



"Taxing Our Neighbors? Why Some Sub-National Revenues are So Small"

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D.T.: N° 100

Marzo, 2010

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Taxing our neighbors? Why some sub-national revenues are so small?

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“Don’t tax you, don’t tax me, tax the fellow behind the tree”

Senator Russell Long¹

Abstract

This paper analyzes the determinants of local government revenues and the incentives faced by politicians in the design of tax policy. The decision of deepening local tax collections carries costs and benefits for local politicians. Balancing in the margin these costs and benefits allows for an endogenous determination of the taxing level. The paper stresses the role of markets size in determining politicians’ incentives to enact a tax regime. In addition, we provide a rationale for the central *government-local government* tax ratio as a key tax effort variable. Furthermore, local levels of income inequality are relevant in explaining tax collections.

1. Introduction and review of the literature

This paper is about the determinants of local government revenues as well as the incentives faced by sub-national politicians in the design of tax policy. Local taxation in developing countries is a relevant issue for a variety of reasons. First, it imposes a constraint on crucial government expenditures such as education, health and environmental control. Second, as revealed by the experience of fiscal federalist countries, the intergovernmental expenditure and tax policies design can severely affect local government’s attitudes toward taxation. Third, the growth experience of developed

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I thank Enrique Kawamura, Cecilia Rumi and Ernesto Rezk, and participants in Seminars at Universidad del CEMA, Universidad de San Andrés, and CEPAL’s XXI Seminar of Fiscal Policy, for helpful comments and suggestions.

¹ “Everybody Else Did It”, Wall Street Journal, October 16, 2008.

countries shows a substitution of local tax structures less progressive in incidence in favor of wealth and income intensive taxation. These reasons highlight the importance of understanding the economic variables that affect local tax settings and identifying the channels through which the fiscal relation between different government levels affects local tax legislation and procedures.

Notwithstanding the relevance of local taxation, relatively little research effort has been devoted to the revenue side of local governments. Conversely, profuse is the literature on local government outlays both at the theoretical and applied levels. The standard models focus their attention on the determinants of the expenditure side of local government's balance sheets. A common aspect is that fiscal revenues are endogenously and implicitly determined by satisfying the government fiscal constraint. The local population level usually has a key role in these standard models, although not always stressed. The reason for this is because the main interest is the determination of government expenditures and, therefore, to assume a lump sum taxation is clearly reasonable in order to focus on expenditure and not on distortionary taxation. For instance, Gasparini and Porto (1995) present a model where the influence of population on per capita government expenditure depends on how marginal cost of public goods enters into the government budget constraint. However, it can be shown that in their model an increase in population implies additional government revenues and it is through this link that total government outlays are financed and expanded. In other type of public goods models (Rubinfeld, 1987, Stiglitz, 1977) population (N) determines the local output level through the production function and, given the output-expenditure identity, individual maximization sets the marginal utility of the private good equal to N times the marginal utility of the public good. In this context, per capita demand for the private good is decreasing in N whereas aggregate demand of the public good is increasing in N . Diminishing returns of labor is critical for these results. If congestion costs are added to the model, the effect of the population on the demand for the public good depends on the gap between average and marginal congestion costs; usually local governments operating at minimum average costs make the local population levels an endogenous variable (Rubinfeld, 1987). Under the standard framework, an increase in N changes the marginal rate of substitution between (per capita) private goods and the good provided by the government. In this sense, an increase in N reduces the maximum per capita private goods because there are diminishing returns to labor. In the same way, an increase in N raises the maximum public goods output. For this reason, an increase in population usually leads to an increase in

the consumption and production of public goods and it is at this point where the link between government's expenditures and receipts is relevant: a common feature of these settings is that an implicit expenditure-income restriction is on the background providing a link between government expenditures and tax receipts. Therefore, a lump sum tax rate is endogenously determined assuring the saving-investment equality. As it is shown in the Appendix 1, under diminishing returns in the production of goods and assuming balanced fiscal budget, the association between the rate of population growth $\hat{n}$ and the rate of change in the tax rate $\hat{t}$ is *negative* and equal to

$$\hat{t} = \left[\left(\frac{\frac{\partial G}{\partial N}}{\frac{G}{N}} \right) - 1 \right] \hat{n}$$

Therefore, an expanding population implies a declining lump sum tax rate: a rise in population increases more tax collections than government expenditures and, since the government runs a balanced budget, the tax rate has to decline. For this reason, the standard framework, although appropriated for focusing on the determinants of public provision of goods, hardly captures the main motivations and determinants of tax administration and design²³.

