Yardstick Competition, Corruption, and Electoral Incentives

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Abstract

This paper investigates the relationship between electoral incentives, institutions and corruption. We assume that voters use a yardstick criterion. The incumbent provides a public good and extracts rent, which are financed by imposing a distortionary tax. We demonstrate the possibility that yardstick competition itself fails to restrict rent seeking. We complement the static setting with a dynamic scenario where each incumbent politician faces an election after a finite, fixed term. Under relative performance evaluation, dynamic incentives impose more restriction on rent appropriation in comparison to the static case.

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Keywords: yardstick competition, rent-seeking, public good, electoral incentives.

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1 Introduction

The present work investigates the relationship between electoral incentives, political institutions and political corruption. While the traditional textbook view of the politician as a benevolent maximizer of social welfare is passé, there is no consensus about the alternative behaviour. At one extreme, one encounters the Virginia School's view of the politician as a Leviathan, maximizing the government size with a high degree of corruption. At the other extreme, there is the Chicago School's view that politicians' behaviour is shaped by electoral incentives and party politics. If politicians are indeed rational, then political competition must align their interest with that of the majority of voters (otherwise they forfeit elections). In other words, elections serve as disciplinary stick.

The above conclusion can be used to prescribe welfare maximizing political institutions. High degrees of economic decentralization accompanied by the creation of multiple political jurisdictions ("deepening of democracy", to borrow a phrase from the United Nations Human Development Report (2002) make local politicians more accountable to their lower level constituencies. As a result, the degree of political competition increases, yielding a higher welfare for the population and reducing corruption.

A growing literature, known as the political agency literature, investigates how elections may serve as an appropriate stick. The idea is to treat the voters as principals and the politicians as agents. According to this point of view, rent appropriation by politicians occurs only if there exists imperfect information. Barro (1973) and Ferejohn (1986) developed models of moral hazard where the politicians' effort levels are not observable by voters, and that allow the politicians to capture some rent. Here, the politicians care only for rent and nothing else. In a dynamic sense, it is optimal for the voters to offer a positive rent to the election-seeking politicians in order to avoid higher rent extraction in the current period.

On the other hand, the informational asymmetry may take the form of pure adverse selection and an associated signalling game. Such asymmetries are exploited in the electoral cycle model of Rogoff (1990) and Rogoff and Sibert (1988). Before the elections, the politicians try to signal their competence, and engage in lower rent extraction than post election time period. The role of elections, in such models, is to choose the right type of politicians.

A related strand of literature takes into account both adverse selection and moral hazard. In this strand, there are different types of politicians (like in adverse selection models), and at the same time there exists imperfect information on politicians' action. The role of elections is two fold: choosing the right type of politician and restraining the politicians' rent seeking activity.

A question that naturally arises is the following: how do the voters evaluate the performances of the incumbent politician? While there are a host of models in this regard, one recent strand of literature, known as theory of yardstick competition, finds considerable empirical and theoretical attention. The idea is the following: voters judge the performance of the incumbent using the yardstick of performance of the politician in a neighboring state: i.e. the incumbent must perform well relative to the neighbor. Needless to say, such models are well suited to the environment of multiple jurisdictions, e.g. that of a federation.

The models involving both moral hazard and adverse selection have been successfully applied to such yardstick competition.The ideas of relative evaluation and yardstick competition come from the industrial organisation literature (Shleifer,1985). A major paper that exploits the idea within a political economy framework is Besley and Case (1995), who show, using data on US state elections, that vote seeking and tax setting patterns can be predicted by theory of yardstick competition. Besley and Smart (2001) demonstrate that the effect on voter welfare may be ambiguous. While yardstick competition allows the detection of bad incumbents, it also induces more rent extraction by bad incumbents who are never going to be re-elected. Belleflame and Hindricks (2005) show if the re-election effect is strong, then yardstick competition always disciplines the incumbent as well as provides the desired sorting: so yardstick competition can never go "the wrong way". Ellis, Dincer and Waddel (2005) find evidence that decentralization, by allowing yardstick competition among politicians, reduces corruption.

A problem with such a specification is that politician types are not endogenous. For our purpose, we think the first generation moral hazard modelling has the virtue that a single politician, depending on the situation, can be either good or bad. On the other hand, for the yardstick models involving moral hazards, it requires that the voters (as in second movers in a dynamic game of imperfect information) be able to extract signals from incumbent behavior and judge whether the incumbent is good or bad. This might be placing too much importance on voters. Instead, we assume that given a yardstick voting rule to which the voters commit to, the contest is among neighboring incumbents, that is, the actual policymakers.

