Finite-Lived Politicians and Yardstick Competition*

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Abstract

The introduction of finite-lived politicians within a life cycle model raises the well-known "last period problem". An opportunistic incumbent, who is serving his/her last term, will not be penalized for introducing higher taxes. In this and other respects, tax competition is often considered as a yardstick. Changes in the tax rate within a given jurisdiction are influenced by the tax rate changes in neighboring jurisdictions. Combining these two notions yields the conclusion that a leviathan politician in office may not be contained if the incumbent in the neighboring jurisdiction is holding office for the last time. In this paper we challenge that conclusion. We show that the efficiency of yardstick competition in restraining opportunistic political behavior depends upon the number of competing jurisdictions and the way in which these jurisdictions are spatially organized.

JEL-Classification: D72, H11
Keywords: opportunistic politicians, local Taxation, Term Limits, Yardstick Competition

1. Introduction

This paper studies the behavior of finite-lived politicians within a life cycle model under the assumption of leviathan politicians. In this case, the introduction of "finite life" raises the well-known "last period problem". This issue has recently been discussed in various papers via the term "limitation issue" (see Lopez, 2003 for a survey). Many countries impose term limits upon their President. This, for example, is the case in the United States and practically all of Latin America; it is also the case for most governors in the United States. Moreover, term

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limits are currently being debated in some European countries, e.g. France. Such limitations usually take the form of prohibiting the re-election of an incumbent or capping the number of consecutive terms a politician may hold office. Since the late 1980's, several empirical studies have addressed this issue. The main focus of this research work has been to assess the impact of term limits on the behavior of politicians, for example in Lott (1987) and Lott and Bronars (1993). More recently, Besley and Case (1995a) studied the consequences of term limits on tax-levying and public expenditure choices. They found that the presence of term limits exerted significant effects on tax rates; in particular, they showed that when a United States governor faces a term limit, per capita taxes on general sales or gross receipts will be 7 to 8 dollars higher in all of the final term years examined. The theoretical explanation behind this result is straightforward: an opportunistic incumbent finishing his/her last term will not be penalized for raising the level of taxes.

Meanwhile, the literature on yardsticks within a framework of fiscal federalism has been expanding rapidly. In a world of imperfect and asymmetric information, voters' possibilities to evaluate the performance of representatives in their polity remain quite restricted. Selfish representatives seek to accumulate political rents and hence are enticed to retain information about their opportunistic behavior that goes hidden from the voting public. Voters however may draw inferences on politician behavior by comparing it with the performance of governments and parliaments in neighboring jurisdictions. All other things aside, these neighbors serve as yardsticks for voters' evaluation. A poorer performance in their own jurisdiction compared to other jurisdictions leads to punishing representatives by voting them out of office in the subsequent elections. According to such a concept, the public choice would be driven not only by information gathered from neighboring jurisdictions, but also by behavior-mimicking. Since elected representatives anticipate the yardstick mechanism, they are able to hold onto power by adapting policies to their neighbors' (Salmon, 1987). Empirical studies of this hypothesis tend to confirm the existence of such mimicking behavior in many countries, e.g. Besley and Case (1995b) in the case of the United-States, Bordignon, Cerniglia and Revelli (2002) for Italy, Solé Ollé (2003) for Spain, and Feld, Josselin and Rocaboy (2003) for France. As regards tax rate-setting, these studies have determined that changes to tax rates within a given jurisdiction are influenced by changes to the rate in neighboring jurisdictions. To the best of our knowledge, no papers simultaneously consider the effect of term limits and "yardsticking" on taxation decisions. One exception was found in Besley and Case (1995b), who showed that during years in which a state is governed by a politician not allowed to seek re-election, no sensitivity to neighbors' tax behavior is detected.

