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Tax shape, debt and electoral opportunism at the municipal level: French empirical evidence and a model

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Abstract

This paper explores the local incumbent behaviours during their office. The aim is twofold. Firstly, empirical evidence is shown on the fiscal policy instruments by which French local governments try to influence election outcome. The second purpose of this paper is to build a theoretical framework consistent with the empirical findings. Finally, the resulting electoral cycle depends on the tax shape, the availability to contract loans, and the shape of the demand for public goods. In particular, the model predicts the tax cut observed during the election period in French municipalities. Furthermore, indebtedness may lead to an electoral cycle on public spending provided that the public good demand is elastic.

JEL classification codes: D_7, H_{30}, R_{50}

Key-words : Municipal political cycle, Dynamic panel data, median voter.

1 Introduction

Little is still known about the behaviour of local incumbents during their office when the formers worry about being re-elected. In such a situation, the local government's term of office may be decomposed into one electoral and one non-electoral period. During both of them, policy-makers may be either entirely benevolent or wholly selfish. These two attitudes reflect markedly different perceptions of fiscal policy by an elected mayor. To our knowledge, it remains uncertain which one better characterises the incumbent's preferences during each sub-period of his office.

Indeed, many alternative specifications can be picked up from the public choice theory in order to explain fiscal policies conducted by local governments. The well-known median voter model owing to Black's [1948] theorem has been challenged by the theory of bureaucracy developed by Niskanen [1971]. But the focus has now shifted to yardstick competition, as stressed by Besley and Case [1995].

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While the median voter model or yardstick competition framework may be viewed as natural candidates to describe the incumbent's behaviour at the eve of the next round of election, many approaches can be proposed in order to explain local fiscal policies free of electoral considerations.

At the national level, Nordhaus' [1975] pioneering model has shown how voters' myopia explain the opportunistic behaviour of the elected central government at the root of the political business cycle. Instead, the rational expectation debate has led authors like Hibbs [1977] to put the emphasis on conflicting monetary policy rules to understand the changeover of political power between left-wing and right-wing parties. Since then, the theoretical literature has grown exponentially on this subject. Whatever the refinements they received, the bulk of these studies underline the incentives of the national government to improve macroeconomic performances by exploiting the inflation-employment trade-off when setting up his elective-motivated monetary stance.

Even if the focus has shifted to the fiscal policy only recently (see Rogoff [1990] as surveyed in Drazen [2000]), a scarce literature analyses local-level policies implemented before and after the elections. On these grounds, we attempt to build a basic model to understand the local political cycle as well as the instruments that municipal authorities may manipulate to win the next election.

Because little is known about which theoretical model better characterises local government's strategies during each sub-period of his office, it may be helpful first to show the salient features of the electoral cycle at the municipal level. An analytical framework will be then proposed in accordance with our empirical findings.

New issues arise with the empirics on the electoral cycle. For the first time, estimations use a panel data set all from French municipalities with more than 10000 inhabitants. Our dataset enables us to distinguish between the city size. Given the French record, our sample of annual data covers the 1989 and 1995 elections only. The specification of the econometric model is rather familiar since it originates from McCallum [1978]. Though essentially ad hoc, such modelling of a reaction function is a convenient way of encompassing a wide range of fiscal strategies. But the shortcomings of standard methods to estimate dynamic panel data models with few data have to be overcome with more appropriate techniques.

The paper proceeds as follows. The empirical analysis is conducted in the first section in order to deliver with stylised facts on the political cycle in French local jurisdictions. The second section develops a model of the political local cycle where two contrasted behaviours of the incumbent are differentiated on the eve and after elections.

2 Empirical analysis

Firstly, we recall the basic institutional features related to French local public finance and describe the dataset. Secondly, the econometric procedure is assessed to check for the existence of political cycle at the municipal level. Thirdly, our main findings are presented and discussed.

2.1 Overview of the French local public finance system

The French public sector is organised around two major hierarchical levels: the central government, and the local authorities. The latter can be divided into three, although interrelated, tiers whose lowest level is the municipality. We take care on that final jurisdiction only in this study. Vertical links among public authorities are thus omitted.