The present paper broadly belongs to the first generation models, but assumes that the voting rule uses a yardstick criterion. The incumbent can provide a public good and extract rent, which are financed by imposing a distortionary tax on the population. An incumbent derives utility from rent as well as popularity. The popularity index depends on voters' net welfare and esteem/reputation. Reputation is decreasing in rent appropriation. Under yardstick criterion of performance evaluation, the voting behaviour reflects the fact that higher *relative* rent lowers the popularity index of the incumbent. To contrast the performance of yardstick competition, we use a hypothetical case where the absolute performance is used by the voters to evaluate the politician. This is more prevalent in a unitary country, comprising of one head of the state. On the other hand, yardstick competition is more likely to occur in a federal economy, such as India, Australia, Canada, the USA. However, the scope of application of our model is not limited to federal economies. Within the EU, voters may well use the performance of a neighbouring country as a yardstick: the fact that the Spanish economy recently overtook the Italian one (on the basis of GDP per head) has helped the re-election of the Spanish incumbent government. Our model, however, does not applies to autocracies, where changes of governments do not result from democratic processes.

We demonstrate the possibility that yardstick competition itself fails to restrict rent seeking without assigning an *ex ante* type on the politician. On hindsight, the intuition is the following: the power of judgement is somewhat lost once we use a yardstick criterion. If the politician knows that the voters' judgement is relative, then he has to perform only a "little better" than his neighboring government in order to get re-elected. In equilibrium, there are cases when both of them perform equally bad, and yardstick competition fails to distinguish between them. Thus both the sorting and restraining effect of election may fail.This effect is more acute as we move from perfect to imperfect information environment where the incumbent of a particular province knows his popularity index but not that of the neighboring incumbent. It can be shown that expected rent appropriation under imperfect information is higher than the perfect information case, and is increasing in the noise.

We complement the static setting with a dynamic scenario where each incumbent politician faces an election after a finite, fixed term. The stock of reputation or esteem builds up or decays over time. The incumbent cares for both instantaneous as well as the end-of-term reputation. The idea that an incumbent politician's long-term interest may restrain his short-term opportunistic behaviour has been well explained by Olson (2000) who made a famous comparison between between a roving bandit and a stationary bandit; see also Dalgic and Long (2006). We show that under unitary performance evaluation, dynamic incentives restrain the politician only if the shadow value of reputation (that measures current and future marginal benefits of increased reputation) is sufficiently high throughout the term. For such a high shadow value to exist, benefits of both instantaneous and end-of-period reputations have to be high enough. On the other hand, in comparison to the static case, dynamic incentives imposes more restriction on rent appropriation under relative performance evaluation. The reason is the following. A high shadow value imposes restriction on current rent expropriation. In the case where relative evaluations matter, higher shadow price in one region reduces incentive of rent expropriation in the *other* region as well.

The present work is divided into the following sections. Section 2 describes the basic model. Sections 3 and 4 compare and contrast unitary evaluation criterion with relative criterion under a static setting. Section 5 analyses the dynamic model. Section 6 concludes.

2 A Static Model

Let τ_i be the tax collected from province i, and r_i be the rent that accrues to the government of province i. The amount $(\tau_i - r_i) \equiv g_i$ is used to supply a local public good. The utility function of the voters in province i is

$$W(g_i, \tau_i) = U(g_i) - C(\tau_i)$$

where $U(.)$ is concave and increasing in g_i, and $C(.)$ is convex and increasing in τ_i. The function $C(.)$ includes the cost of forgone consumption of private good, as well as distortionary costs associated with non-lump-sum taxation.

The government's objective function, denoted by G_i, is assumed to be a weighted average of (i) social welfare, (ii) politicians' private benefits from rents, $B(r_i)$, and (iii) the politicians' valuation of the public esteem, denoted by

$$E_i = E_{i0} - \theta_i v_i(r_i)$$

Here $\theta_i v_i(r_i)$ is a measure of the loss of esteem that arises from the public's perception of rent extraction by politicians, and E_{i0} is a constant. The function $v_i(.)$ is strictly convex and increasing in r_i, θ_i is a positive parameter which reflects the degree of sensitivity of the public. The function $B(.)$ is concave and increasing in r_i.