In this paper we combine the literature on both finite-life behavior and yardstick competition. In the yardstick political competition literature (eg Besley and Case, 1995b), the only focus is on the tax-setting behaviour of newly elected politicians. The case where one incumbent is in office for the first time while the other is serving a final term and the consequence it might have on the average tax rate of the region is not examined. Here the "classical" yardstick competition model is amended so as to incorporate this possibility. The different states in which a region can lie in are defined. If we assume that politicians are bound to a two-term limit in office, a region composed of two jurisdictions is in one of the four following states: the state where both politicians are newly elected, the two symmetric states where one incumbent is holding office for the first time while the other is carrying out his second and last mandate, and the state where both politicians are re-elected to a second and final term. We show that the process of moving from one state to another is Markovian, and we use the Markov chain theory to compute the regional expected tax rate in the long run. Then we consider the case of three jurisdictions along with different spatial organisations. We show that the long-run expected tax rate of the region and then the efficiency of yardstick competition in containing opportunistic political behavior depends both on the number of jurisdictions that compose the particular region and on the region's spatial organization. The remainder of this paper will be structured as follows: Section 2 describes the basic theoretical background; Section 3 analyzes the effect of yardstick competition on tax rates over the long run; and Section 4 provides some concluding remarks.

2. Theoretical background

The basic model used in this paper is similar to the one presented in Feld, Josselin and Rocaboy (2003). We will first discuss the model and then provide a numerical illustration of key results using a particular specification of the re-election probability function.

2.1. The model

The basic framework of our model consists of two identical jurisdictions i and j that supply public goods financed through local taxation. Each jurisdiction is represented by an elected politician, who is constitutionally bound to a two-term limit in office with an election held at the end of the first term. For each model period, the jurisdiction representative is assumed to commit him/herself to providing voters with the same quantity of public good g. The tax level that exactly balances this quantity is denoted $\underline{t}$, while $\bar{t}$ measures the maximum tax that can be levied by politicians. We also assume that either prosecution by authorities external to the jurisdictions or migration may prevent against unbounded rents. The yardstick competition hypothesis is introduced into the model through the re-election probability function R. It describes the beliefs of politician i as regards his/her chance of being re-elected and is formalized by the following expression: $R_i(t_i, t_j, A)$ with $\frac{\partial R_i}{\partial t_i} < 0$, $\frac{\partial R_i}{\partial t_j} > 0$, and $\frac{\partial R_i}{\partial A} < 0$. This expression yields the probability of politician i to be re-elected and depends on the tax in jurisdiction i compared to the tax in jurisdiction j. This probability also depends on the intensity of political competition, as denoted by A. In this paper, we will not address the principal-agent relationship between voters and politicians, but instead mainly focus on strategic fiscal interactions between representatives whose motivations revolve around their chances of winning re-election. It is in the interest of the electorate however to convince politicians that their re-election depends on household taxation rates in comparison with the rates practiced in adjacent jurisdictions. Moreover, in order to be credible, the electorate must honor its promise to return the politician to office with a probability correlated with taxation behavior; otherwise, knowing that any re-election bid will systematically fail, an incumbent will engage in maximal rent seeking as of the first term[1]. We are supposing herein that the electorate commits itself to re-elect politicians with probability R in order to discourage rent-seeking.

The opportunistic politician is assumed to maximize the revenue extracted from the time spent in office; this revenue is measured by the difference between tax receipts and local public expenditure. Besley and Case (1995a) found that when a U.S. governor faces a term limit, per capita sales or per capita income tax is higher during all years of the final term. According to this result, we have assumed that since the number of terms is limited to two, then with nothing to lose the re-elected representative will systematically behave opportunistically by always choosing the highest tax rate $\bar{t}$ during the second and last period in office. The tax rate set by politician i in the first period is thus a solution to the following:

$$\max_{\{t_i\}} EG_i = (t_i - \underline{t}) + R_i(t_i, t_j, A)\delta(\bar{t} - \underline{t}) \tag{1}$$

whith δ being the discount factor ($\delta \leq 1$). The first order condition is then given by:

$$\frac{-\partial R_i(t_i, t_j, A)}{\partial t_i} \quad \delta(\bar{t} - \underline{t}) = 1 \tag{2}$$

and the second order condition:

