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How much does VAT revenues cost in Mexico?

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Abstract

The low levels of tax revenues in the developing countries have limited the capacity of their governments to redistribute income, provide public goods and generate economic growth. According to Dubin, et. al. (1990) tax revenues will increase if the government increases the enforcement spending. However, if the return of the enforcement spending is low, it might be better to increase the severity of the penalties and sanctions, since it accounts for minor costs. Therefore, only when we know the yield of the enforcement spending in terms of tax revenues we can decide to what extent it will be profitable to raise the amount of resources devoted to enforce tax compliance. This is relevant for any developing country, where the scarcity of the resources is greater than in developed countries.

The present paper estimates the return of the enforcement spending in terms of VAT revenues for the case of Mexico, using the model of Engel et. al. (2001). The results are compared to the case of Chile. To our knowledge, there is no evidence of any work that has made this kind of analysis for the case of Mexico. The differences between the return of the enforcement spending in these two countries is explained by the gap in the administrative efficiency between the SII (Internal Tax System in Chile) and SAT (agency that is in charge of the tax administration in Mexico).

There is a lot to learn from the Chilean experience: At the beginning of the nineties in Chile, VAT evasion was approximately 30 percent, while at the end of the decade this rate dropped to 18.3 percent. This goal was achieved through improvements both in enforcement and in the administrative efficiency of the SII. In fact, administration expenditure as a percentage of net tax revenues in Chile in 1998 was lower than in many other OCDE countries: it accounted for 0.73 percent. The paper provides some suggestions to improve tax administration in Mexico according to the latest modifications, both in the law and in the practice, during the Fox administration. The results of this paper represent the starting point in the debate about how to construct an administrative reform to increase both SAT's internal and external efficiency.

Resumen

Para Dubin, et al. (1990) los ingresos tributarios aumentarán en la medida en la que el gobierno aumente el gasto para la fiscalización de los impuestos. Sin embargo, aumentar la severidad de las multas y sanciones puede resultar una mejor opción pues éstas acciones no implican desembolsar recursos Esta cuestión es relevante, particularmente en países

como México, donde los recursos son más escasos en comparación con cualquier país desarrollado. Este trabajo estima el rendimiento del gasto en fiscalización para la recaudación del IVA en México. Los resultados son comparados con el caso de Chile. Estas diferencias en la rentabilidad del gasto en fiscalización son explicadas por la brecha existente entre la eficiencia administrativa del SII y el SAT. Así, estos resultados son el punto de partida en la discusión sobre cómo diseñar una reforma administrativa en el SAT que mejore su eficiencia tanto interna como externa.

Introduction*

The low levels of tax revenues in the developing countries have limited the capacity of their governments to redistribute income, provide public goods and generate economic growth. Data published by the Organization for Economic Cooperation and Development (OECD) shows the backwardness of these countries: In 1999 their average tax revenue was 18 percent of GDP, which barely reached half of the average tax revenue in the industrialized countries during the same year¹.

In Mexico, like in many other countries in Latin America, the main causes for the fragile tax collection are the high levels of tax evasion and the inefficient administration of the tax system. For instance, estimates for 1993 show that in Peru Value-Added Tax (VAT) evasion was 68 percent, while in Guatemala it was 52 percent. For the same year, 37 percent of VAT revenues were not collected in Mexico. See Table 1.

T A B L E 1

COUNTRY	PERCENTAGE OF VAT EVASION (1993)
ARGENTINA	31.5
BOLIVIA	43.9
COLOMBIA	35.8
CHILE	19.7
ECUADOR	38.2
GUATEMALA	52.5
HONDURAS	35.4
MEXICO	37.1
PERU	68.2
URUGUAY	29.7

Source: Etcheberry (2001).

The high levels of tax evasion reduce the revenues of the government, distort the allocation of resources, and create social conflicts between those individuals who pay and those who do not. Therefore, governments are very concern about tax evasion. The most common way to fight evasion is with audits and fines. Dubin, *et al.* (1990) estimated the impact on the federal income tax revenue in the U. S. when there is an increase in the rate of audits. They concluded that an increase in the probability of an audit, substantially increases the marginal return of tax collection, thus increasing considerably tax

* The author wishes to thank Sandra Robles and Juan Francisco Islas for their valuable assistance. The support of the Program on Budget and Public Spending CIDE-FORD is gratefully acknowledged.