2.1 Unitary state outcome

The provincial government chooses r_i and τ_i to maximize

$$G_i \equiv U(\tau_i - r_i) - C(\tau_i) + B(r_i) + E_{i0} - \theta_i v_i(r_i)$$

It is convenient to decompose this maximization problem into a two-stage problem. In the first stage, for a given r_i, we determine the optimal τ_i, and express this as a function $\tau_i(r_i)$. In the second stage, we determine r_i.

Thus, the first stage problem consists of solving the optimal provision of public good, for a given r_i, i.e.

$$W^*(r_i) \equiv \max_{\tau_i} U(\tau_i - r_i) - C(\tau_i) \tag{1}$$

In the second stage, the government chooses r_i to maximize $G_i = W^*(r_i) + B(r_i) + E_{i0} - \theta_i v_i(r_i)$

The maximization problem (1) yields the first order condition

$$U'(\tau_i - r_i) = C'(\tau_i)$$

from which we obtain the optimal amount of tax as a function of r_i

$$\tau_i = \tau_i(r_i) \tag{2}$$

with

$$0 < \frac{d\tau_i}{dr_i} = \frac{U''}{U'' - C''} < 1 \tag{3}$$

Substituting the function $\tau_i(r_i)$ into (1), we get

$$W^*(r_i) = U(\tau_i(r_i) - r_i) - C(\tau_i(r_i))$$

Applying the envelope theorem, we obtain the derivative of the social welfare function with respect to rents

$$\frac{dW^*(r_i)}{dr_i} = -U'(\tau_i(r_i) - r_i) < 0 \tag{4}$$

The second derivative is

$$\frac{d^2W^*}{dr_i^2} = -U''(\tau_i(r_i) - r_i)\left[\frac{d\tau_i}{dr_i} - 1\right] < 0 \tag{5}$$

This shows that social welfare is concave in r_i.

Now, turning to the second step, we find the optimal rent to be sought by the government. From the government's objective function,

$$G_i = W^*(r_i) + B(r_i) + E_{i0} - \theta_i v_i(r_i)$$

we get the first order condition

$$\frac{dG_i}{dr_i} = W^{*\prime}(r_i) + B'(r_i) - \theta_i v_i'(r_i) = 0 \tag{6}$$

The second order condition is satisfied because $W^*(r_i)$ and $B(r_i)$ are concave in r_i, and $\theta v(r_i)$ is convex in r_i.

$$\frac{d^2G_i}{dr_i^2} = W^{*''}(r_i) + B_i''(r_i) - \theta_i v_i''(r_i) < 0$$

Using (6) and (4), we see that the amount of rent optimally chosen by the government can be depicted by the equation

$$B'(r_i^{opt}) = \theta_i v'(r_i^{opt}) - U'(\tau_i(r_i^{opt}) - r_i^{opt}) \tag{7}$$

The left-hand side of eq (7) is the marginal benefit (MB), and the right-hand side is the marginal cost (MC). Since MB is downward sloping and MC is upward sloping, the optimal rent is uniquely determined. An increase in θ_i will shift the MC curve up, and result in a lower amount of rent sought. This result is stated as Proposition 1 below:

Proposition 1: *Increased voter sensitivity decreases rent seeking.*

Proof: Differentiating the equation (6) to get

$$\left[W^{*''}(r_i) + B_i''(r_i) - \theta_i v_i''(r_i)\right] dr_i - v_i'(r_i) d\theta_i = 0$$

Thus

$$\frac{dr_i}{d\theta_i} = \frac{v_i'(r_i)}{\Delta} < 0$$

where $\Delta \equiv W^{*''}(r_i) + B_i''(r_i) - \theta_i v_i''(r_i) < 0$.

2.2 Relative Evaluation

Now assume that voters in province i cares about the relative performance (in terms of corruption) of government i. Let κ_i be a parameter, where $\kappa_i \in [0,1]$, and define

$$z_i \equiv r_i - \kappa_i r_j$$

We assume the loss of popularity is proportional to the function $v_i(z_i)$:

$$v_i = v_i(r_i - \kappa_i r_j) \equiv v_i(z_i)$$

with $v_i'(z_i) > 0$ and $v_i''(z_i) > 0$. In the polar case where $\kappa_i = 0$, we are back to the absolute performance evaluation of the preceding sub-section. We will focus on the other polar case, where $\kappa_i = 1$; it is convenient to think of this polar case as the limiting case where κ_i tends to 1 from below.