$$\partial^2 R_i(t_i, t_j, A)/\partial^2 t_i < 0 \tag{3}$$

The left-hand side of 2 measures the discounted loss of the second period expected payoff due to a marginal increase in tax during the first period, while the right-hand term measures the first period gain due to this marginal increase. The equilibrium tax in Period 1 is a decreasing function of the political competition intensity if $\partial^2 R_i(t_i, t_j, A)/\partial t_i \partial A < 0$. It means that it is so if the marginal probability of re-election is a decreasing function of the intensity of the political competition. The first-order condition constitutes the "reaction function" of jurisdiction i. Condition (3) indicates that if the re-election probability function can be expressed as a concave function of the jurisdiction i tax rate, then an optimal t_i that maximizes the rent of politician i for each given t_j must indeed exist. As regards R_i, this would suggest that for a given t_j, as t_i increases, the decrease in the marginal probability of being re-elected becomes more pronounced. By applying the implicit function theorem on the first-order condition, we are able to obtain the slope of the reaction curve for politician i as follows:

$$\frac{dt_i}{dt_j} = \frac{-\partial^2 R_i(t_i, t_j, A)/\partial t_i \partial t_j}{\partial^2 R_i(t_i, t_j, A)/\partial^2 t_i} \tag{4}$$

The slope of the reaction curve is nonzero if $\partial^2 R_i(t_i, t_j, A)/\partial t_i \partial t_j \neq 0$. This condition is important as a requirement to the existence of strategic interactions between the tax policies enacted in the two jurisdictions. Before studying the yardstick competition process, let's first examine a numerical illustration of the basic fiscal game equilibrium.

2.2. A numerical illustration of the basic fiscal game equilibrium

In the following numerical illustration, we have opted for a specification of the re-election function derived from the "Contest Success Function" proposed by Tullock (1980):

$$R_i(t_i, t_j, A) = \frac{1}{1 + A\frac{u_i(t_j, g)}{u_i(t_i, g)}} \tag{5}$$

where $u_i(t_i,g)$ is the satisfaction derived by voter i from the tax policy in effect in jurisdiction i, while $u_i(t_j,g)$ is the utility of the same voter if he/she had been living in j. Moreover, we assume that $A \in]0,1]$. In the case where $t_i = t_j$ therefore, the re-election function depends solely on the intensity of political competition. Should the level of political competition be maximal ($A = 1$), the re-election probability would be equal to 1/2. This implies that even in the case of perfect tax-mimicking behavior, politicians in the competing jurisdictions may not be re-elected. Consequently, the variable A can be considered as a political competition index within each jurisdiction. For the sake of simplicity, we have supposed the following form of the utility function: $u_i(t_i,g) = (\bar{t} - t_i)g$. This specification proves similar to a loss function. For a given amount of local public good, as the tax rate approaches its maximum value, voter satisfaction drops. Taking this specification into account yields the following:

$$R_i(t_i,t_j,A) = \frac{1}{1 + A\frac{\bar{t}-t_j}{\bar{t}-t_i}} \tag{6}$$

Two symmetric Nash equilibria are found in this game:

$$\bar{t} \qquad \text{and} \qquad t^* = \frac{A\delta}{(1+A)^2}\underline{t} + \left(1 - \frac{A\delta}{(1+A)^2}\right)\bar{t} \tag{7}$$

In reference to Cournot and considering a dynamic interpretation of this game, only the interior equilibrium is stable. Moreover, in the case of two newly-elected politicians, if both were to believe that the other would not risk setting the tax rate at its maximum, then the interior solution would constitute the game equilibrium. This approach would lend support for t^* as the likely solution to this game when both politicians are newly-elected incumbents. We will assume herein that the interior solution is the equilibrium of the yardstick competition game when all incumbents are holding office for the first time; this solution is a convex linear combination of $\underline{t}$ and $\bar{t}$. The regulatory effect of yardstick competition is defined as the propensity of this kind of competition to force politicians to reduce tax rates. The magnitude of this effect depends on various parameters. Should the discount rate δ be high, the equilibrium would lie close to $\underline{t}$. Since the politician ascribes a high value to the future payoff, he/she will be incited to moderate fiscal policy during the first term in order to increase the probability of being re-elected. Furthermore, as political competition A becomes more intense, t^* decreases. These two Nash equilibria have been depicted in Figure 1 for both $A = 1$, $\delta = 1$, $\underline{t} = 0.3$ and $\bar{t} = 0.7$. The tax rates in i and j are measured on the vertical and horizontal axes, respectively. The $t_i(t_j)$ curve displays the reaction function of politician i, while $t_j(t_i)$ shows that of politician j. The interior solution is denoted E_1 and the corner solution E_2. We will now examine the tax rate-setting game as a repeated game between an infinite-lived electorate and a series of finite-lived politicians.

