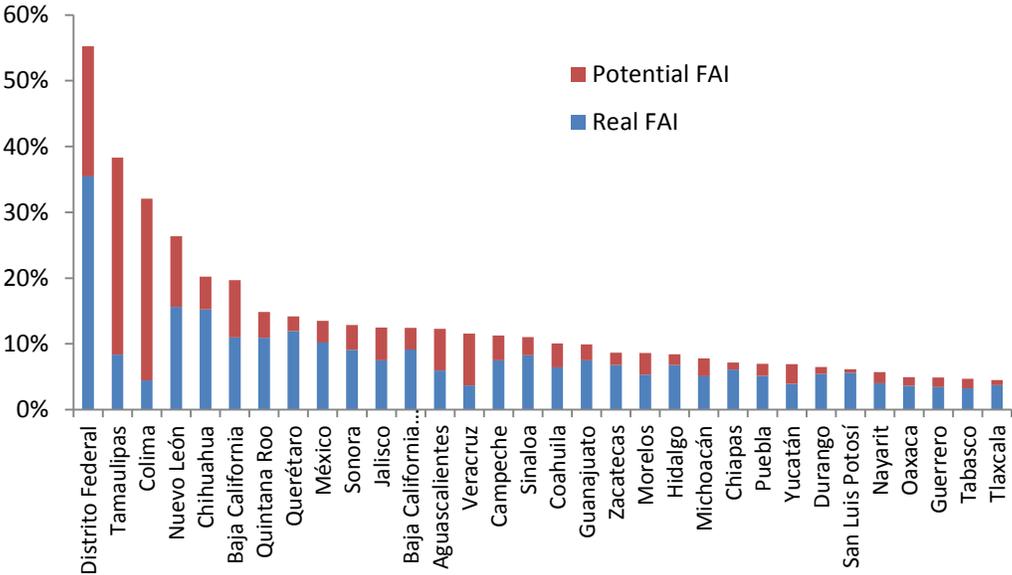
Source: Authors' calculations.

Even though this scenario reports an average value of the FAI of 13.4 percent (slightly higher than the other two scenarios proposed), total state revenues would increase by 4.3 percent. Note that this increase is higher than those we reported in all previous sections.

11.2 The Case of the Personal Income Tax Surcharge

The Personal Income Tax (PIT) is another component of the RFP which, in fact, has a greater share in non-oil tax revenue than the VAT. However, the income tax scheme is much more complex and requires the application of different rates for personal and corporate income according to the different tax brackets specified by law. Nonetheless, is possible to use some assumptions to simplify the tax regime such as calculating the effect of a personal income tax surcharge at the state level.

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Following Ríos et al. (2012), when calculating the PIT for Venezuelan municipalities, we estimate income from survey data collected in 2010.[24] Using income data from each state and a flat rate of 1 percent for all incomes above the lowest tax bracket, we find that total collection would be close to USD 900 million in 2010. This is equivalent to 1 percent of total state revenues and 12 percent of states' own revenues. Again, as in the case of the VAT, if an increase in the tax rate and a broadening of the tax base is not implemented, the final impact of a surcharge might be negative in terms of total revenues.[25]

Table 24 shows the total PIT collection of by state and the percentage it represents of its total and own revenue. Although all states to the mean regarding the PIT surcharge as percentage of total revenues, it varies more when it comes to the percentage of own revenues. In this case, it goes from 1.7 percent in the Distrito Federal to 17.4 in Tlaxcala. These percentages could be increased using a different rate structure for different income breaks. As it was proposed with the VAT, to increase efficiency this tax could also be collected by the Federation with states deciding tax rates.