In this paper a different view of the local tax policy design is presented. We focus the tax policy under the wide framework provided by the overall public formulation process where decisions are taken by the interaction of different players (Banco Interamericano de Desarrollo, 2006). We try to analyze the liaison between local government officials and local elites. In this sense, the political decision of deepening local tax collections carries costs as well as benefits for local politicians. The costs of tax enhancing are particularly severe for the case of politicians having close ties with the local elite that owns a significant share of domestic assets. In this case, and as Sokoloff and Zolt (2007) have stressed, "where the wealthy enjoyed disproportionate political power, they were able to procure schooling services for their own children and to resist being taxed to underwrite or subsidized services to others". In this regard, localities characterized by subdued provision of public goods can be the result of influential elites hindering the financing of public expenditures targeted to the less wealthy population.

² In this regard, the wide use of the standard model, as well as the emphasis on public provision of goods as opposed to tax collections, has implied the use of per-capita government receipts as the traditional explained variable in empirical works.

³ See Annex 1 for the assumptions and implications of the standard models.

On the other hand, however, an expanding level of tax collections presents a benefit for local ruling politicians. This benefit stems from the additional flows of money entering into government treasuries usually characterized by non-transparent procurement and budgetary procedures. In the model we present, balancing in the margin these costs and benefits allows for an endogenous determination of the taxing level.

In addition, and as it is well known in the fiscal federalism literature, when sub-national governments receive a significant part of their financial resources through transfers provided by the central government, a common pool problem arises. This problem implies that most of the local governments' disbursed resources are collected by the central government and, therefore, the designing of an efficient local tax administration is discouraged. We take into account this problem both theoretically and empirically.

The paper is organized as follows. In section 2 we present a model of local tax determination. Section 3 provides an overview of the data for the case of Argentine provinces. In section 4 the empirical results are presented. Finally, section 5 concludes.

2. The model

In this section we present a model where the level of local taxation is determined by balancing politicians' costs and benefits. In setting the model we rest on a linear combination of Rebelo (1998) and Acemoglu and Johnson (1999). Local agents' utility function depends on consumption of a local good y and a good imported from the rest of the country x :

$$U = x + \frac{1}{\alpha} y^\alpha \quad (1)$$

Total expenditure has to be equal to total income m , both measured in imported good units. The relative price of local to imported goods is p .

$$m = x + p y \quad (2)$$

Utility maximization subject to the constraint (2) gives the demand for the local produced good:

$$y = p^{-\frac{1}{1-\alpha}} \quad (3)$$

or:

$$p = y^{\alpha-1} \quad (4)$$

The local good is produced through a production function characterized by a quality variable λ ⁴:

$$y_t = A \lambda_t^\alpha K_t^{1-\alpha} N_t^\alpha \quad (5)$$

Local output maximization gives the demand for capital:

$$(1-\tau) A (1-\alpha) \lambda_t^\alpha K_t^{-\alpha} N_t^\alpha = r \quad (6)$$

where r is the price of capital goods and τ is the tax rate levied over consumption of good y .

The local elite have a monopoly on the production of capital goods. The supply of intermediate capital goods is obtained by the following maximization:

$$\text{Max}_K \left[A (1-\alpha) \lambda_t^\alpha K_t^{-\alpha} N_t^\alpha \right] K_t - \varphi K_t \quad (7)$$

where φ is the cost of intermediate capital goods faced by the elite.

Maximization of (7) gives the standard result that a mark-up over marginal production cost φ is charged by the elite for the capital:

$$r = \frac{\varphi}{1-\alpha} \quad (8)$$

The equilibrium level of capital is determined by substituting (8) into (6):

$$K_t = \left[\frac{A (1-\tau) (1-\alpha)^2}{\varphi} \right]^{\frac{1}{\alpha}} \lambda_t N_t \quad (9)$$

⁴ We can assume that the quality parameter λ grows at an exogenous rate per unit of time. However, and since the aim of the analysis is not on the dynamics of the development process, λ can also be considered as a constant.

The production of the local good, therefore, is obtained by substituting (9) into the production function (5):

$$y_t = \Gamma \lambda_t N_t \quad (10)$$

where

$$\Gamma = A \left[\frac{A(1-\tau)(1-\alpha)^2}{\varphi} \right]^{\frac{1-\alpha}{\alpha}}$$

It is assumed that local population is equal to labor supply and it is an exogenous variable. Therefore, the local population level is a proxy for the size of the domestic market (equation 10). The role of the population in the present model is interesting. On the one side, an increase in population tends to diminish the marginal product of labor. However, and on the other side, an increase in N expands the demand for capital in a way that the resulting percentage change in capital demanded equals the original increase in the labor supply (equation 9). This is a well known feature of the quality ladders literature (Barro, 1998, Rebelo, 1998). In the present model, given the technology parameters, the population level determines the demand for capital and, given the assumed constant price of capital goods, the capital stock is determined. The stock of capital and the population define the quantity produced of the local good through equation 10. In addition, the real wage is determined by the productivity of the local sector⁵. Given an initial equilibrium in the labor market, an exogenous increase in N produces a parallel shift to the right of both the supply and the demand equations that will intersect after the shock at the same level of real wages that existed before the exogenous change⁶.