Given r_j, the provincial government i chooses r_i and τ_i to maximize

$$G_i \equiv U(\tau_i - r_i) - C(\tau_i) + B(r_i) + E_{i0} - \theta_i v_i(r_i - \kappa_i r_j)$$

Again, for any given r_i, the choice of τ_i must maximize $U(\tau_i - r_i) - C(\tau_i)$. So we obtain the function $\tau_i = \tau_i(r_i)$, exactly as before. Thus

$$G_i = W^*(r_i) + B(r_i) + E_{i0} - \theta_i v_i(r_i - \kappa_i r_j)$$

The first order condition is

$$\frac{dG_i}{dr_i} = W^{*\prime}(r_i) + B_i'(r_i) - \theta_i v_i'(r_i - \kappa_i r_j) = 0 \tag{8}$$

The second order condition is

$$W^{*''}(r_i) + B_i''(r_i) - \theta_i v_i''(r_i - \kappa_i r_j) < 0$$

which is satisfied because of the concavity of $W^*(r_i)$ and of $B(r_i)$ and the convexity of $v_i(z_i)$.

Equation (8) implicitly defines the reaction function

$$r_i = R_i(r_j; \kappa_i, \theta_i)$$

where κ_i and θ_i are regarded as parameters. The slope of the reaction function $R_i(r_j; \kappa_i, \theta_i)$ can be obtained by applying the implicit function theorem to the following equation

$$F^{(i)}(r_i, r_j; \kappa_i, \theta_i) \equiv W^{*\prime}(r_i) + B_i'(r_i) - \theta_i v_i'(r_i - \kappa_i r_j) = 0 \tag{9}$$

We now show that the reaction function is upward sloping, i.e., r_i and r_j are *strategic complements:*

$$\frac{dr_i}{dr_j} = \frac{\frac{\partial F^{(i)}}{\partial r_j}}{\frac{\partial F^{(i)}}{\partial r_i}} = \frac{\kappa_i \theta_i v_i''(z_i)}{\theta_i v_i''(z_i) + \Omega(r_i)} > 0 \text{ if } \kappa_i > 0$$

where

$$\Omega(r_i) \equiv \left[-W^{*''}(r_i) - B''(r_i)\right] > 0$$

Since

$$0 \leq \frac{\kappa_i \theta_i v_i''(z_i)}{\theta_i v_i''(z_i)} \leq 1$$

and $\theta_i v_i''(z_i) + \Omega(r_i) > \theta_i v_i''(z_i)$, the slope of the reaction function is positive and strictly less than 1 if and only if $\kappa_i \in (0, 1]$.

A similar analysis applies to government j's reaction function $r_j = R_j(r_i; \kappa_j, \theta_j)$.The intersection of the two reaction curves determines a unique Nash equilibrium (r_i^N, r_j^N). It is a stable equilibrium, because the condition $-1 < \left(\frac{\partial R_i}{\partial r_j}\right)\left(\frac{\partial R_j}{\partial r_i}\right) < 1$ is satisfied.

Unlike the unitary case, the voter sensitivity in one region affects the equilibrium rent extraction in both provinces.

Proposition 2: *Increased voter sensitivity in one region reduces rent-seeking in both regions if κ_i and κ_j are positive.*

Proof:

First, from (9) we can show that an increase in θ_i will shift the reaction curve down (i.e., for any given r_j, an increase in θ_i will decrease r_i):

$$\frac{\partial R_i}{\partial \theta_i} = -\frac{\frac{\partial F^{(i)}}{\partial \theta_i}}{\frac{\partial F^{(i)}}{\partial r_i}} = \frac{-v_i'}{\theta_i v_i''(z_i) + \Omega(r_i)} < 0 \tag{10}$$