3. Yardstick Competition over the long run

In this section, we will first examine the yardstick competition over the long run in the case of just two jurisdictions. Next, this competition will be analyzed in the presence of three jurisdictions, along with two distinct spatial organizations.

3.1. The case with two jurisdictions

We will now mainly focus on the yardstick competition effect on tax rates (t_i, t_j) during each period of the tax rate-setting game. This process is formalized by use of a Markov chain. At the beginning of the first period, the politicians in jurisdictions i and j are assumed to be new incumbents. At the end of each period after the election, the region thus lies in one of the four following states:

- State I: Both incumbents are re-elected and empowered to fulfill their second and last term. As previously postulated, this state marks the end of the game for both politicians and neither has any incentive to maintain the tax rate at a low level. The Nash equilibrium is then $(\bar{t}, \bar{t})$.
- State II: The incumbent in jurisdiction i carries out his/her first term, while the one in jurisdiction j has been re-elected to a second term. Since the politician in j will no longer be holding office, he/she sets the highest tax rate in order to maximize rent-seeking. In the presence of yardstick competition, the optimal tax-setting behavior for the politician in i would be to mimic his/her neighbor. The tax rate within each jurisdiction would then be maximal and the Nash equilibrium would be $(\bar{t}, \bar{t})$.
- State III: The politician in i is holding office for the second and last term, while the politician in j has been newly-elected. For the same reason as that cited in State II, the Nash equilibrium is $(\bar{t}, \bar{t})$.
- State IV: Both politicians are new incumbents. The yardstick competition has a regulatory effect and the Nash equilibrium is (t^*, t^*). This is the only case where the tax rate equilibrium is less than $\bar{t}$.

The transition from one state to another is a discrete stochastic process, where each period denoted $N = \{0, 1, \ldots, n-1, n, n+1, \ldots\}$ corresponds to a term in office. The state space E is finite: $E = \{I, II, III, IV\}$ and describes the four possible states that could ever apply to the region. The Markov assumption holds for this stochastic process, denoted (X_n). This assumption may be summarized as follows:

$$P(X_{n+1} = e_{n+1} | X_0 = e_0, \ldots, X_n = e_n) = P(X_{n+1} = e_{n+1} | X_n = e_n) \tag{8}$$

with $e_0, \ldots, e_{n+1} \in E$. The state characterizing the region's situation during period $(n+1)$ then solely depends on the state the region was in during period n. In other words, future behavior depends probabilistically only on the current state and not on any past behavior. The Markov transition matrix, which expresses the one-step transition probabilities of this discrete Markov transition process, can thus be written as follows:

$$\mathbf{M} = \begin{pmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & R & (1-R) \\ 0 & R & 0 & (1-R) \\ R^2 & (1-R)R & (1-R)R & (1-R)^2 \end{pmatrix} \tag{9}$$

The element in the l^{th} row $(l = I, \ldots, IV)$ and the m^{th} column $(m = I, \ldots, IV)$ represents the transition probability from State l to State m at each time period. As for the first line of the transition matrix, if the region lies in state I at time n (incumbents are carrying out their second and last mandate), then the probability for the region to be in state I, II or III at time $(n+1)$ is equal to zero because politicians are not allowed to be re-elected. The only possibility for the region is to lie in state IV at time $n+1$ (incumbents i and j are newly elected). The probability to move from state I to state IV is then equal to 1.

Line two of the transition matrix can be explained as follows. Departing from state II (incumbent i is newly elected and incumbent j is re-elected) the probability to move to state I (re-election of incumbents i and j) or to state II (re-election of incumbent j and election of incumbent i) is zero. From state II, the region can only move to state III (incumbent i is re-elected and incumbent j is newly elected) or to state IV (incumbents i and j are newly elected). The probability to move from state II to state III is then equal to R (the probability of politician i to be re-elected), and from state II to state IV to $(1-R)$ ie the probability of politician i to be defeated. Computation of line three is the same as that of line two.