Table 24. PIT Collection with a Flat Rate of 1 Percent, 2010

State	PIT Collection (million USD)	Percentage of total revenues	Percentage of own revenues
Aguascalientes	$ 11.00	1.0%	17.3%
Baja California	$ 34.17	1.3%	13.9%
Baja California Sur	$ 6.99	0.9%	8.6%
Campeche	$ 6.94	0.6%	5.9%
Coahuila	$ 23.33	0.6%	12.6%
Colima	$ 6.58	0.9%	11.9%
Chiapas	$ 18.00	0.4%	6.3%
Chihuahua	$ 27.17	0.8%	6.5%
Distrito Federal	$ 120.83	1.1%	1.7%
Durango	$ 10.33	0.6%	11.6%
Guanajuato	$ 35.17	0.9%	11.8%
Guerrero	$ 16.75	0.5%	13.5%
Hidalgo	$ 13.25	0.6%	6.7%
Jalisco	$ 70.83	1.2%	18.6%
México	$ 115.00	0.8%	7.1%

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[24] Encuesta Nacional de Ingreso y Gasto de los Hogares (ENIGH), 2010.
[25] These calculations are not reported here because providing an accurate value requires further assumptions and information due to the aforementioned complexity of this tax.

Table 24., continued

State	PIT Collection (million USD)	Percentage of total revenues	Percentage of own revenues
Michoacán	$ 26.17	0.6%	14.0%
Morelos	$ 13.83	0.8%	18.7%
Nayarit	$ 9.17	0.7%	15.8%
Nuevo León	$ 54.33	1.1%	12.1%
Oaxaca	$ 19.58	0.5%	15.5%
Puebla	$ 33.25	0.7%	15.9%
Querétaro	$ 16.17	0.9%	8.4%
Quintana Roo	$ 15.25	0.8%	8.7%
San Luis Potosí	$ 20.25	0.9%	15.8%
Sinaloa	$ 21.42	0.8%	10.9%
Sonora	$ 23.25	0.7%	8.7%
Tabasco	$ 13.08	0.4%	10.9%
Tamaulipas	$ 25.42	0.8%	10.2%
Tlaxcala	$ 7.58	0.5%	17.4%
Veracruz	$ 47.00	0.6%	18.4%
Yucatán	$ 14.50	0.8%	13.5%
Zacatecas	$ 8.13	0.4%	9.8%
Total	**$ 884.72**	**0.9%**	**12.5%**

Source: Authors' calculations.

11.3 Tax on Electric Consumption

Another potential source of revenue could be a tax on electricity consumption. Using data from the Ministry of Energy at the *Sistema de Información Energética*, we calculate tax collection with a 30 percent tax rate. Table 25 shows the prices per Kilowatt/hour, total sales by each sector and the amount that would be collected in 2010 using such rates. Here it is important to note that this calculation does not consider reductions in demand when the tax is implemented. Although electricity consumption is considered relatively inelastic for the average consumer, this might not be true for low-income households. For this reason, this tax collection could be overestimated.

In total, using the 30 percent rate tax collection would be about US$ 6,231 million, which is about 7.5 percent of total transfers to states and 7.4 percent of transfers to municipalities. These estimates indicate that a tax on electricity consumption could be a

potential source of revenue for states and municipalities. An important element of this tax is that it is aligned with environmental policies. One alternative to reduce socially sensitive issues associated with this tax could be to allow households a certain quantity of electricity at a zero tax rate to cover their basic needs and start taxing for every Kilowatt consumed over this benchmark.

Table 25. Electricity Price, Total Sales and Tax Collection for Different Sectors, 2010

	USD per Kwt/hr	Total sales (million USD)		Tax collection at 30 percent tax rate (million USD)	
Residential	0.094	$	4,544	$	1,363
Comercial	0.155	$	2,782	$	835
Services	0.214	$	1,196	$	359
Agriculture	0.041	$	353	$	106
Industry	**0.110**	**$**	**11,894**	**$**	**3,568**
Medium firms	0.119	$	8,354	$	2,506
Large firms	0.092	$	3,539	$	1,062
Total	**0.112**	**$**	**20,770**	**$**	**6,231**

Source: Authors' calculations with data from the Ministry of Energy.

12. Conclusions

Increasing sub-national revenue carries significant political costs. An increase in the number of taxes or in the tax rate could result in potential electoral losses that sub-national governments do not want to face and which, under the current revenue-sharing arrangements, they can avoid.