¹ The average tax revenue in the industrialized countries for 1999 was 37.3 percent of GDP. *Revenue Statistics of OECD Countries 1965-2000*, Paris, 2001, p. 77.

revenues. Therefore, according to Dubin, *et al.* (1990), the reason for having high levels of tax evasion is due to weak monitoring –meaning that the rate of audits is low because there is a lack of equipment and personnel in the tax agencies. Consequently, if the government increases the enforcement spending, then tax revenues will increase². However, increasing the number of audits is not always the best choice. Sometimes it might be better to increase the severity of the sanctions, since it accounts for minor costs. Therefore, only when we know the yield of the enforcement spending in terms of tax revenues we can decide to what extent it will be profitable to raise the amount of resources devoted to enforce tax compliance. This is particularly relevant in the case of developing countries, where the opportunity cost of their resources is greater than in any industrialized country.

For that reason, this work estimates the yield of the enforcement spending on VAT revenues in Mexico, using the model of Engel *et al.* (2001). The results are compared to the case of Chile. At the present time, there is no evidence of any work that has made this kind of analysis for the case of Mexico. The paper is divided in four sections. The description of the VAT system and the Tax Administration System (SAT) in Mexico is presented in the first section. The model appears in Section II. The results for Mexico and Chile are shown in the third section. The fourth section summarizes and concludes.

The VAT System and the Tax Administration System (SAT) in Mexico

The majority of worldwide tax reforms have introduced VAT as one of their main components³. Mexico was not the exception. In 1980, during the administration of President Lopez Portillo, VAT was introduced to substitute more than 30 federal indirect taxes and 300 state taxes⁴. Although the principal objective of the VAT was to simplify and facilitate the administration of the fiscal system, its adoption was also a response to the fiscal changes that took place in several Latin American countries: By the end of 1975 Argentina, Chile, Colombia, Costa Rica, Nicaragua and Honduras had already implemented the VAT system in their economies⁵.

VAT rates in Mexico have undergone important adjustments since their first appearance. In 1980 the VAT rate was stipulated in 10 percent throughout the whole country, with only three exceptions: *i*) a 6 percent rate at the border

² There are other factors, besides enforcement forces, that can also explain low levels of tax compliance: *i*) lack of honesty *ii*) the perception that the tax system is unfair *iii*) the idea that the number of individuals in the economy who pay their taxes is low *iv*) the government wastes taxpayers money *v*) the regulatory framework is complex and is not very transparent. However, in this paper we only discuss the effect of the enforcement spending on the levels of tax revenues in the economy. For a complete revision of the literature see Andreoni *et al.* (1998).

³ In 1985 only 36 countries were using VAT systems. Currently, more than 80 countries have adopted it. Agha and Haughton (1996) p. 303.

⁴ Gil and Thirsk (1997), p. 316.

⁵ Perry and Herrera (1994), p. 115.

line, *ii*) a zero rate for non-processed highly consumed foodstuffs and, *iii*) an exempted regime for certain goods and services such as education, books, newspapers and magazines, among others. Actually, the VAT rate is 15 percent, except at the borderline, which is 10. The exempted regime for certain goods and services still persists, and there is a zero tax rate for staple commodities, medicines and books⁶. In Table 2 we can see that the VAT rate in Mexico is lower than the one in Argentina Brazil, Chile and Colombia.

T A B L E 2
VAT RATES IN LATIN AMERICAN COUNTRIES

COUNTRY	YEAR OF VAT IMPLEMENTATION	TAX RATE DURING THE FIRST YEAR	1980	1990	1997
ARGENTINA	1975	16	16	18	21
BOLIVIA	1973	10	2.1	10	14.9
BRAZIL	1967	15	16	20	12.36 y 17
COLOMBIA	1975	10	15	10	16
COSTA RICA	1975	10	8	10	15
CHILE	1975	20	20	18	18
ECUADOR	1970	4	5	10	10
EL SALVADOR	1992	10	5	-	13
GUATEMALA	1983	7	2	7	10
HONDURAS	1976	3	-	7 A 10	7,10
MEXICO	1980	10	10	15	15
NICARAGUA	1975	6	8	15	15
PANAMA	1977	5	-	5	5
PARAGUAY	1993	12	-	-	10
PERU	1976	20	5	-	18
DOMINICAN REPUBLIC	1983	6	22	12	8

Source: Shome (1992), Shome (1999).