The decentralisation laws in the 1980s have increased to a substantial degree the room of manœuvre of French municipalities in the conduct of their own fiscal policies. They now provide a wide range of public services like: primary education, social care, highway maintenance, industrial park development, and local public employment. Furthermore, local governments are free to set tax rates on resident firms and households since 1980. Yet, this autonomy is restricted by legal texts in two ways: an upper limit on the annual tax growth, and strong links between tax rates.

The French local tax system is characterised by three main components: a tax on businesses ("Taxe Profesionnelle" TP), another paid by residents ("Taxe d'habitation" TH), and the final one due on built real estate ("Taxe Foncière Bâtie" TFB). The business tax TP is paid by firms established in the municipality. During the period under study, this tax was applied to 18 % of total wages adding to the whole value tangible assets. TFB and TH are due by landlords and tenants respectively. They are proportional to the property and renting values of real estate assets.

Local public spending and tax rates are the main tools over which municipal incumbents can exert some influence in order to improve their chances of winning future elections. There is however little and weak evidence on the electoral incentives for French local authorities to engage in discretionary policies. This calls for deeper empirical investigations to give new or more precise insights on this subject.

Our study makes use of a panel data set of all the 883 French municipalities of at least 10000 inhabitants. All data are taken from the DGCL services (a.k.a. "Direction Générale des Collectivités Locales"). These figures have already been aggregated at the regional level, i.e. the largest local administrative division which is equivalent to the European NUTS2 standard). As a result, we are provided with a single mean value for each item and for one of the 22 regions concerned. Unfortunately, no piece of information has been made available to the public at the individual level.

This source of panel data has nonetheless very suitable features. The sample is quite homogeneous since it gathers 883 municipalities among at total of 36000 cities which are similar in size and share the same political system. To this respect, it is worth mentioning that elections held at fixed intervals of time. Mean values are also reported for four sub–groups of municipalities ranked by their population size.

Three kinds of local policy instruments have been collected over the 1988-1999 time–period. We separate local capital from operating expenditures measured in constant French francs. These are also per capita figures to account for congestion effects. Owing to the complexity of the French local fiscal system, we had no choice but to measure the tax burden on households by the corresponding amount of local tax receipts per head. In France, local public expenditure can be financed either by own-source revenues (mainly taxes), state subsidies, and loans. Debt may be viewed as another instrument on which municipal incumbents can act on to be re-elected. Then, we also have considered a final variable measuring the (average) amount of borrowing per capita.

2.2 Econometric methodology

Our empirical approach is inspired from McCallum's [1978] original work. Basically, his approach consists in running a regression of the policy instrument on its lagged value, and two political dummies which refer to the electoral period of the office. The first one corresponds to the election year, whereas the second relates to the year preceding the ballot.

The dynamic econometric model is in accordance with Niskanen's view that some inertia is expected in the path of fiscal instruments. There is overwhelming evidence that their current level largely determines their future values. Though essentially ad hoc, this specification does not rely on a particular model of incumbent's behaviour [1].

It remains however to describe the dynamics of the candidate instruments. To this end, let us consider a fixed-effects model of the form:

$$Y_{it} = \alpha_i + \beta Y_{it-1} + \eta ELEC_t + \gamma ELEC1_t + \epsilon_{it} \tag{1}$$

Y_{it} represents the fiscal instrument, that is either local public spending, tax pressure or borrowing, measured at date $t = 1..T$ in municipalities of size $i = 1..N$. $ELEC_t$ stands for the corresponding election–year dummy, $ELEC1_t$ refers to the pre–election year.

According to opportunistic view, a political cycle appear if electors vote to some extent on the basis of the past observed economic outcomes. This economic record is assumed to depend itself heavily on the use of fiscal policy tools. Local incumbents would then resort to chosing one of them in a discretionnary way to win the election. A surge in local public

[1] As it will appear later, this rather crude specification may give nonetheless useful preliminary results.

expenditures (respectively debt) is thus expected during the electioneering campaign. In this case, parameters η or γ should be strictly positive. Instead, tax level should be reduced for the same reason so that the associated parameters would turn to be negative.

As concerns the econometric procedure, two techniques are usually implemented for dynamic panel data models: Anderson and Hsiao's (AH) [1982] estimator, Arellano and Bond's (AB) [1991].