Finally if the region lies in state IV (line four) at time n (incumbents i and j are newly elected), the probability for the region to move to state I (incumbents i and j are re-elected) is equal to R^2. The probability for the region to move to state II (incumbent i is newly elected and incumbent j is re-elected) is equal to $(1-R)R$. In the same vein, the probability for the region to move from state IV to state III is equal to $R(1-R)$. If the region lies in state IV the probability for the region to move to state IV (incumbent i and j are newly elected) is equal to $(1-R)^2$ ie the probability of both politicians to be defeated.

One comment on this transition matrix merits attention at this point. Being in State IV during period n, i.e. the state wherein politicians complete their first term in office, the region may lie in one of the four possible states during the following period. However, as the level of political competition grows less intense (high value of R), the probability of being in State I (the state where both incumbents are re-elected) during period $(n+1)$ increases. With the transition probability from State I to State IV being equal to 1, the process may therefore oscillate between these two states. As regards fiscal policy matters, this insight implies that the region will often experience a period of high tax rates followed by a period of low tax rates. From another perspective, if the region is in State II during a given period and should the level of political competition be weak, the probability of making the transition from State II to State III would be high, in which case voters in the region would have to pay high taxes during all periods.

The definition of transition probabilities yields: $\pi_{m,n} = P(X_n = m) = \sum_{l \in E} P(X_n = m | X_{n-1} = l)P(X_{n-1} = l)$. We then obtain: $\pi_{m,n} = \sum_{l \in E} \pi_{l,n-1} M(l,m)$, with $M(l,m)$ the element in the l^{th} row and m^{th} column of the transition matrix. This latter expression can be written in matrix notation as follows: $\pi'_n = \pi'_{n-1}M$. The stationary probability distribution of this chain is thus the solution to: $\pi' = \pi' M$. After computation, this stationary distribution is given by the following probability vector:[2]

$$\pi' = (\pi_I, \pi_{II}, \pi_{III}, \pi_{IV}) = (\frac{R^2}{(1+R)^2}, \frac{R}{(1+R)^2}, \frac{R}{(1+R)^2}, \frac{1}{(1+R)^2}) \tag{10}$$

This vector yields the probability of being in a particular state after a long period of time. For instance, if the Markov chain starts in State IV, i.e. within the only regulatory state of the state space, the probability of being in this same state after a large number of steps is equal to $\frac{1}{(1+R)^2}$ and the probability of being in one of the remaining states is then $(1-\frac{1}{(1+R)^2})$. By use of this stationary distribution of probabilities, we are able to compute the expected long-run tax rate of the region as follows:

$$Et_{LR} = \frac{1}{(1+R)^2}t^* + (1-\frac{1}{(1+R)^2})\bar{t} \tag{11}$$

This expected tax rate depends on the intensity of political competition. As this competition grows in intensity, the expected long-run tax rate drops. Such a relationship is due firstly to a decrease in t^* and secondly to an increase in the probability of being in regulatory state IV. In considering the Tullock re-election function (Equation 6) and knowing that $R_i(t_i, t_j, A) = \frac{1}{1+A}$ since $t_i = t_j$, regardless of the region's current state, the stationary distribution of probabilities can be written as:

$$\pi' = (\frac{1}{(A+2)^2}, \frac{A+1}{(A+2)^2}, \frac{A+1}{(A+2)^2}, \frac{(A+1)^2}{(A+2)^2}) \tag{12}$$

and the long run expected tax rate as:

$$Et_{LR} = \frac{A\delta}{(A+2)^2}\underline{t} + (1-\frac{A\delta}{(A+2)^2})\bar{t} \tag{13}$$

Figure 2 provides an illustration of this numerical application. Tax rates are measured on the vertical axis, while the intensity of political competition is measured on the horizontal axis. The expected long-run tax rate Et_{LR} is always higher than the Nash equilibrium t^* within the regulatory state, except when the intensity of competition is equal to zero. In this case, the expected long-run tax rate and the Nash equilibrium are both equal to the maximum tax rate $\bar{t}$. Moreover, as the political competition becomes more intensive, the expected long-run tax rate drops.