The results show that the current tax base is not sufficient to strengthen sub-national public finances. It needs to be broadened so that local revenues make up a greater share of the country's public finances. Under current legislation, even if states could collect their full potential, this extra revenue would not have a significant impact on total tax revenues.

The situation is different for Mexican municipalities which do not adequately exploit their current tax base, including the property tax. There is an important opportunity to increase municipal revenue just by better exploiting current taxing authority.

On the other hand, if some taxing authority is returned to Mexican states so that they can keep a share of central government taxes, other redistribution criteria could be

considered for the *participaciones,* since a few states would be very favored while the great majority would be harmed, and the gap between regions would widen. These criteria should incentivize a more efficient exploitation of local tax bases so that sub-national governments do not return to the situation of total dependence on central government transfers. However, proposing a new fiscal coordination system is beyond the scope of this study.

Finally, any policy aimed at increasing sub-national revenue must be accompanied by a proposal to improve transparency and increase accountability for sub-national governments, to ensure that the additional resources collected are used properly.

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Appendix 1.

Aguascalientes	Juanacatlán	Tultepec	Juan C. Bonilla	Xaloztoc
Jesús María	Ocotlán	Tultitlán	Ocoyucan	Papalotla de Xicohténcatl
San Francisco de los Romo	Poncitlán	Villa del Carbón	Puebla	Xicohtzinco
Ensenada	Puerto Vallarta	Xonacatlán	San Andrés Cholula	Yauhquemecan
Mexicali	El Salto	Zinacantepec	San Felipe Teotlalcingo	Zacatelco
Tecate	Tlajomulco de Zúñiga	Zumpango	San Gregorio Atzompa	La Magdalena Tlaltelulco
Tijuana	Tlaquepaque	Cuautitlán Izcalli	San Martín Texmelucan	San Damián Texoloc
Playas de Rosarito	Tonalá	Valle de Chalco Solidaridad	San Miguel Xoxtla	San Francisco Tetlanohcan
La Paz	Zapopan	Tonanitla	San Pedro Cholula	San Jerónimo Zacualpan
Los Cabos	Acolman	Jacona	San Salvador el Verde	San Juan Huactzinco
Campeche	Almoloya de Juárez	Morelia	Santiago Miahuatlán	San Lorenzo Axocomanitla
Carmen	Amecameca	La Piedad	Tehuacán	Santa Ana Nopalucan
Acuña	Apaxco	Tarímbaro	Tepatlaxco de Hidalgo	Santa Apolonia Teacalco
Arteaga	Atenco	Uruapan	Tlaltenango	Santa Catarina Ayometla
Castaños	Atizapán de Zaragoza	Zamora	Corregidora	Santa Cruz Quilehtla
Frontera	Atlautla	Atlatlahucan	Huimilpan	Santa Isabel Xiloxoxtla
Matamoros	Axapusco	Ayala	El Marqués	Alvarado
Monclova	Ayapango	Cuautla	Querétaro	Amatlán de los Reyes
Nava	Calimaya	Cuernavaca	San Juan del Río	Atzacan
Piedras Negras	Coacalco de Berriozábal	Emiliano Zapata	Isla Mujeres	Banderilla
Ramos Arizpe	Cocotitlán	Huitzilac	Othón P. Blanco	Boca del Río
Saltillo	Coyotepec	Jiutepec	Benito Juárez	Camerino Z. Mendoza
Torreón	Cuautitlán	Temixco	Solidaridad	Cazones
Armería	Chalco	Tepoztlán	Ciudad Fernández	Coatepec
Colima	Chapultepec	Tlayacapan	Rioverde	Coatzacoalcos
Comala	Chiautla	Xochitepec	San Luis Potosí	Coatzintla
Coquimatlán	Chicoloapan	Yautepec	Soledad de Graciano Sánchez	Córdoba
Cuauhtémoc	Chiconcuac	Yecapixtla	Ahome	Cosoleacaque
Manzanillo	Chimalhuacán	Xalisco	Culiacán	Chinameca
Tecomán	Ecatepec de Morelos	Tepic	Mazatlán	Emiliano Zapata
Villa de Álvarez	Ecatzingo	Bahía de Banderas	Cajeme	Fortín
Chiapa de Corzo	Huehuetoca	Apodaca	Empalme	Huiloapan
San Cristóbal de las Casas	Hueypoxtla	Cadereyta Jiménez	Guaymas	Ixhuatlancillo
Tapachula	Huixquilucan	García	Hermosillo	Ixhuatlán del Sureste
Tuxtla Gutiérrez	Isidro Fabela	San Pedro Garza García	Navojoa	Ixtaczoquitlán
Aldama	Ixtapaluca	General Escobedo	Nogales	Xalapa
Aquiles Serdán	Jaltenco	Guadalupe	Cárdenas	Jáltipan
Chihuahua	Jilotzingo	Juárez	Centro	Jilotepec