However, the (small) sample size is a central issue in this context. Monte Carlo experiments have been carried out in order to assess the respective performance of the above estimators. It has been shown that the robustness of each estimator depends ultimately on panel dimensions (N and T).

These unsatisfactory results have led Bun and Kiviet's (BK) [2000] to propose a corrected Least Squared Dummy Variable ($LSDV_c$) estimator. When the time or space dimensions are relatively small (one of each less than twenty), the bias-corrected $LSDV$ estimator performs better than its AH and AB counterparts. BK's estimator shows the lowest mean-squared error. As stressed by Bun and Kiviet, the power of tests has to be questioned if based on asymptotic results. Accordingly, we would incorrectly reject the corresponding null hypothesis. Therefore, t-ratios have to be simulated for running significance tests.

In practice, $LSDV_c$ estimates can be obtained through the following four-step procedure [2]:

- get the standard uncorrected $LSDV$ estimates,
- perform an instrumental variable estimation according to Anderson and Hsiao and store the estimated variance of residuals as well as estimated regressors,
- evaluate the bias of $LSDV$ estimates as in Bun and kiviet (2000, pp. 8-10),
- run Monte Carlo simulations (see Bun and Kiviet (2000, p. 16) to get the corrected t-ratios.

2.3 Empirical results

For each fiscal instrument, we consider five panels: the first gathering all 883 municipalities (first column), the final four are sub-sets ranked by the population size.

[2] See Bun and Kiviet [2000] for full details. The procedure has been translated into GAUSS language.

Regression results for local tax pressure are reported in the following table:

Table 1. Local tax pressure trend (1988-1999)

Regressor	Total	10-20000	20-50000	50-100000	100-300000
X_{t-1}	0,97*	0,93*	0,95*	0,89*	0,95*
	(45,14)	(36,95)	(35,84)	(27,95)	(42,21)
$ELEC$	-0,8*	-0,91*	-0,57	-1,15*	-0,87*
	(-3,2)	(-3,12)	(-1,8)	(-2,88)	(-2,35)
$ELEC1$	-0,65*	-0,59*	-0,65*	-0,16	-0,46
	(-2,31)	(-2,03)	(-1,94)	(-0,35)	(-1,08)
R^2					
M	883	470	306	70	33

*An asterisk * signals a significant parameter at the 5% level.*

M is the number of municipalities in the 22 regions under study. We find evidence in France of a discretionary use of taxes to have one's mandate renewed. The local tax pressure seems to decrease in the two years of the electoral period, depending on the subgroup considered. Estimation results show that the election term leads to a tax cut from 0,5 to 1 FRF per capita.

Table 2. Capital expenditure (per capita) trend (1988-1999)

Regressor	Total	10-20000	20-50000	50-100000	100-300000
X_{t-1}	0,36*	0,41*	0,06	0,45*	0,50*
	(5,6)	(6,61)	(0,98)	(7,1)	(6,99)
$ELEC$	-0,03	-0,31	0,93	-0,26	-1,41
	(-0,06)	(-0,65)	(1,00)	(-0,28)	(-1,21)
$ELEC1$	2,27*	1,035*	2,9*	1,96*	4,06*
	(4,67)	(2,17)	(3,23)	(2,21)	(3,38)
R^2	0,54	0,57	0,31	0,6	0,49
M	883	470	306	70	33

Table 2 reveals a significant increase in capital expenditure per head (between 1 and 4 FRF) in the pre-election year depending on the municipal population size considered. This findings are consistent with opportunistic expenditure decision manipulation. Furthermore, capital expenditure seems to be the only budget instrument used for re-election purpose. Insignificant results are obtained for operating expenditure, which explain why those estimations are nor reported here.