Total tax collected by the local government is:

$$\xi = \tau p y$$

Using (4) and (10) we get:

$$\xi = \tau (\lambda \Gamma N)^\alpha \quad (11)$$

⁵ In our case the real wage is $w = A(1-\tau)\alpha\lambda\Gamma$

⁶ In fact, the model assumes that there are no relevant labor supply effects on real wages. This can be a strong assumption, although the aim of this paper is to focus on the local market size link to tax administration incentives.

The decision to tax:

Local politicians will decide about imposing taxes to the local good if the benefits of doing that are greater than the costs of such policy action. If V are the tax receipts the local government gets without taxing the local good and T are the total tax collected in the case of implementing a local tax policy, then the government will enact taxes when $T > V$.

V is given by:

$$V = \delta + stB_0 \quad (12)$$

where s is the secondary tax-sharing coefficient of the local state, t is the federal tax rate, B_0 is the federal tax base, and δ are the discretionary grants received by the local state from the federal government.

T is given by:

$$T = \xi - [\Omega_0 + \Omega(\sigma)] + stB_1 + \delta \quad (13)$$

where Ω_0 is the fixed cost faced by local authorities of enacting the local tax system and Ω is the cost component assumed to be dependent on the local state level of income inequality σ . B_1 is the federal tax base that has been expanded by the local state tax legislation ($B_1 \geq B_0$). That is to say, the local government decision to tax has a spillover effect that comes from the overlapping of federal and local tax bases. Arias (2008) shows that tax behavior in one level of government can affect tax collections and tax evasion in other government levels. In addition to overlapping tax bases, one important channel through which this spillover effect can be transmitted is the coordination among tax audit departments (Arias, 2008). In this regard, Esteller-Moré (2003) says that “when taxpayers face the decision about how much tax base to evade, they should bear in mind that as long as tax bases are crosschecked, their decision might not only have consequences on that tax, but also on other interrelated taxes. Having increased the expected costs of tax evasion, such type of tax systems should therefore be useful in a priori promoting tax compliance”.

Using (11) the local tax legislation will be enacted if:

$$\tau(\lambda\Gamma N)^\alpha + st(B_1 - B_0) \geq \Omega_0 + \Omega_1(\sigma) \quad (14)$$

Empirically, equation (14) says that the probability of observing a provincial government enacting a local tax regime will be higher the greater the level of population, the greater the gap between B_1 and B_0 , the lower the state inequality, and the lower the fixed cost Ω_0 . Note that the $st(B_1 - B_0)$ term captures the common pool effect: if a local state is big enough to generate a significant spillover tax effect it will be more likely to go ahead with the local tax policy. Conversely, if the ruling politicians perceive that the federal tax base will not increase by the local decision, it will less likely decide the policy change. In other words, the relative size of the local state is what matters in terms of the common pool effect.

3. Data

Figure 1 plots for the case of the Argentine provinces of the log of average local tax collections in the period 2001-2006 against our three variables of interest: the log of provincial population, the log of the Central Government-Local Government tax ratio, and the gini coefficients. Local tax collections are the taxes collected by the provincial fiscal authorities and institutions. The Central Government-Local Government tax ratio measures the number of monetary units the Central Government transfers to the Province for each monetary unit of locally collected taxes by the Province. For our empirical analysis it is assumed that the higher the central-local tax ratio, the lower is the perception of local politicians that their tax administration efforts would spill over into an increased national tax base leading to higher provincial revenues transferred from the central level. At a first glance, local tax collections show a strong positive relationship with population, a negative association with the central-local ratio and a seemingly negative relation with the gini coefficient. Provinces with important populations (Mendoza, Córdoba, Santa Fe, and Buenos Aires) and strong local taxes in relation with Central Government transfers (Entre Ríos and Neuquén, in addition to the previous ones) have higher levels of domestic taxation. There is also a somewhat negative association between local taxation and

inequality, although care must be taken in order to assess if this is driven by some provincial outliers. Table 1 provides descriptive statistics for the variables of interest.