|				
Delicias	Juchitepec	Monterrey	Comalcalco	Mariano Escobedo
Juárez	Lerma	Salinas Victoria	Huimanguillo	Medellín
Durango	Melchor Ocampo	San Nicolás de los Garza	Macuspana	Minatitlán
Gómez Palacio	Metepec	Santa Catarina	Nacajuca	Nogales
Lerdo	Mexicaltzingo	Santiago	Altamira	Orizaba
Celaya	Naucalpan de Juárez	Oaxaca de Juárez	Ciudad Madero	Oteapan
Guanajuato	Nezahualcóyotl	Salina Cruz	Matamoros	Pánuco
Irapuato	Nextlalpan	San Agustín de las Juntas	Nuevo Laredo	Papantla
León	Nicolás Romero	San Agustín Yatareni	Reynosa	Poza Rica de Hidalgo
Pénjamo	Nopaltepec	San Andrés Huayápam	Río Bravo	Pueblo Viejo
Purísima del Rincón	Ocoyoacac	San Antonio de la Cal	Tampico	Rafael Delgado
Salamanca	Otumba	San Bartolo Coyotepec	Victoria	Rafael Lucio
San Francisco del Rincón	Otzolotepec	San Blas Atempa	Amaxac de Guerrero	Río Blanco
Silao	Ozumba	San Jacinto Amilpas	Apetatitlán de Antonio Carvajal	Tihuatlán
Acapulco de Juárez	Papalotla	Ánimas Trujano	Apizaco	Tlalnelhuayocan
Coyuca de Benítez	La Paz	San Juan Bautista Tuxtepec	Cuaxomulco	Tlilapan
Zihuatanejo de Azueta	Rayón	San Lorenzo Cacaotepec	Chiautempan	Veracruz
Atitalaquia	San Antonio la Isla	San Pablo Etla	Ixtacuixtla de Mariano Matamoros	Yanga
Atotonilco de Tula	San Martín de las Pirámides	San Sebastián Tutla	Mazatecochco de José María Morelos	Zaragoza
Cuautepec de Hinojosa	San Mateo Atenco	Santa Cruz Amilpas	Contla de Juan Cuamatzi	Nanchital de Lázaro Cárdenas del Río
Epazoyucan	Tecámac	Santa Cruz Xoxocotlán	Tepetitla de Lardizábal	Conkal
Mineral del Monte	Temamatla	Santa Lucía del Camino	Acuamanala de Miguel Hidalgo	Kanasín
Pachuca de Soto	Temascalapa	Santa María Atzompa	Nativitas	Mérida
Mineral de la Reforma	Tenango del Aire	Santa María Coyotepec	Panotla	Ucú
San Agustín Tlaxiaca	Teoloyucán	Santa María del Tule	San Pablo del Monte	Umán
Santiago Tulantepec de Lugo Guerrero	Teotihuacán	Santo Domingo Tehuantepec	Santa Cruz Tlaxcala	Guadalupe
Tizayuca	Tepetlaoxtoc	Santo Domingo Tomaltepec	Tenancingo	Zacatecas
Tlahuelilpan	Tepetlixpa	Tlalixtac de Cabrera	Teolocholco	
Tlaxcoapan	Tepotzotlán	Villa de Zaachila	Tepeyanco	
Tula de Allende	Tequixquiac	Amozoc	Tetla de la Solidaridad	
Tulancingo de Bravo	Texcoco	Coronango	Tetlatlahuca	
Zapotlán de Juárez	Tezoyuca	Cuautlancingo	Tlaxcala	
Zempoala	Tlalmanalco	Chiautzingo	Tocatlán	
Guadalajara	Tlalnepantla de Baz	Domingo Arenas	Totolac	
Ixtlahuacán de los Membrillos	Toluca	Huejotzingo	Tzompantepec	