Table 3. Loans (per capita) trend (1988-1999)

Regressor	Total	10-20000	20-50000	50-100000	100-300000
X_{t-1}	0,30*	0,38*	-0,01	0,41*	0,35*
	(4,88)	(6,33)	(-0,19)	(6,84)	(4,65)
$ELEC$	0,24	0,47	1,25	0,21	-0,17
	(0,56)	(1,26)	(1,57)	(0,24)	(-0,17)
$ELEC1$	1,79*	1,32*	2,89*	1,56*	2,6*
	(4,17)	(3,44)	(3,72)	(1,83)	(2,58)
R^2	0,41	0,47	0,27	0,42	0,33
M	883	470	306	70	33

The last table, showing loans pattern, leads to approximately the same result as capital expenditure. Indeed, local incumbent seems to have increased loan at the same time, the year before the election, and at the same level (up to 3FRF). French local authorities are also prompted to improve public spending by increasing indebtedness in order to boost their popularity before the election.

To sum up, there is empirical support to election-oriented tax cuts. Local incumbents also seem to favour debt-financed capital expenditure. Finally, in French municipalities, it is often the case that a change in taxation is combined with an extra local expenditure, even though the latter is financed by debt.

3 Tax shape, debt, and the electoral cycle in municipalities

What is at stake now is to provide a theoretical framework likely to describe a municipal political cycle. We also need to assess the consistency of this model building with our previous empirical findings.

The analysis is carried out in two steps: after having depicted the local incumbent's behaviours during both periods of his office, the features of the municipal political cycle will be discussed according to whether policy-makers are able or not to resort to indebtedness.

3.1 Local incumbent's behaviours

Since the early 1970s, the median voter model has figured strongly in economic modelling of the public government sector. Owing to Black [1948], this approach is based on the assumption that the politician has an incentive to follow policies in the median voter's interest should he wish to win the next round of election. More precisely, under two crucial assumptions, he is sure to have his mandate renewed when the ballot rests on a simple majority rule.

Under such circumstances, this model appears to be the most convenient way, in a preliminary analysis, to describe fiscal strategies decided by election-motivated local authorities. During the electoral period, the supplied municipal commodity matches with

the median quantity demanded by the citizens. Furthermore, as shown by Bergströ m and Goodman [1973], the required level corresponds to the demand of the median–income citizen in the municipality if the demand of local public good is a monotone function of income.

Let the median voter's utility function be of the form $U(x, g)$ where x is the quantity of unit cost private goods which he consumes. g measures the usefulness of the public facility to any individual in the municipality. With crowding of municipal services, population size exerts a direct effect on individual demands g. So, $g = \frac{G}{N^{\lambda}}$, with N the number of consumers, G the total quantity of the supplied local public good and λ the crowding parameter.

The budget constraint facing the deciding voter is:

$$y_m = x + tb_m \tag{2}$$

Following Bergström and Gooddman [1973], y_m figures the median income in the municipality. Conversely, b_m is the median voter's tax base which is not necessarily equal to the median value of that tax base.

The budget constraint facing the local authorities is given by the following equation:

$$C(G) = tB \tag{3}$$

$C(G)$ relates to local public expenditures. t is the tax level on household residents in the municipality. It is supposed here that local public expenditures can't be financed by debt. This restrictive assumption will be relaxed in the next sub-section.

Finally, the incumbent sets its fiscal policy in order to satisfy the median voter's preferences:

$$\max U(x, g) s/c \quad \begin{cases} t = \frac{C(G)}{B} \\ y_m = x + tb_m \\ G = gN^{\lambda} \end{cases}$$

The first–order condition gives the marginal rate of substitution between public and private goods:

$$TMS_{x,g} = \frac{\partial U/\partial g}{\partial U/\partial x} = C_G N^{\lambda} \frac{b_m}{b} \frac{1}{N_c} = p_m \tag{4}$$

p_m is the median voter's tax price. It depends on his tax burden $\frac{b_m}{b}$ such that the median voter has to pay the share $\frac{b_m}{b}$ of the total cost of municipal expenditures in his city. $p = C_G N^{\lambda}$ amounts to the unit cost of the public good. $b = \frac{B}{N_c}$ corresponds to the average local tax base.

Under the standard log–linear specification, the median voter's demand function for g may be written as:

$$g_m = kp_m^{\alpha} y_m^{\beta} = kp^{\alpha}(\frac{b_m}{b})^{\alpha}(\frac{1}{N_c})^{\alpha} y_m^{\beta} \tag{5}$$

In this relationship, demand depends on income and tax price. Both price and income elasticities of the demand for the public good are assumed constant (respectively $\alpha<0$ and $\beta>0$).