Figure 1

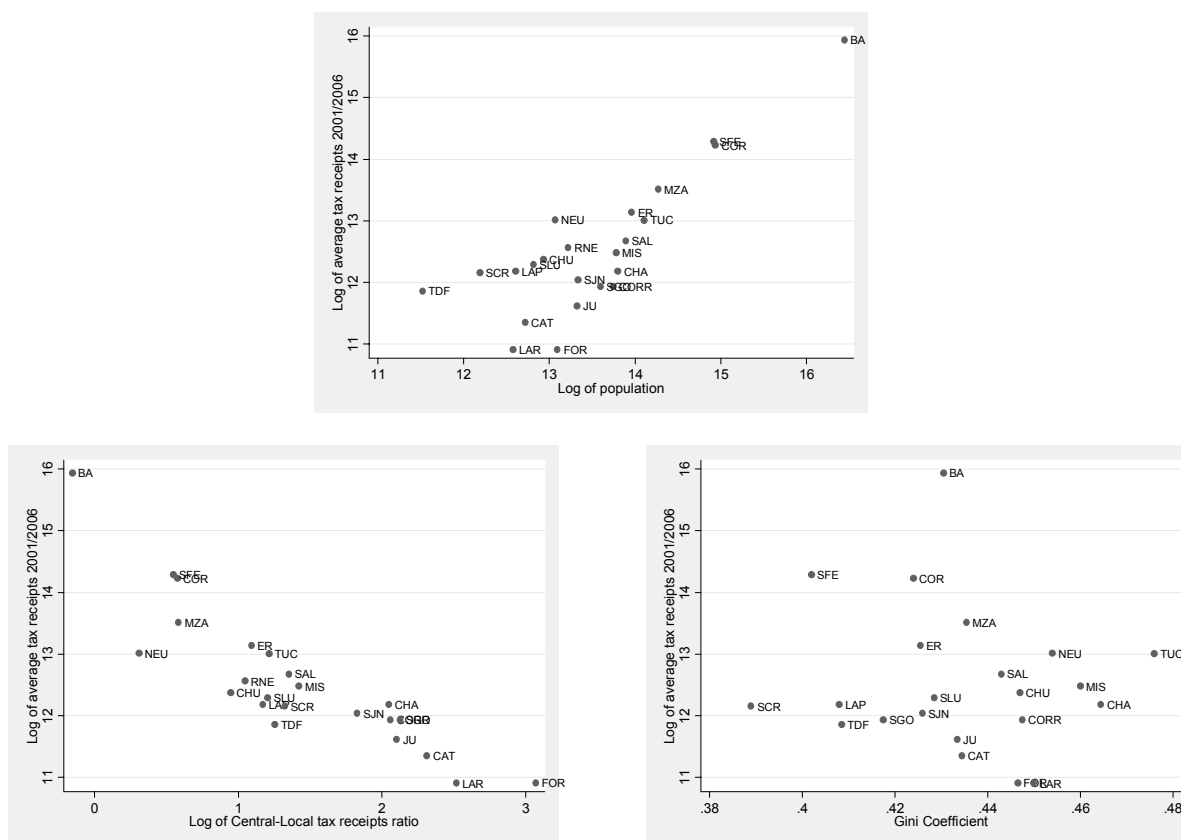


Table 1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min.	Max.
tribprom (1)	23	714638	1718968	54425	8374053
pob (1)	23	1455826	2806071	101079	13827203
rcnacpcias (1)	23	5.37	4.67	0.86	21.51
coefgini (1)	22	0.43	0.021	0.39	0.48
ibtotprom (2)	23	434980	967005	40604	4715764
inmprom (2)	23	80253	198648	24.2	929367
sellprom (2)	23	66513	136271	1614.5	652931
tribut (3)	46	632187	1593111	28526	8998964
pob (3)	46	1509592	2878281	91996	14295749
rcnacpcias (3)	46	5.56	4.87	0.84	25.87
gini (3)	44	0.49	0.031	0.42	0.54
gini98 (3)	44	0.47	0.032	0.42	0.54

(1) tribprom are the provincial tax receipts measured as the average for the 2001-2006 period. rcnacpcias are the *Central Government-Local Government* tax ratio and measures the

number of monetary units the Central Government transfers to the Province for each monetary unit of locally collected taxes by the Province; it is averaged for the 2001-2006 period. coefgini is the gini coefficient of the Provinces based on Mirabella de Sant (2005) and Fossati, V (2002).

(2) ibtotprom is the rollover taxation, inmprom is the real state taxation and sellprom is the financial transactions taxation; all variables measured as the average for the 2001-2006 period.

(3) tribut are the total locally collected provincial tax receipts of years 1998 and 2002. rcnacpcias is the Central Government-Local Government tax ratio and measures the number of monetary units the Central Government transfers to the Province for each monetary unit of locally collected taxes by the Province for the same years. gini is the gini coefficient of the Province i in years 1998 and 2002 whereas gini98 is the same coefficient for 1998; both based on Busso, M, Cerimedo, F, and Cicowiez, M (2004

In order to assess the correlations among our main variables, Table 2 reports ordinary least-squares regressions of the log of local tax collections on log of population, log of the central-local tax ratio and the gini coefficient. Column (2) shows that all explanatory variables are significant at 1 % level. The R^2 of the regression in column (2) indicates a quite strong association between the variation in local tax receipts and the variation in the three explanatory variables. Both the estimated coefficients and their significance levels are roughly the same if we drop the Buenos Aires Province, a potential outlier.