According to Bird and Casanegra (1992) if the tax system is simplified then there is an increase in tax revenues in countries with high levels of tax evasion⁷. In fact, the implementation of VAT system improved tax revenues in the majority of the Latin American countries; however, they did not reach the estimated levels. Table 3 shows that in 1999 Chile was the country with the highest VAT revenues in Latin America: 8.2 percent of GDP.

⁶ During 2002 the VAT rate was also applied to some luxury goods. However, this type of VAT was canceled by the end of that same year.

⁷ In almost every country, VAT is evaded basically by underreporting sales or overestimating purchases of inputs. This is why there is an international trend to simplify VAT to one flat rate.

T A B L E 3
VAT REVENUES IN LATIN AMERICA
(PERCENTAGE OF GDP)

COUNTRY	1980	1990	1993	1996	1999
ARGENTINA	4.3	2.8	5.9	6.4	7.7
BOLIVIA	0	2.2	4	4.5	3.3
BRAZIL	N.A.	N.A.	12.4	9.5	
COLOMBIA	1.9	2.8	-	-	5.6
COSTA RICA	1.7	3	5.7	7.1	
CHILE	10.2	8.9	8.5	8.8	8.8
ECUADOR	1.5	2.8	3	3.3	5.5
GUATEMALA	1.5	1.2	2.6	3.7	
MEXICO	2.6	3	2.7	2.9	3.5
NICARAGUA	2.2	0.9	3.2	4.7	
PANAMA	1.9	1.2	1.8	1.9	
PARAGUAY	0.6	0.8	1.8	4.1	
PERU	5.7	N.A.	3.2	5	5.6
DOMINICAN REPUBLIC	0.6	0.7			

Source: Shome (1992), Shome (1999).

The legal and institutional framework in Mexico has been modified several times in order to improve the levels of tax collection⁸. One of the most recent institutional changes took place in July 1997 when the SAT was created as a decentralized agency of the SHCP⁹. The SAT is in charge of collect and control federal taxes, as well as the supervision of compliance with fiscal obligations. Within the objectives of the SAT there was a need to modernize and simplify the administrative and operating processes of the tax system.

Apparently the impact of the SAT administration has been positive in terms of VAT revenues. For instance, 0.15 percent of GDP was devoted to enforce compliance in 1999; whereas, VAT revenues amounted to 3.2 percent of GDP, while in 2003 the enforcement was also 0.15 percent of GDP and VAT revenues rose to 3.8 percent of GDP. See Table 4.

⁸ Das-Gupta and Mookherjee (1998), p. 307.

⁹ SHCP (Secretaría de Hacienda y Crédito Público) is the equivalent to the Treasury Department in the US.

T A B L E 4
VAT REVENUES AND ENFORCEMENT SPENDING IN MEXICO
(PERCENTAGE OF GDP)

YEAR	ENFORCEMENT SPENDING	VAT REVENUES
1997	0.055	3.07
1998	0.141	3.11
1999	0.146	3.29
2000	0.127	3.45
2001	0.137	3.58
2002	0.150	3.72
2003	0.121	3.27
2004*	0.128	3.81
2005*	0.131	4.01

Source: Estimates obtained using data from SHCP. Data in real terms, base 1993.

* Estimates from "Ley de Ingresos de la Federación"

One could argue that in order to improve tax revenues, it will be necessary to increase enforcement spending. However, this will not necessarily have a positive effect. There is evidence that the tax effort in Mexico is low: Shome (1999), based on data from 1992 and 1996 –and taking into account other taxes that exist in each country– classified Mexico among the Latin American countries that have medium tax revenues along with Argentina, Bolivia, Colombia and Panama¹⁰. Consequently, it is relevant to calculate the yield of an additional dollar in enforcement spending to generate policy recommendations. Specifically, these results can shed light to whether it would be better to implement an administrative reform or to increase the amount of resources to enforce VAT compliance in Mexico.