The quantity of G demanded is thus N^{λ} times the quantity of g:

$$G_m = N^{\lambda} g_m = kN^{\lambda} p^{\alpha}(\frac{b_m}{b})^{\alpha}(\frac{1}{N_c})^{\alpha} y_m^{\beta} \tag{6}$$

Total expenditures finally equal to:

$$C(G) = pG_m = kp^{\alpha+1} N^{\lambda}(\frac{b_m}{b})^{\alpha}(\frac{1}{N_c})^{\alpha} y_m^{\beta} \tag{7}$$

The tax rate desired by the median voter is also derived from the budget constraint:

$$t_m = \frac{C(G)}{B} = kN^{\lambda} p^{\alpha+1} b_m^{\alpha} b^{-\alpha-1}(\frac{1}{N_c})^{\alpha+1} y_m^{\beta} \tag{8}$$

To make up the municipal political cycle model we still have to describe budget decisions free of electoral concerns.

From a theoretical viewpoint, alternative models of public good provision can be considered to depict fiscal policy avoiding electoral considerations. In this setting, specifying either a bureaucrat or an incumbent maximising his popularity or else the usual approach brought up by Pommerehne and Frey [1976] may be natural candidates.

To our knowledge, no consensus has been reached yet about which of the above views is well-suited during the non–electoral period. Therefore, the third approach is retained here on two grounds:

- The median voter model is not compared with alternative formal models of political institutions. Rather, it is usually confronted with the simple traditional model which makes use of the mean income and the mean tax share instead of the medians.

- With respect to the empirical evidence, Turnbull and Mitias [1999] underline the fact that both the median and mean voters models are relevant but each one for a limited span of the local government's office. Extending their empirical findings at the theoretical level remains however an issue.

As it stands, our work is basically exploratory since we propose one possible way of modelling the municipal political cycle. Comparing alternative approaches is obviously beyond the scope of this paper.

Thus, the traditional model considers a local incumbent concerned with all citizens' interests. Then, local authorities maximise the utility of one fictional tax–payer. This particular voter is assumed to earned the mean income and subject to the mean tax base. Consequently:

$$\max U(x,g) \quad \begin{cases} t = \frac{C(G)}{B} \\ \bar{y} = x + tb \\ G = gN^{\lambda} \end{cases}$$

The corresponding expenditure and demand functions are:

$$g_c = kp^{\alpha}(\frac{1}{N_c})^{\alpha}\bar{y}^{\beta} \tag{9}$$

$$G_c = N^{\lambda}g_c = kN^{\lambda}p^{\alpha}(\frac{1}{N_c})^{\alpha}\bar{y}^{\beta} \tag{10}$$

$$C(G) = pG_c = kp^{\alpha+1}N^{\lambda}(\frac{1}{N_c})^{\alpha}\bar{y}^{\beta} \tag{11}$$

To finish, tax rate level becomes:

$$t_c = \frac{C(G)}{B} = kN^{\lambda}p^{\alpha+1}(\frac{1}{N_c})^{\alpha+1}b^{-1}\bar{y}^{\beta} \tag{12}$$

3.2 Electoral opportunism at the municipal level without indebtedness

The municipal political cycle can be illustrate by comparing local public spending (or local tax rate) chosen in the two different sub-periods of the local incumbent's office. The main findings can be summarised as follows:

- Local public investment (or indifferently the corresponding expenditures) can be viewed as an instrument the local incumbent can manipulate in order to win the election if $G_m > G_c$, or if $(\frac{b_m}{b})^{\alpha}y_m^{\beta} > \bar{y}^{\beta}$ or $(\frac{b}{b_m})^{-\alpha/\beta}\frac{y_m}{\bar{y}} > 1$. If local taxation is progressive, the share paid by the mean voter is greater than the one levied on the median voter ($\frac{tb_m}{y_m} < \frac{tb}{\bar{y}}$) when the municipal income distribution is unequal ($y_m < \bar{y}$). Under such local tax system, local public expenditures increase during election time and decrease once the local incumbent ballot is renewed, as long as $\frac{-\alpha}{\beta} \geq 1$. This result still prevails if $\frac{-\alpha}{\beta} < 1$ as soon as b is greatly higher than b_m thanks to the tax progressiveness. Tax degression does not completely impede a discretionary choice of public good level for electoral purpose as soon as $b > b_m$ together with $\frac{-\alpha}{\beta}$ sufficiently huge and greater than unity.