Appendix 2. Overview of the Fiscal Situation in the Central Government

Excluding oil revenue, the central government is responsible for the most lucrative revenue sources: income taxes, value-added tax (VAT), special taxes on production and services, and trade tariffs.

Tax revenue in Mexico consists mainly of two taxes: the income tax and the VAT. Production and Services Special Tax (IEPS) shows a variable pattern because of its reliance on gasoline prices, becoming a subsidy when international prices are very high, as in 2008.

Current gasoline pricing schemes aggravate the volatility of the fiscal dependency on oil. The IEPS tax on gasoline becomes a subsidy when oil prices increase, as shown in Figure 28 for 2008, when government gasoline subsidies were equivalent to 18 percent of total tax revenue.

Figure 28. Tax Revenue Structure
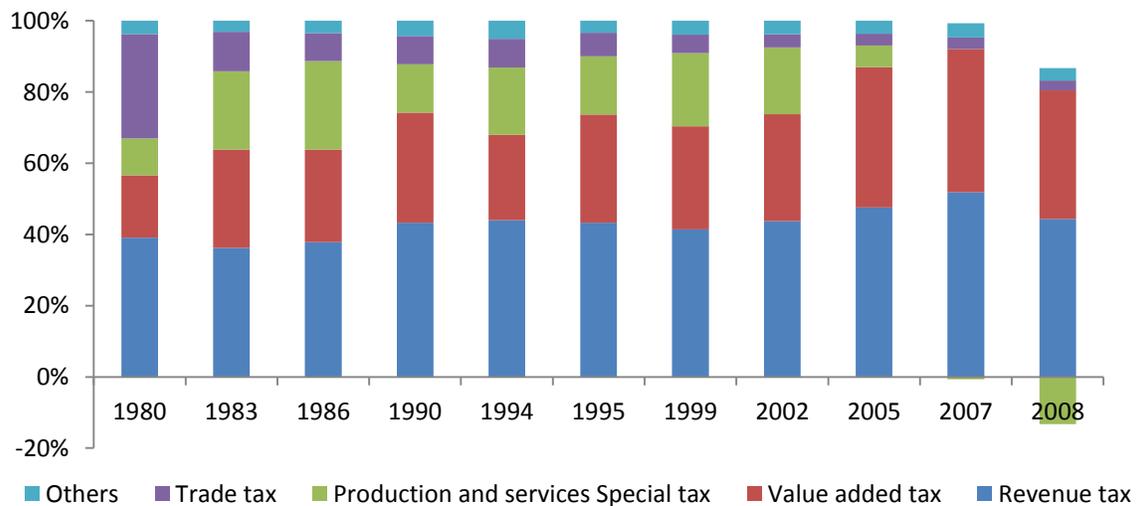
Source: Chamber of Deputies Public Finance Study Center.

In 2008, income taxes accounted for more than 50 percent of non-oil tax revenue. The second most important source of non-oil tax revenue was the value added tax, accounting for 38 percent.