The difference between efficient taxation $\underline{t}$ and the expected long-run tax rate Et_{LR} is equal to:

$$Et_{LR} - \underline{t} = (1-\frac{A\delta}{(A+2)^2})(\bar{t}-\underline{t}) \tag{14}$$

The difference is called the expected rent left for opportunistic politicians; this political rent is positive since $A \leq 1$ and $\delta \leq 1$. It will increase as the difference between the maximum and minimum tax levels rises. Moreover, fierce political competition and a high discount factor will induce politicians to lower taxation and then decrease rent-seeking. We will now study the effect of increasing the number of jurisdictions on the expected long-run tax rate.

3.2. The case with three jurisdictions

We have considered the case of a region with three contiguous jurisdictions. Within this context, the issue arises of how voters actually make comparisons. Voters are usually presumed to compare their situation with that in neighboring jurisdictions. In most studies conducted, the neighborhood is defined as a set of jurisdictions with a common border. As Besley and Case (1995b) stated, this geographical definition is relevant for two main reasons: the likelihood that the economic conditions are more similar in geographic neighbors is greater; and geographic neighbors reflect the notion that jurisdictions belong to the same media market, by virtue of possessing good information on events happening nearby. We have assumed herein that the incumbent in one jurisdiction compares his/her tax rate with the average tax rate of neighboring jurisdictions. In this case, the geographical structure of the region does matter as regards taxation policy. In order to delve more deeply into this point, we will now consider two kinds of spatial organization: the I-shaped organization, and the T-shaped organization.

3.2.1. I-Shaped spatial organization (IS)

The geography of the regional structure is as follows:

Jurisdiction i
jurisdiction j
jurisdiction k

We define the average number of jurisdiction neighbors as the average number of geographically-neighboring jurisdictions for each jurisdiction in the region. Since jurisdiction i has one geographical neighbor, jurisdiction j two geographical neighbors and jurisdiction k one geographical neighbor, the average number of neighbors is equal to 4/3. The probability of politician re-election in i, j and k can be written respectively as: $R_i = R_j(t_i, t_j, A)$, $R_j = R_j(t_j, (t_i + t_k)/2, A)$ and $R_k = R_k(t_k, t_j, A)$. Eight distinct possibilities thereby exist:

- State I: The three incumbents are all re-elected and fulfill their second terms. The Nash equilibrium would then be $(\bar{t}, \bar{t}, \bar{t})$.
- State II: The incumbents in jurisdictions i and k hold office for the last time, while the incumbent in j is a newly-elected official. The Nash equilibrium would then be $(\bar{t}, \bar{t}, \bar{t})$.
- State III: The incumbents in jurisdictions j and k are voted back to office, while the incumbent in i is newly-elected. The Nash equilibrium would then be $(\bar{t}, \bar{t}, \bar{t})$.
- State IV: The politician in k fulfills his/her second term, while politicians in both i and j are new incumbents. In this state, the yardstick competition exerts a regulatory effect and the Nash equilibrium is $(t_1, t_2, \bar{t})$.
- State V: The incumbents in jurisdictions i and j hold office for their last term, while the incumbent in k is elected for the first time. The Nash equilibrium would then be $(\bar{t}, \bar{t}, \bar{t})$.

- State VI: The politician in i is re-elected, while those in both j and k are newly-elected. State VI is a regulatory state and the Nash equilibrium is $(\bar{t}, t_2, t_1)$.
- State VII: The politician in j has been elected to a second term, while the incumbents in both i and k are newly-elected officials. The Nash equilibrium would then be $(\bar{t}, \bar{t}, \bar{t})$.
- State VIII: The three politicians are all new incumbents. The regulatory effect of yardstick competition is maximal and the Nash equilibrium can be expressed as (t^*, t^*, t^*).