- Conversely, if local taxation is degressive, income distribution unequal and $b < b_m$, the local government should include only a tax cut in his electoral platform. Here,

a tax opportunist manipulation would have positive effects on the median voter satisfaction. If $b > b_m$, the same result appears when $\frac{-\alpha}{\beta} < 1$, even if $\frac{-\alpha}{\beta} > 1$ as soon as it is not too high.

- Local incumbents can not reduce tax and increase public spending simultaneously. Joint manipulation of the two instruments is dismissed to balance the budget.

- When income and tax distributions are symmetrical ($y_m = \bar{y}$ and $b_m = b$), we notice the absence of election-motivated manipulation, whatever instrument considered. Indeed, $G_m = G_c$ and $t_m = t_c$. Then, local incumbents do not change their budget policy on the eve of the election.

All in all, the model predicts most of the time an election-motivated increase of public expenditures during the run-up to the election if local taxation is progressive, and if most of residents earn an income lower than the corresponding income mean. Here, the median voter's tax burden is proportionally lower than the mean voter's. The former will prefer a public expenditure stimulation rather than a tax–cut.

Conversely, when local taxation is degressive, the local incumbent will generally find it better to cut tax. Indeed, the median voter supports a proportionally higher tax pressure than the mean voter. Therefore, the former is more sensitive to a tax bonus rather than to more public spending.

As previously mentioned, the French municipal system is based on two main taxes on households (TH and TFB). It is well known that the corresponding tax bill on household income can be taken in a degressive taxation. Therefore, our model predicts a tax–cut during the electoral period in French local jurisdictions, consistent with our empirical findings.

3.3 Electoral opportunism at the municipal level with indebtedness

3.3.1 Local incumbent behaviours

From now on, local incumbents entail borrowing to finance their policy. They are able to finance their electoral programme through debt but they must pay it back in the following sub-period.

Henceforth, the new local incumbent programme during the run-up to the election can be written as:

$$\max U(x, g) s/c \quad \begin{cases} C(G) = tB + D(G) \\ y_m = x + tb_m \\ G = gN^{\lambda} \end{cases}$$

The related marginal rate of substitution between public and private goods is:

$$TMS_{x,g} = \frac{\partial U/\partial g}{\partial U/\partial x} = \frac{b_m}{b}\frac{N^\lambda}{N_c}(C_G - D_G) = p'_m \tag{13}$$

The marginal cost of diverting one unit of public services decreases with marginal indebtedness (D_G):

$p' = N^\lambda(C_C - D_G)$

The resulting median voter's demand functions are:

$$g'_m = k(N^\lambda(C_G - D_G))^\alpha(\frac{b_m}{b})^\alpha(\frac{1}{N_c})^\alpha y_m^\beta \tag{14}$$

$$C(G'_m) = kN^\lambda(N^\lambda(C_G - D_G))^{\alpha+1}(\frac{b_m}{b})^\alpha(\frac{1}{N_c})^\alpha y_m^\beta \tag{15}$$

The desired tax rate by the median voter is also inferred from the budget constraint:

$$t'_m = kN^\lambda(N^\lambda(C_G - D_G))^{\alpha+1}(\frac{b_m}{b})^\alpha(\frac{1}{N_C})^{\alpha+1}b^{-1}y_m^\beta(1-\tau_D) \tag{16}$$

τ_D measures the share of debt–finance public spending.

Notice that indebtedness allow the public spending desired by median voter to increase. This path results in two opposite forces which are public expenditures down in unit price and a greater demand elasticity. Other things equal, public spending is stimulated during election time period if demand is strongly elastic. Conversely, tax burden on median voter is limited when demand is weakly elastic.