Table 2

	(1)	(2)
	ltribprom	ltribprom
lpo	0.587 (8.87)**	0.622 (12.47)**
lrcnacpcias	-0.913 (14.13)**	-0.863 (16.69)**
coefgini		-5.470 (3.56)**
Constant	5.875 (6.09)**	7.719 (7.75)**
Observations	23	22
	OLS	OLS
R-squared	0.98	0.99

Robust t statistics in parentheses

Significant at 5%; ** significant at 1%.

ltribprom is the log of provincial tax receipts measured as the average for the 2001-2006 period. lrcnacpcias is the log of the Central Government-Local Government tax ratio and measures the number of monetary units the Central Government transfers to the Province for each monetary unit of locally collected taxes by the Province; it is averaged for the 2001-2006 period. coefgini is the gini coefficient of the Provinces based on Mirabella de Sant (2005) and Fossati, V (2002).

Table 3 extends this initial regression analysis by splitting the log of local tax collection into its three main components: the log of rollover taxation (libtotprom), the log of real state taxation (linmprom) and, finally, the log of financial transactions taxation (lsellprom). A SURE procedure was used for the estimation. Two aspects are worth to mention. First,

the signs of the estimated coefficients are the same than in Table 2. Second, both population and central-local tax ratio continue to be highly significant variables whereas the gini coefficient is only significant in the financial transactions taxation (Column3).

Therefore, the results of Tables 2 and 3 are consistent with our view that the size of the domestic markets, the incentive provided by the central government transfers, and the inequality level faced by the provinces are relevant predictors of local taxation levels. However, the results are based on a low level of observations and the task of expanding the sample size is required.

Table 3

	(1)	(2)	(3)
	Libtotprom	linmprom	lsellprom
lpo	0.553 (10.61) **	1.862 (5.08) **	0.528 (6.20) **
lrcnacpcias	-0.858 (12.20) **	-0.047 (0.09)	-1.053 (9.16) **
coefgini	-3.044 (1.33)	-15.414 (0.96)	-7.884 (2.10) *
Constant	7.206 (6.95) **	-9.114 (1.25)	7.981 (4.71) **
	SURE	SURE	SURE
Observations	22	22	22

Absolute value of z statistics in parentheses
significant at 5%; ** significant at 1%

libtotprom is the log of rollover taxation, linmprom is the log of real state taxation and lsellprom is the log of financial transactions taxation; all variables measured as the average for the 2001-2006 period. lrcnacpcias is the log of the *Central Government-Local Government* tax ratio and measures the number of monetary units the Central Government transfers to the Province for each monetary unit of locally collected taxes by the Province; it is averaged for the 2001-2006 period. coefgini is the gini coefficient of the Provinces based on Mirabella de Sant (2005) and Fossati, V (2002).

4. Estimation approach

Using the Busso, M, Cerimedo, F, and Cicowiez, M (2004) estimations of the Gini coefficient for the Provinces we can have a two-period panel for the years 1998 and 2002. This allows us to have 22 provincial observations for each of the two years. *yr02* is a dummy variable equal to 1 if the observation comes from 2002 and zero if it comes from 1998.

Although we present results for the model of equation (15), our preferred model is equation (16). The reason is that the macroeconomic crisis of 2001-2002 caused a sizable increase in inequality and this is clearly captured by the 2002 gini coefficients of

the provinces. In this regard, the gini explanatory variable of equation (16) is the 1998 gini coefficient of each province allowing, therefore, a *ceteris paribus* interpretation of β_3 .

$$\log(\text{tribut})_{ij} = \beta_0 + \beta_1 \log(\text{pob})_{ij} + \beta_2 \log(\text{rcnacpcias})_{ij} + \beta_3 \text{gini}_{ij} + \beta_4 \text{yr02} \quad (15)$$

$$\log(\text{tribut})_{ij} = \beta_0 + \beta_1 \log(\text{pob})_{ij} + \beta_2 \log(\text{rcnacpcias})_{ij} + \beta_3 \text{gini}_i + \beta_4 \text{yr02} \quad (16)$$

Table 4 presents the panel estimation results and column 4 is our preferred estimation. A one percent increase in population increases own tax collections by about 0.66 percent. Furthermore, if the *Central Government-Local Government* tax ratio declines by 10 percentage points, tax collections increases by about 8.6 percent. Both results are particularly robust. Inequality seems to be a very relevant variable in economic terms: if the gini coefficient declines by 0.01 units tax receipts increases by about 1.79 percent. The dummy variable *yr02* and the inclusion of the 1998 gini explanatory variable have important estimation effects. In this regard, *gini98* avoids the decline exhibited by *gini* in the second period of the panel as the result of the economic and social crisis of 2001-2002⁷. The results provided by column 3 are similar to the ones obtained in column 4 implying that the heterogeneity bias caused by omitting a time constant gini coefficient seems to be small.