**Figure 29. Composition of Non-oil Tax Revenue, 2008**
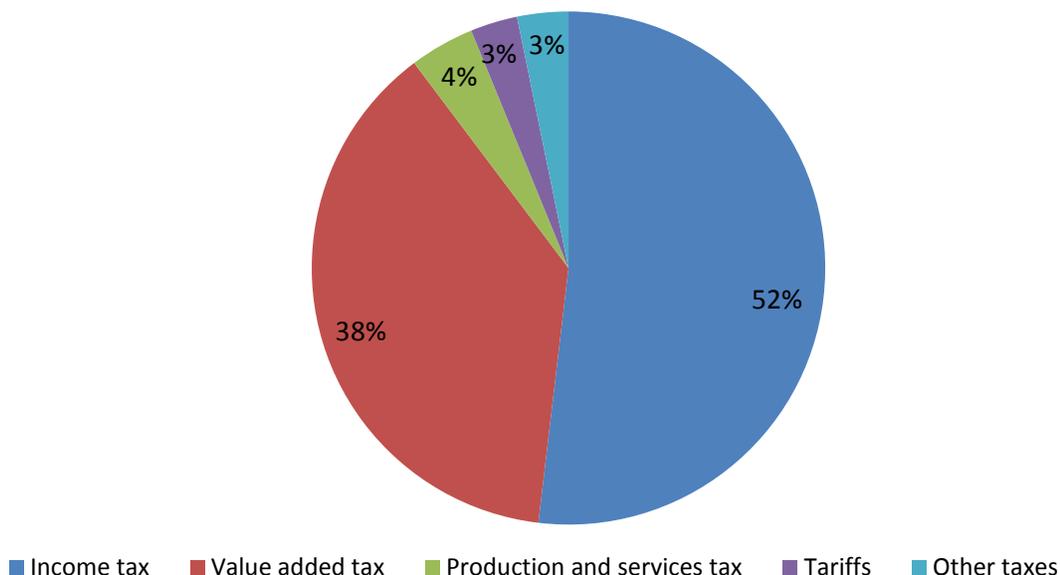
Source: Treasury Ministry (SHCP).

In Mexico, income taxes can be divided into three groups: personal, corporate, and payroll. In recent years, revenue from the payroll tax has been rising. In 2002 it was about 24.7 percent of total income tax collection, while in 2008 it accounted for 48 percent of the total.

Income tax is progressive: the lowest income earners do not pay this tax and in fact have a negative tax rate that works like a wage subsidy. As the level of income increases, so does the tax rate. The highest tax bracket is 30 percent of gross personal income. However, this tax has a high evasion rate. Research by El Colegio de México, CIDE, and ITAM has found that personal income tax evasion ranges from 20 to 80 percent of potential revenue.

Mexico has a great potential of increasing the amount collected through the VAT. Between 1997 and 2010, the VAT rate stood at 15 percent. In 2010, it was increased to 16 percent. Mexico still has one of the lowest rates among OECD countries as well as one of the lowest levels of collected revenue.

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Figure 30. Value-added Tax Rates for OECD countries, 2010
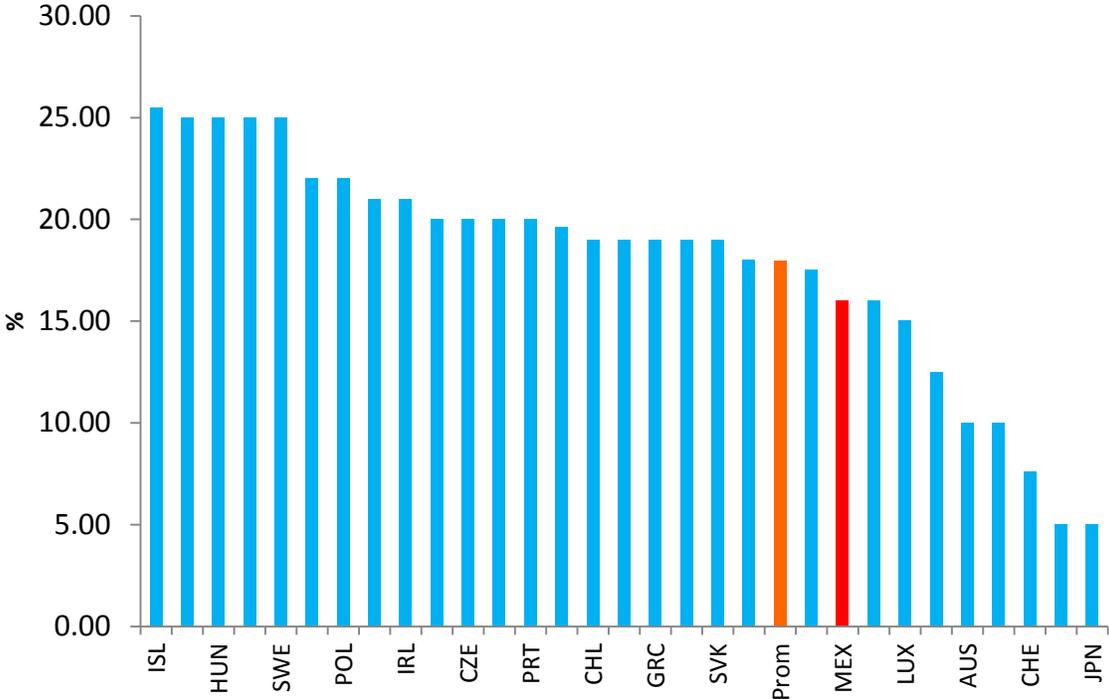
Source: IMCO using data from OECD 2010.