As previously indicated, moving from one state to another is a stochastic process with discrete time and discrete state space $E = \{I, II, III, IV, V, VI, VII, VIII\}$. Moreover, the probability of being in a particular state during period n depends solely upon the state of the region during period $(n-1)$, hence this discrete stochastic process satisfies the Markov assumption. The stationary distribution is then given by the vector of probabilities: $\pi^{IS} = (\pi^{IS}_{I}, \pi^{IS}_{II}, \pi^{IS}_{III}, \pi^{IS}_{IV}, \pi^{IS}_{V}, \pi^{IS}_{VI}, \pi^{IS}_{VII}, \pi^{IS}_{VIII})$. In this case, the expected long-run tax rate is equal to:

$$\mathrm{E}t^{IS}_{LR} = \pi^{IS}_{VIII} t^* + 2\pi^{IS}_{IV} \frac{t_1 + t_2 + \bar{t}}{3} + (1 - \pi^{IS}_{VIII} - 2\pi^{IS}_{IV})\bar{t} \tag{15}$$

For the sake of simplicity, the values of π^{IS}_{IV}, π^{IS}_{VIII}, t_1 and t_2 have not been reported in this paper[3]. In order to illustrate the effect of raising the number of jurisdictions on tax rates, let's return to the numerical example given above. Figure 2 shows that the expected long-run tax rate with two jurisdictions is always greater than that with three jurisdictions within the I-shaped spatial organization, $\mathrm{E}t^{IS}_{LR}$. This finding is mainly due to the fact that the number of regulatory states in the case of three jurisdictions is higher than that with two jurisdictions. As the number of jurisdictions increases, so does the number of neighbors serving as yardsticks for voter evaluation, and the probability of at least one neighboring politician holding office for the first time increases. In this case, yardstick competition to contain the leviathan politician becomes more efficient over the long run. In the case of a T-shaped spatial organization, as we will see below, the yardstick competition effect on taxation is different.

3.2.2. T-Shaped spatial organization (TS)

The geographical structure of the region under this spatial organization is as follows:

<table>
<tr><td>Jurisdiction i</td><td>Jurisdiction j</td></tr>
<tr><td colspan="2" align="center">Jurisdiction k</td></tr>
</table>

Each jurisdiction has two neighbors, thus the average number of jurisdiction neighbors is equal to 2. The re-election probability of the politicians in i, j and k can be written respectively as: $R_i = R_i(t_i, (t_j + t_k)/2, A)$, $R_j = R_j(t_j, (t_i + t_k)/2, A)$ and $R_k = R_k(t_k, (t_i + t_j)/2, A)$. As in the previous case, eight distinct possibilities exist. When at least two incumbents are fulfilling their second term, the tax rate-setting decisions are the same in both the I- and T-shaped spatial organizations. Such is the case for States I, II, III and V, in which taxes are equal to $\bar{t}$. Rate-setting decisions will also be identical in both spatial organizations in the case where all incumbents are newly-elected, which corresponds to State VIII and a tax level equal to t^*

everywhere. The only differences in rate-setting decisions between these two kinds of spatial organizations lie in States IV, VI and VII. In these states, only one politician is returned to office and hence sets a tax equal to $\bar{t}$, whereas the other two are new incumbents setting a tax denoted t_3.

It should be noted that $t_3 > (t_1 + t_2)/2$, where t_1 and t_2 are the tax rates set by incumbents carrying out their first terms in regulatory states IV and VI within the I-shaped spatial organization. As seen above, moving from one state to another is Markovian. The stationary distribution of this stochastic process is denoted π^{TS}. For the sake of simplicity, the value of probabilities and the value of t_3 have not been included herein. Knowing that $\pi_{IV}^{TS} = \pi_{VI}^{TS} = \pi_{VII}^{TS}$, the expected long-run tax rate within the T-shaped spatial organization is equal to:

$$\mathrm{Et}_{LR}^{TS} = \pi_{VIII}^{TS} t^* + 3\pi_{IV}^{TS} \frac{2t_3 + \bar{t}}{3} + (1 - \pi_{VIII}^{TS} - 3\pi_{IV}^{TS})\bar{t} \tag{16}$$