Model

We used the Engel *et al.* model (2001) to estimate the yield of the enforcement spending on VAT revenues. The main advantage of this approach is that it allows us to use tax revenues data, instead of evasion. In this way the model uses information that is more reliable than tax evasion estimates, and that is frequently collected in all countries¹¹. By definition, VAT revenues and tax evasion are related by the following identity:

$$\frac{R}{Y} \equiv \tau(1 - e) \frac{B}{Y} \quad (1)$$

¹⁰ Shome (1999).

where R represents the VAT revenues, Y is the GDP, τ is the VAT rate, e is the tax evasion rate and B is the tax base. Taking logarithms on both sides of the equation (1), we obtain:

$$\log \frac{R}{Y} = \log \tau + \log(1 - e) + \log u \quad (2)$$

where $u = \frac{B}{Y}$ measures the tax base as a fraction of GDP. We expect that the tax evasion rate increases when the VAT rate increases, and decreases when the enforcement spending increases. Therefore (2) may be stated as:

$$\log(1 - e) = c + \beta \log \frac{S}{Y} - \gamma \log \tau \quad (3)$$

where c , β and γ are all constants, and S is the enforcement spending. Some researchers argue that the tax evasion rate varies systematically with the business cycle. Therefore, we must also consider the following equation:

$$\log(1 - e) = c + \beta \log \frac{S}{Y} + \gamma \log \tau + \delta \log \frac{Y}{Y(-1)} \quad (4)$$

where $Y(-1)$ is the lagged GDP. If we substitute (3) or (4) in equation (2), the result is:

$$\log \frac{R}{Y} = c + (1 - \gamma) \log \tau + \beta \log \frac{S}{Y} + \varepsilon \quad (5)$$

$$\log \frac{R}{Y} = c + (1 - \gamma) \log \tau + \beta \log \frac{S}{Y} + \delta \log \frac{Y}{Y(-1)} + \varepsilon \quad (6)$$

Equations (5) and (6) are the equations that we are going to estimate for the case of Mexico. It is important to mention that GDP normalization prevents from spurious correlations between tax revenues (R) and enforcement spending (S). Since γ is positive, but not necessarily less than 1, the sign of the coefficient that multiplies the VAT rate (τ) will be positive if the economy stands on the left side of the *Laffer* curve, and it will be negative otherwise. Tax evasion is assumed to be counter cyclical, thus the coefficient δ is expected to be positive. According to the simple model of expected utility, tax evasion decreases when the probability of an audit increases. Thus, if we assume that

¹¹ This is particular important in countries like Mexico, where the lack of information is the main restriction to do research.

an increase in the enforcement spending increases the probability of an audit, then β must be positive. Finally, β estimates the marginal return of the enforcement spending on VAT revenues. In other words, β is the elasticity of the enforcement spending, since equations (5) and (6) imply:

$$\frac{\partial R}{\partial S} = \beta \frac{R}{S} \quad (7)$$

Results

The sample period is from 1980 to 2005. The dependent variable is the logarithm of the VAT revenues as percentage of GDP. τ is the VAT rate stipulated throughout the whole country for each year, S is the enforcement spending, Y is the GDP base 1993, $Y(-1)$ is the previous GDP of a period¹². The model that provided the best adjustment was the one that includes the cyclical component (equation 6)¹³. The regression results are shown in Table 5. Also, note that the VAT coefficient rate was positive and significant, thus indicating that an increase in the VAT rate, will raise tax revenues. On the other hand, the coefficient for the counter cyclical effect of the GDP was also positive and significant.

The results obtained for Mexico show that in recent years the yield of the enforcement spending has been low. The elasticity of the enforcement spending was estimated to be .069. In this way, for each additional dollar for enforcement spending, VAT revenues would increase to \$1.87 dollars in the year 2005.

¹² In order to estimate the equations, the enforcement spending was considered since 1984 because we could not find the data for the first three years. Also, the 1983 enforcement spending was omitted because it was considered an atypical observation (*outlier*). Until the SAT was created in 1997, we considered as a proxy for the VAT enforcement spending the authorized net expenditure for the Program "Administración de Política de Ingresos" from the SHCP.

¹³ Equation (5) was also estimated, but the enforcement spending coefficient was not significant and the goodness of fit was poor.

T A B L E 5
REGRESSIONS RESULTS (*)
DEPENDENT VARIABLE: LOG (REVENUES OF VAT/GDP)

Constant (C)	-2.27 (-6.62)
Log τ	0.350 (2.61)
Log $\left(\frac{S}{Y}\right)$.069 (2.10)
Log $\frac{Y}{Y(-1)}$.187 (1.88)
R ² adjusted	0.99
DW	1.75
Number of Observations	20

Sources of data: First State of the Union Address of President Carlos Salinas, Sixth State of the Union Address of President Ernesto Zedillo, First State of the Union Address of President Vicente Fox, National Institute of Statistics, Geography and Informatics in Mexico (INEGI), Cuenta de la Hacienda Pública Federal (SHCP), Mexico's Central Bank (BANXICO).