In Mexico, some products are not taxed or are exempted from the VAT, such as foodstuffs and medicines. Moreover, Mexico has a special VAT regime in regions bordering the United States. Research by ITAM (Trigueros and Fernández, 2001) estimates that tax evasion represents 20 to 23 percent of potential revenue, equivalent to 1 percent of GDP. These conditions would allow the country to increase the portion of the VAT in total revenue both in absolute terms and as a percentage of GDP.

Figure 31. Value-added Tax Revenue as Percentage of GDP, 1980-2008

Value-added tax revenue
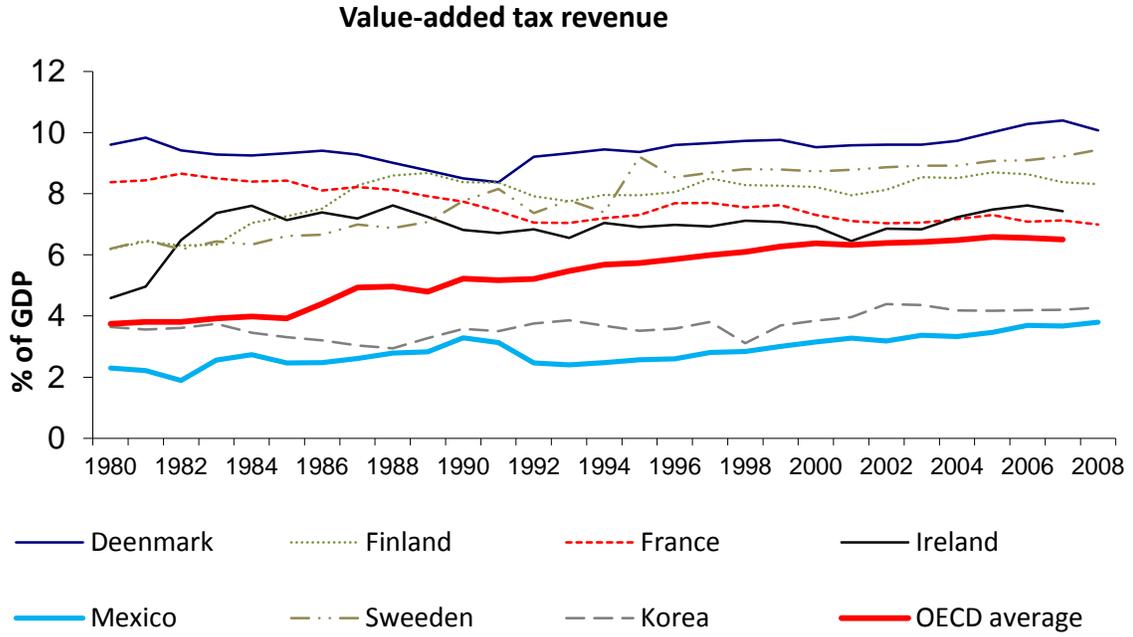
Source: IMCO using data from OECD revenue statistics.