In order to illustrate the impact of spatial organization on the regulatory effect of yardstick competition, i.e. on the expected long-run tax rate, let's once again return to the numerical example described in Section 3.2.1 (see Fig. 2). The expected long-run tax rate with two jurisdictions is higher than that with three jurisdictions according to the T-shaped spatial organization. This finding confirms the fact that increasing the number of jurisdictions, regardless of a region's spatial organization, yields a drop in the expected long-run tax rate of the region. Moreover, the expected long-run tax rate within the T-shaped spatial organization is lower than the expected long-run tax rate of I-shaped spatial organizations. Two opposing effects are at play herein. First, the regulatory effect of T-shaped organizations in States IV and VI is less pronounced than in I-shaped organizations ($t_3 > (t_1 + t_2)/2)$). Second, the number of regulatory states is higher in the T-shaped spatial organization, meaning that the probability of being in a regulatory state is greater in this particular case. It would seem that the latter effect outweighs the former. This numerical example suggests that in the long run, as the average number of neighbors increases, yardstick competition becomes more effective at regulating opportunistic behavior. These results can be summarized by the following two propositions:

Proposition 1: The expected long-run tax rate in a region depends upon the number of jurisdictions composing the region. A higher number of jurisdictions goes hand in hand with a lower expected long-run tax rate.

Proposition 2: For a given number of jurisdictions within a region, as the average number of jurisdiction neighbors increases, the expected long-run tax rate of the region drops.

4. Conclusion

Yardstick competition is generally perceived as a way to regulate opportunistic tax rate-setting behavior. This perception however may no longer be applicable when politicians are finite-lived incumbents. Under this assumption, the election process is not an efficient mechanism for containing leviathan politicians. During their last term in office, incumbents will indeed take advantage of this situation in order to maximize rent-seeking. As regards yardstick competition, the neighbor(s) of such a jurisdiction will not be enticed to maintain low tax levels. This observation raises the issue of yardstick competition as an incentive mechanism to curtail opportunistic tax rate-setting decisions. This topic has been the focus of the present article. Within a simple framework and using simulation results, we have shown that the efficiency of yardstick competition in limiting opportunistic tax rate-setting behavior depends not only on the number of jurisdictions composing the region, but also on the way these jurisdictions are spatially organized. The reason behind the results obtained stems from the fact that increasing the number of neighbors serving as yardsticks for voter evaluation raises the probability of having at least one politician holding office for the first time as a neighbor, which is a condition for newly-elected politicians not to set the tax rate at its maximum level.

Our analysis may be further developed in several directions. First, varying term limits across jurisdictions would make it possible to directly address the issue of asymmetries and to consider the effects of such asymmetries on the expected long-run tax rate of a region. Moreover, our model could be extended to examining a situation in which inter-jurisdictional spillover effects are present; the conclusion that increasing the number of jurisdictions results in a gain for the region might thus have to be changed. A political economy approach could also have been considered, on the grounds that term limitations act to constrain representative democracy. Lastly, testing for the existence of a link between a region's tax rate and its spatially organization could add useful empirical relevance to this research.

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Figure 1 Nash Equilibrium

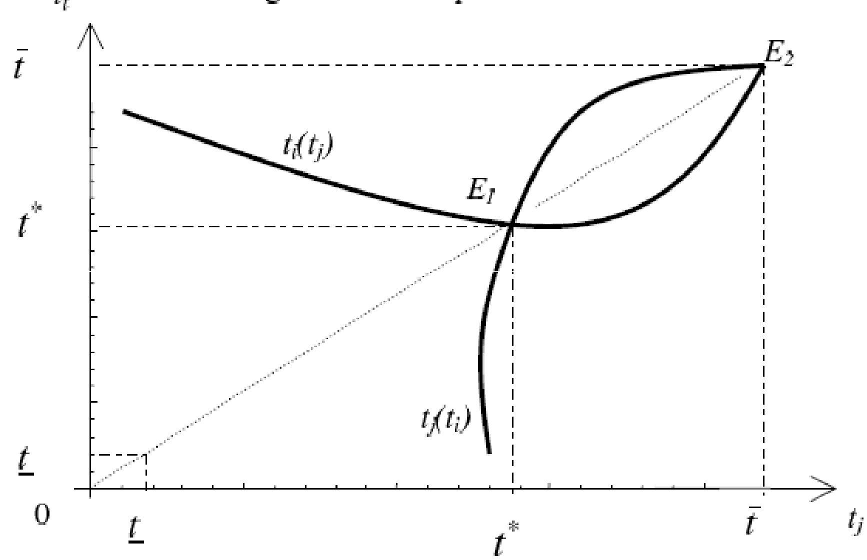

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Figure 2 Long run expected tax rates