Table 4: Panel

	(1)	(2)	(3)	(4)
	ltribut	ltribut	ltribut	ltribut
lpob	0.647 (13.82) **	0.685 (12.76) **	0.630 (15.93) **	0.664 (17.56) **
lnnacpcias	-0.892 (20.76) **	-0.853 (14.22) **	-0.907 (24.13) **	-0.863 (26.27) **
gini	-1.051 (1.07)	-3.562 (3.00) **		
yr02	-0.351 (7.47) **		-0.374 (7.56) **	-0.374 (7.84) **
gini98				-1.790

⁷ A Breusch-Pagan test failed to reject the null hypothesis of homoskedasticity (1 % level).

				(2.14) *
Constant	5.498 (9.53) **	5.967 (8.54) **	5.255 (9.29) **	5.578 (9.54) **
Observations	44	44	44	44
R-squared	0.98	0.97	0.98	0.99
Chow test for structural change across time	NO	Yes	No	No

Robust t statistics in parentheses

significant at 5%; ** significant at 1%

ltribut is the log of total locally collected provincial tax receipts of year j.

lrcnacpcias is the log of the *Central Government-Local Government* tax ratio and measures the number of monetary units the Central Government transfers to the Province for each monetary unit of locally collected taxes by the Province. gini is the gini coefficient of the Province i in year j whereas gini98 is the same coefficient for 1998; both based on Busso, M, Cerimedo, F, and Cicowiez, M (2004). yr02 is a dummy variable equal to 1 if the observation comes from 2002 and zero if it comes from 1998.

The use of the gini coefficient as a measure of the local distribution of wealth is reasonable as a first approximation, although other alternative variables should be analyzed in future research⁸. It is likely to expect the wealth distribution to remain relatively constant through time and, certainly, to be highly invariant during the four years period of our empirical work⁹. In order to assess our model under a different setting, a first-differenced estimation was computed

$$\Delta ltribut = \delta + \beta_1 \Delta lpob + \beta_2 \Delta lrcnacpcias + \mu$$

The results are presented in Appendix 2. The interval estimates are consistent with the point estimates of our main specification, although the population variable is not significantly different from zero.

Interaction terms and additional controls

Our empirical results are subject to the potential problem of coefficient bias stemming from omitted variables. One variable that clearly appears as eventually influencing both our regressors and the error term is the tributary base. To proxy for the tributary base we include the provincial GDP as an additional right hand variable¹⁰. This is done in Table 5 under the wider framework of allowing an interaction term between the log of the

⁸ The empirical literature on the inequality-growth link has stressed that the Gini coefficient could proxy for omitted variables. See Banerjee and Duflo (2000), and Barro (1999)

⁹ This explains our preference for model 16.

¹⁰ Appendix 3 provides details about our provincial gdp variable.

population and the gini coefficient. In order to facilitate the interpretation of the results, the gini coefficient was replaced by the equality variable (*equal*) defined as one minus the gini coefficient.

The provincial gdp variable is significant at the 5 % level and its inclusion does not affect the significance of our other included variables. In addition, the evidence of functional form misspecification of column (5) is no longer present in the estimation of column (6). Furthermore, the omitted variable biases seem to be relatively minor since the new coefficients are inside the 95 % confidence interval of the estimation of column (5); the only exception is the estimated coefficient of the national-provincial tax ratio (*lrcnacpcias*) which increases from -0.81 to -0.72.

There is strong evidence of interaction between population and equality. If we apply the results of column 6 to our sample mean values of *equal* and *lpob*, the elasticity of taxation with respect to population is 0.60 and the elasticity with respect to equality is 1,70 both values being roughly the same than the ones reported in the column (4) of Table 4.

Table 5

	(5)	(6)	(7)
	ltribut	ltribut	ltribpercap
lpob	2.318 (7.83) **	1.970 (6.89) **	
lrcnacpcias	-0.811 (35.09) **	-0.719 (16.62) **	-0.690 (14.06) **
yr02	-0.375 (10.14) **	-0.338 (9.84) **	-0.314 (7.94) **
equal	43.453 (5.79) **	36.926 (5.49) **	13.940 (12.06) **
lpob*equal	-3.059 (5.33) **	-2.604 (5.04) **	-0.937 (9.37) **
lgdp		0.171 (2.47) *	0.278 (3.69) **
Constant	-18.846 (4.84) **	-15.502 (4.46) **	-3.069 (4.71) **
Observations	44	44	44
R-squared	0.99	0.99	0.96
RESET functional form test	p=0.002	p=0.113	

Robust t statistics in parentheses

* significant at 5%; ** significant at 1%

ltribpercap is the log of per capita tax receipts.

Column (7) presents our estimation results for the case of using the log of per capita tax collections as a dependent variable. These results are presented for comparison reasons since we acknowledge that in the empirical tradition of explaining sub-national tax and expenditure functions per capita aggregates are usually chosen as explained variables. We disagree with this tradition because, unless a lump-sum view of the tax policy is adopted, it is difficult to understand why the tax aggregates should be measured in per capita terms. In this regard, it is not clear the theory sustaining such empirical approach. Nevertheless, the column (7) results are quite supportive of our previous findings with all variables significant at the 1 percent level. In addition, these results can also help in addressing a potential multicollinearity problem between the GDP and Population variables.