(*) The estimated model fulfilled the assumptions of the linear models. The absence of heteroscedasticity, omission of variables and linearity were verified as well. Also, we calculate the DW statistic, and since the statistic fall into the inconclusive area, we ran the transformed model using the coefficient value from regression of the residuals against the residuals with one lag, and no constant. The results of the transformed model are reported, where we rejected the presence of autocorrelation. Also, given our small sample size, we estimated the bootstrap confidence intervals to assess the robustness of our estimators. The intervals were very similar to those reported in this section. The t values are in parentheses.

An interesting exercise is to calculate the ratio of VAT revenues divided by the enforcement spending $\left(\frac{R}{S}\right)$. If this ratio increases, then the yield of the enforcement spending has increased. In Table 6 we can observe that this has been the case of Mexico: The return of each dollar on enforcement spending dropped in 1997, year in which the SAT was created. However, the cost of each dollar has dropped by VAT revenues, and again went up in recent years.

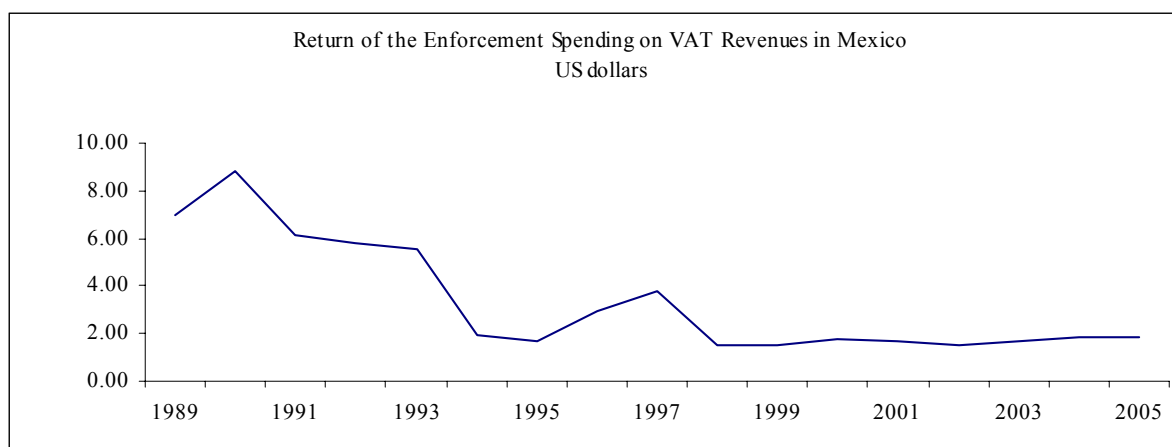
T A B L E 6
RETURN OF THE ENFORCEMENT SPENDING IN MEXICO 1983-2005

YEAR	$\frac{R}{S}$	YIELD OF EACH ADDITIONAL DOLLAR IN ENFORCEMENT SPENDING (US DOLLARS) (*)	YIELD OF EACH ADDITIONAL DOLLAR IN ENFORCEMENT SPENDING (1996 DOLLARS) (*)
1983	1.49	0.10	
1984	44.94	3.12	
1985	145.34	10.10	
1986	60.43	4.20	
1987	96.18	6.68	
1988	63.65	4.42	
1989	83.62	5.81	6.94
1990	110.30	7.66	8.82
1991	79.34	5.51	6.13
1992	77.06	5.35	5.82
1993	75.04	5.21	5.54
1994	26.26	1.82	1.90
1995	24.25	1.69	1.72
1996	42.27	2.94	2.94
1997	55.65	3.87	3.81
1998	21.96	1.53	1.48
1999	22.40	1.56	1.49
2000	27.09	1.88	1.77
2001	26.23	1.82	1.67
2002	24.68	1.71	1.55
2003	26.87	1.87	1.65
2004	29.77	2.07	1.82
2005	30.65	2.13	1.87

(*) This column is calculated by multiplying the enforcement spending elasticity times the ratio (R/S)