Now, write the Nash equilibrium equations as

$$r_1^N - R_1(r_2^N, \kappa_1, \theta_1) = 0 \tag{11}$$

$$r_2^N - R_2(r_1^N, \kappa_2, \theta_2) = 0 \tag{12}$$

Then

$$\begin{bmatrix} 1 & -\frac{\partial R_1}{\partial r_2^N} \\ -\frac{\partial R_2}{\partial r_1^N} & 1 \end{bmatrix} \begin{bmatrix} dr_1^N \\ dr_2^N \end{bmatrix} = \begin{bmatrix} \frac{\partial R_1}{\partial \theta_1} & 0 \\ 0 & \frac{\partial R_2}{\partial \theta_2} \end{bmatrix} \begin{bmatrix} d\theta_1 \\ d\theta_2 \end{bmatrix}$$

The determinant of the matrix is

$$D = 1 - \left(\frac{\partial R_1}{\partial r_2}\right)\left(\frac{\partial R_2}{\partial r_1}\right) > 0$$

Thus

$$\frac{dr_1^N}{d\theta_1} = \frac{\frac{\partial R_1}{\partial \theta_1}}{D} < 0$$

$$\frac{dr_2^N}{d\theta_1} = \frac{\frac{\partial R_2}{\partial r_1^N}\frac{\partial R_1}{\partial \theta_1}}{D} < 0$$

2.3 Comparison of rents under relative evaluation and under unitary evaluation

Let us focus in the case where the parameters are the same for both provinces. We have seen above that (r_1^N, r_2^N) depends on κ_1 and κ_2. Under unitary evaluation, $\kappa_1 = \kappa_2 = 0$. Under symmetric relative evaluation, $\kappa_1 = \kappa_2 = \kappa > 0$. We consider the effect of a change from $\kappa = 0$ to $\kappa = 1$. If starting from any $\kappa \in (0, 1)$, a small increase in κ always increase (r_i^N, r_j^N) then we can conclude that a discrete jump from $\kappa = 0$ to $\kappa = 1$ results in more rent seeking.

Proposition 3: *Relative performance evaluation always generates more rent.*

Proof: From (11) and (12),

$$\begin{bmatrix} 1 & -\frac{\partial R_1}{\partial r_2^N} \\ -\frac{\partial R_2}{\partial r_1^N} & 1 \end{bmatrix} \begin{bmatrix} dr_1^N \\ dr_2^N \end{bmatrix} = \begin{bmatrix} \frac{\partial R_1}{\partial \kappa_1} & 0 \\ 0 & \frac{\partial R_2}{\partial \kappa_2} \end{bmatrix} \begin{bmatrix} d\kappa_1 \\ d\kappa_2 \end{bmatrix}$$

Setting $d\kappa_1 = d\kappa_2 = d\kappa$, we find that

$$\frac{dr_1^N}{d\kappa} = \frac{\frac{\partial R_1}{\partial \kappa}}{D} > 0$$

If we look at voters' welfare W, then $\dfrac{dW_i}{d\kappa} = -U_i'(\tau_i - r_i^N)\dfrac{dr_1^N}{d\kappa} < 0$.In other words, increased κ reduces voters' welfare.

Remark: The intuition behind proposition 3 is as follows. The incumbent knows that the voters' judgement is relative: he has to perform only a "little better" than his neighboring government in order to get re-elected. In equilibrium, there are cases when both of them perform equally bad, and yardstick competition fails to distinguish between them. Thus both the sorting and restraining effect of election may fail.

3 Dynamic Rent Appropriation

So far, we have seen that relative performance evaluation may lose its ability to restrict politicians if the provinces are symmetric in 'punishment'. Now we want to see if the same results apply if the incumbent of region i operates over a time horizon of $[0, T]$. We show that dynamic considerations make the relative evaluation criterion better than the static case in terms of restraining the politician, even if the provinces are otherwise symmetric.

Every T years, there is an election. The chance that the incumbent is re-elected depends on the stock of esteem the electorate has for him at that time. This stock is denoted by $S_i(t)$. (We avoid the notation I_i because of the possible confusion between flow and stock). Let ρ_i be the discount factor of the incumbent politician. He wishes to maximize

$$\int_0^T e^{-\rho_i t}\left[B(r_i) + \omega_i S_i(t)\right] dt + e^{-\rho_i T}\phi(S_i(T))$$

where $\phi(S_i(T))$ is the politician's perceived expected value of his remaining political life and ω_i refers to the weight that the politician puts on the current stock of reputation.

The stock of esteem/reputation changes over time according to the following dynamic equation

$$\dot{S}_i(t) = U(\tau_i(t) - r_i(t)) - C(\tau_i(t)) - \theta_i v_i(r_i(t), r_j(t))$$

where $S_i(0)$ is given and the incumbent chooses $S_i(T)$.