5. Conclusions and further research

Five are the main points this paper raises. First, the focus on analyzing the revenue side of local governments as opposed to modeling the expenditure side. Second, the use of the overall public formulation process framework where decisions are taken by the interaction of different players allows us to analyze the liaison between local authorities and local elites highlighting that the political decision of deepening local tax collections carries costs as well as benefits for politicians. Third, the relevance attached to the size of local markets. Fourth, the rationale of the *central government-local government* tax ratio as a key tax effort variable. Finally, the finding that local levels of income inequality are empirically significant in explaining tax collections, as Sokoloff and Zolt (2007) have emphasized.

Equipped with our empirical results, we can advance a preliminary answer to the question posed in the title of this paper: sub-national governments facing strong inequality, low levels of economic activity, generous grants channeled by the national government, and relatively small populations are more likely to face strong constraints in the design and implementation of tax policy.

The policy lessons derived are not novel. Tax sharing regimes should attach a critical role to the process of simultaneous determination of the local and national tax bases. In this

sense, a high starting level of the central government –local government tax ratio should not prevent the design of marginal incentives to enhance local taxation. One interesting approach would be to coordinate a country wide tax reform focused on substituting local taxes uncorrelated with the national tax base in favor of, for instance, alternative wealth taxation. The size of local markets, in spite of being a medium term variable, seems to offer a policy dimension. In our model the supply of capital goods is produced by a monopoly run by the local elite. In this regard, relatively small domestic markets coupled with relatively strong wealth inequality and unregulated markets provide room for local policy changes.

Our empirical findings are in line with the literature reviewed in Section 1 and the model presented. In the empirical estimation, the coefficients of our variables of interest are highly significant. However, the results should be analyzed with caution. The panel estimation allowed us to duplicate the number of observations but, unfortunately, the data set belongs to a period characterized by important changes both at the national and at the local tax regimes. Future empirical research should try to increase the number of observations and, also, analyze how robust the results of this paper are under a wider time frame.

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APPENDIX 1

In this appendix we present a very simple model of the Tiebout tradition with the aim of highlighting the endogenous determination of the tax rate implicit in the standard models. The representative consumer maximizes a utility functions with two arguments: per-capita consumption of a private good and total consumption of a public good.

$$u = u(X, G) \quad (i)$$

where X is per capita consumption of the private good, and G is the economy wide consumption of the government-provided good. Total production of goods is carried out through a production function depending on labor:

$$Q = F(N) \quad (ii) \quad \text{where} \quad F' > 0, F'' < 0$$

Disposable income equals production less tax payments plus government transfers:

$$W = F(N) - tN + G \quad (iii)$$

where W is disposable income, t is the tax rate levied on population, and G are the government transfers to the representative consumer.

Total output has to be allocated to (total) private goods and government-provided goods:

$$F(N) = XN + G \quad (iv)$$

The consumer maximizes the utility function (i) subject to the constraint (iv). The first order conditions determine the celebrated Samuelson's result that the marginal utility of the private good equals N times the marginal utility of the public good. The FOCs also provide the demands for both types of goods. For instance, if we assume a Cobb Douglas utility function $u = X^\alpha G^{1-\alpha}$ we get:

$$G = (1 - \alpha)F(N) \quad (v)$$

$$X = \alpha \left[\frac{F(N)}{N} \right] \quad (vi)$$

Therefore, per capita demand for the private good is decreasing in N , whereas aggregate demand of the public good is increasing in N .

Although this standard model is usually expanded to make N endogenous by assuming average cost for public goods that depends on the population size, it is important for the sake of our argument to close the model here and to focus on the (usually implicit) fiscal balance restriction:

$$G = tN \quad (vii)$$

This fiscal balance restriction reveals the endogenous nature of the tax rate t . Given the diminishing returns of the production function (ii), an increase in N implies two fiscal effects. First, it increases government expenditures at a decreasing rate through equation

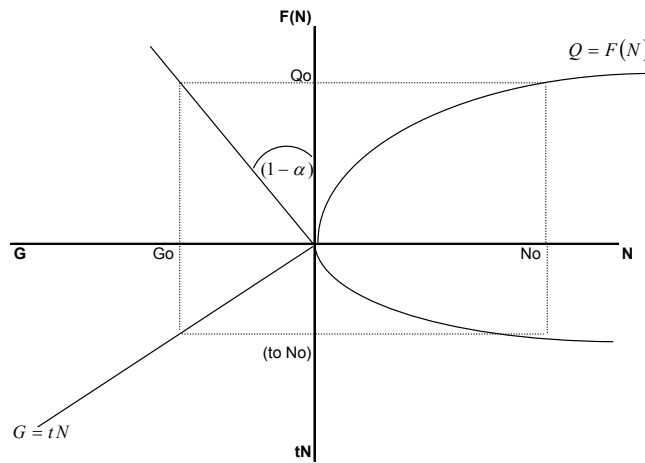
(v). Second, it increases revenues at a constant rate t . Therefore, the lump sum tax rate t has to decline as a result of an increase in population. From (v) and (vii):

$$\frac{\partial t}{\partial N} = \left(\frac{1-\alpha}{N} \right) \left[F'(N) - \frac{F(N)}{N} \right] \quad (\text{viii})$$

Equation (viii) is negative as long as the marginal product of labor is lower than the average product.