Engel *et al.* (2001) estimated that the elasticity of enforcement spending for Chile was 0.47 during 1981 through 1997. Using equation (7) we obtain that in 1997, for each additional dollar on enforcement spending in Chile, VAT revenues would have increased by \$31.2 dollars. If the exact same dollar had been spent in Mexico, VAT revenues would have increased only by \$3.9 dollars. Moreover, in 1997 VAT revenues in Chile as percentage of GDP were 2.73 times Mexico's VAT revenues during that same year. These estimates show the backwardness in the return of the enforcement spending in Mexico: the return of the enforcement spending in Mexico was almost 15 times lower than in Chile in 1997. Unfortunately, this return has been dropping since 1997, year in which SAT was created. See Figure 1.

F I G U R E 1



At the beginning of the nineties in Chile, VAT evasion was approximately 30 percent, while at the end of the decade this rate dropped to 18.3 percent¹⁴. This goal was achieved through improvements in tax supervision and in the administrative efficiency of the Internal Tax System (SII), agency that is in charge of the tax administration in Chile. In fact, administration expenditure as a percentage of net tax revenues in Chile in 1998 was lower than in many other OCDE countries: it accounted for 0.73 percent. In Germany this ratio was 1.71 percent, 1.52 percent in Italy, 1.23 percent in Netherlands, 0.89 percent in Spain and 0.84 percent in the U.K. The countries which had a smaller ratio compared to the one of Chile were Sweden with 0.52 and the United States with 0.49 percent¹⁵.

Therefore, before recommend an increase in the enforcement spending to increase VAT revenues, one must first analyze in depth the efficiency of the administrative spending in Mexico. As an example, in Table 7 we can see some of the administrative differences between SAT and SII: None of the employees at SII register voluntary compliance payments because taxpayers pay directly at the bank. On the contrary, SAT employed 23 percent of its personnel to register voluntary payments in the year 2000. This must have a significant effect on SAT's total expenditure since in 2000 almost 80 percent of its administrative expenditure was on personnel¹⁶. Another variable that makes tax administration more difficult in Mexico is the high percentage of exempted goods: In Chile 92 percent of the consumption goods are taxable, while in Mexico this percentage only reaches to 55¹⁷. Therefore, it is necessary to make an in-depth analysis

¹⁴ Etcheberry (2001).

¹⁵ *Ibidem*.

¹⁶ SAT (2001)

¹⁷ SHCP (1998)

from an administrative point of view, which will enable us to generate specific policy recommendations. This analysis can led us to evaluate whether is would better to increase the enforcement spending, or to start doing an administrative reform at SAT in order to increase VAT revenues in Mexico.

T A B L E 7
SAT AND SSI HUMAN RESOURCES
NUMBER OF PERSONS
2000

FUNCTION	CHILE	AS A % OF THE TOTAL	MEXICO (*)	AS A % OF THE TOTAL
FISCALIZATION	2,085	48.64%	12,477	42.26%
TAX REVENUE (VOLUNTARY COMPLIANCE PAYMENTS)	0	0%	6,882	23.31%
ADMINISTRATIVE AND COERCIVE PAYMENTS	1,418	33.08%	2,333	7.90%
COMPUTER SYSTEMS	126	2.94%	1,415	4.79%
SUPPORT SYSTEMS	583	13.60%	4,393	14.88%
OTHERS	75	1.75%	0	0%
TOTAL	4,287	100%	29,523	100%

Source: Etcheberry (2001).

(*) Data obtained by a survey done by the SII in Mexico.

Conclusions

During the last two decades VAT revenues in Mexico as percentages of GDP have fluctuated only from 2.3 in 1980 to 3.6 percent in 2001. Using Engel *et al.* (2001) this paper presents evidence that is a call for researchers to analyze the return of the administrative spending on the Tax Administration System (SAT), before recommend that enforcement spending must increase in order to increase VAT revenues. For example, Agha and Haugthon (2001) using a sample of 17 OECD countries estimated that an additional dollar spent on administration would raise the VAT revenue by 12 dollars in 1987¹⁸. It would also be interesting to explore if the creation of the SAT explains the downfall in the expenditure profitability since 1997, or perhaps one should have to include in the analysis other factors such as corruption, for instance.

¹⁸ Although Mexico is an OECD country, this study does not include it.

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