Let us now consider the standard model in which the local incumbent is concerned with all citizens interests. Recall that he maximises the utility of one fictitious tax–payer, the one with mean income and mean tax base:

$$\max U(x,g) \quad \begin{cases} C(G) + (1+r)D(G) = tB \\ \bar{y} = x + tb \\ G = gN^\lambda \end{cases}$$

The budget constraint facing the local authorities includes debt settlement (r is the interest rate). The remainder of tax proceeds is used to finance public expenditures.

The first-order condition can be stated as:

$$TMS_{x,g} = \frac{\partial U/\partial g}{\partial U/\partial x} = \frac{N^\lambda}{N_c}(C_G + (1+r)D_G) = p'_c \tag{17}$$

such that:

$p'' = N^\lambda(C_G + (1+r)D_G) > p'$

The corresponding expenditures and demand functions are:

$$G'_c = kN^{\lambda}(N^{\lambda}(C_G + (1+r)D_G))^{\alpha}(\frac{1}{N_c})^{\alpha}\bar{y}^{\beta} \tag{18}$$

$$C(G') = kN^{\lambda}(N^{\lambda}(C_G + (1+r)D_G))^{\alpha+1}(\frac{1}{N_c})^{\alpha}\bar{y}^{\beta} \tag{19}$$

Without elections, debt settlement increases the unit public price and consequently reduce municipal public investment because $\alpha < 0$. The corresponding public spending is also lowered when demand is strongly elastic.

To finish, tax rate level becomes:

$$t'_c = kN^{\lambda}(N^{\lambda}(C_G + (1+r)D_G))^{\alpha+1}(\frac{1}{N_c})^{\alpha+1}b^{-1}\bar{y}^{\beta}(1 + (1+r)\tau_D) \tag{20}$$

Local tax is raised when demand is inelastic. This helps preserving public spending.

3.3.2 Electoral opportunism at the municipal level with indebtedness

We notice an election-motivated public spending manipulation if $C(G'_m) > C(G'_c)$ or:

$$(\frac{C_G - D_G}{C_G + (1+r)D_G})^{\alpha+1}(\frac{b_m}{b})^{\alpha}y_m^{\beta} > \bar{y}^{\beta} \tag{21}$$

Public spending increase incentives is boosted by loans. Conclusions yet depends on public facilities demand sensibility:

- If demand is strongly elastic ($\alpha + 1 < 0$), then $(\frac{C_G - D_G}{C_G + (1+r)D_G})^{\alpha+1} > 1$. If local taxation is progressive, when the municipal income distribution is unequal, public expenditures always increase during election time and decrease once the local incumbent ballot is renewed, if $\frac{-\alpha}{\beta} > 1$. In any case, financing partly local public sector by loan accentuates the opportunistic political budget cycle. Tax degression is not completely inconsistent with an election–oriented choice of public good as long as $(\frac{C_G - D_G}{C_G + (1+r)D_G})^{\alpha+1}$ is sufficiently greater than one.
- If demand is weakly elastic ($\alpha + 1 > 0$), indebtedness discourages any public spending manipulation because its production cost is increased. This effect is due to the following term $(\frac{C_G - D_G}{C_G + (1+r)D_G})^{\alpha+1}$.

If public spending path depends on price elasticity on public services values, the volume of public goods fluctuates independently. Those fluctuations are similar to the case developed above when $\alpha + 1 < 0$.

Local authorities prefer to cut local tax if:

$$(\frac{C_G - D_G}{C_G + (1+r)D_G})^{\alpha+1}\frac{1 - \tau_D}{1 + (1+r)\tau_D}(\frac{b_m}{b})^{\alpha}y_m^{\beta} < \bar{y}^{\beta} \tag{22}$$

- Other things equal, the public spending share financed by loans accentuates municipal tax manipulation during election time. Indeed, $\frac{1-\tau_D}{1+(1+r)\tau_D} < 1$ owing to the tax which will be levied on households' future income.

- As noticed before, when local taxation is degressive and demand weakly elastic, local incumbent will generally choose a tax-cut. As expected, indebtedness magnifies the municipal cycle. Conversely, a huge elasticity discourages this electoral strategy.

- According to equations (21) and (22) a joint vote-rigging on public spending and taxation is not yet excluded, but with τ_D sufficiently high.

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