We can see our main point with the help of Figure 1. An increase in N raises both total goods production and the demand for G at a declining rate. If the lump sum rate t were to remain constant, a higher N will lead to a fiscal surplus, an event ruled out by the condition of fiscal balance. Therefore, the only way for total revenues to exhibit a diminishing impact of N is through a decline in t .

FIGURE 1



Consequently, the standard model does have a concrete tax policy implication. There is a passive tax policy reaction. As it was mentioned in this paper, the assumptions and implications of the standard model are reasonable for isolating expenditure decisions from taxing behavior and consequences. This is what the lump sum tax setting does: to allow focusing on expenditures without taking into account distortionary and second round effects of taxation. These are the benefits of the standard model as well as its limitations when the main focus shifts towards taxing decisions.

APPENDIX 2

	(1)	(2)
clpob	cltribut 2.399 (1.97)	cltribut 1.571 (1.39)
clrcnacpcias	-0.898 (15.29) **	-0.918 (17.75) **
Constant	-0.486 (6.90) **	-0.434 (6.93) **
Observations	22	22
R-squared	0.94	0.94
	OLS	GLS

Robust t statistics in parentheses

significant at 5%; ** significant at 1%

cltribut is the change in the log of provincial tax receipts measured as the average for the 2001-2006 period. clrecpianac is change in the log of the *Central Government-Local Government* tax ratio. clpob is the change in the log of local population.

APPENDIX 3: PROVINCIAL GDP CALCULATION

In Argentina the statistics on gross domestic product for the provinces was estimated comprehensively for the year 1993¹¹. The gdp estimations used in this papers are the result of:

$$PBI_{j,t} = \sum_{i=1}^n va_{j,93}^i \left(\frac{VA_t^i}{VA_{93}^i} \right)$$

where j = Province, t = year, i = sector of economic activity, $va_{j,93}^i$ is the value added by provincial j 's sector i in 1993, and VA^i is the value added by sector i in the country as a whole.

PROVINCIAL GDP – In millions of 1993 pesos

	1998	2001	2002	2003	2004	2005	2006
BUENOS AIRES	85,304	77,714	70,318	76,607	83,290	90,234	97,393
CATAMARCA	1,322	1,234	1,126	1,212	1,309	1,413	1,523
CORDOBA	21,269	19,677	17,807	19,193	20,698	22,543	24,310
CORRIENTES	3,443	3,211	2,935	3,162	3,398	3,690	3,966
CHACO	3,289	3,095	2,832	3,039	3,258	3,538	3,794
CHUBUT	3,546	3,382	3,074	3,282	3,484	3,719	4,036
ENTRE RIOS	7,240	6,824	6,113	6,316	6,646	7,302	7,981
FORMOSA	1,560	1,483	1,366	1,459	1,555	1,688	1,806
JUJUY	2,292	2,146	1,960	2,107	2,263	2,451	2,632
LA PAMPA	2,346	2,227	2,045	2,179	2,310	2,531	2,714
LA RIOJA	1,359	1,278	1,183	1,269	1,361	1,462	1,567
MENDOZA	10,743	9,978	9,107	9,801	10,496	11,403	12,257
MISIONES	3,602	3,373	3,075	3,316	3,577	3,889	4,187
NEUQUEN	5,240	5,220	4,853	5,131	5,376	5,657	6,007
RIO NEGRO	4,069	3,837	3,483	3,747	4,032	4,386	4,729
SALTA	4,060	3,811	3,477	3,740	4,011	4,361	4,680
SAN JUAN	2,750	2,568	2,347	2,518	2,700	2,928	3,149
SAN LUIS	2,597	2,307	2,081	2,306	2,528	2,737	2,964
SANTA CRUZ	2,501	2,518	2,324	2,438	2,512	2,622	2,849
SANTA FE	20,705	19,279	17,577	18,869	20,264	22,035	23,712
S. DEL ESTERO	2,141	2,018	1,847	1,978	2,125	2,301	2,469
TUCUMAN	5,479	5,141	4,703	5,035	5,394	5,852	6,284
TRRA.DEL FUEGO	2,023	1,892	1,706	1,851	1,986	2,119	2,304

¹¹ See “Sistema de Cuentas Nacionales de Argentina Año Base 1993. Estimaciones Trimestrales y Anuales”, Ministerio de Economía y O. y S. Públicos, June 1999.