3.1 Unitary State

In this case, r_j does not appear in the function v_i. For simplicity, we assume the linear functional form for ϕ :

$$\phi(S_i(T)) = \sigma_i S_i(T) \text{ where } \sigma > 0.$$

Let μ_i be the co-state variable associated with the state variable S_i.The Hamiltonian is

$$H = B(r_i) + \omega S_i + \mu_i \left[U(\tau_i - r_i) - C(\tau_i) - \theta_i v(r_i)\right]$$

The necessary conditions are

$$\frac{\partial H}{\partial \tau_i} = \mu_i \left[U'(\tau_i - r_i) - C'(\tau_i)\right] = 0 \tag{13}$$

$$\frac{\partial H}{\partial r_i} = B'(r_i) - \mu_i \left[U'(\tau_i - r_i) + \theta_i v'(r_i)\right] = 0 \tag{14}$$

$$\dot{\mu}_i = \rho_i \mu_i - \omega_i \tag{15}$$

$$\mu_i(T) = \sigma_i \tag{16}$$

Equation (16) is the transversality condition. It says that the shadow price μ_i at the terminal date T must be equal to the marginal contribution of $S_i(T)$ to the salvage value function $\phi(S_i)$.The linear differential equation (15), together with the transversality condition (16) uniquely determine the optimal time path of the co-state variable (shadow price) $\mu_i(t)$. Integrating (15), we get

$$\mu_i(t) = \frac{\omega_i}{\rho_i} + A_i e^{\rho_i t} \tag{17}$$

where A_i is the constant of integration which can be determined by setting $t = T$ in equation (17):

$$\mu_i(T) = \frac{\omega_i}{\rho_i} + A_i e^{\rho_i T}$$

From this equation and (16) we solve for A_i

$$A_i = \left(\sigma_i - \frac{\omega_i}{\rho_i}\right) e^{-\rho_i T}$$

The optimal time path of the shadow price is then

$$\mu_i^*(t) = \frac{\omega_i}{\rho_i} + \left(\sigma_i - \frac{\omega_i}{\rho_i}\right) e^{-\rho_i(T-t_i)} = \frac{\omega_i}{\rho_i}\left[1 - e^{-\rho_i(T-t_i)}\right] + \sigma_i e^{-\rho_i(T-t_i)} > 0 \tag{18}$$

It follows that the shadow price is always positive. Its rate of change is

$$\frac{d\mu_{i*}}{dt} = \rho_i \left(\sigma_i - \frac{\omega_i}{\rho_i}\right) e^{-\rho_i(T-t_i)}$$

which is positive if $\rho_i \sigma_i > \omega_i$ and negative if $\rho_i \sigma_i < \omega_i$.

We now determine the time path of rent $r_i(t)$. From equation (13) we can express $\tau_i(t)$ as a function of $r_i(t)$, independently of the value of μ_i :

$$\tau(t) = \tau(r_i(t)) \tag{19}$$

where

$$0 < \tau_i'(r_i) = \frac{U''}{U'' - C''} < 1 \tag{20}$$

Equations (19) and (20) are exactly the same as equations (2) and (3) of the static section. Substituting (19) into equation (14) we get

$$B'(r_i) - \mu_i^* \left[U'(\tau_i(r_i) - r_i) + \theta_i v'(r_i)\right] = 0 \tag{21}$$

Equation (21) shows that the optimal $r_i(t)$ is a function of the optimal shadow price $\mu_i^*(t)$ which was found in eq (18). Differentiating (21) with respect to time, we get

$$\{B''(r_i) - \mu_i^* \left[\theta v''(r_i) + U''(g_i)(1 - \tau_i'(r_i))\right]\} \frac{dr_i}{dt} = \left[U'(\tau_i(r_i) - r_i) + \theta_i v'(r_i)\right] \frac{d\mu^*}{dt} \tag{22}$$

In view of the inequality (20), the expression inside the curly brackets {...} is negative. Hence we deduce from equation (22) that $r_i(t)$ is increasing over time if and only if $\mu^*(t)$ is decreasing over time, i.e. if and only if $\rho_i \sigma_i < \omega_i$.

Comparing equation (21) with the equation (7) of the static case, we see that dynamic rent is lower than static rent if and only if μ^* is greater than 1.

Clearly, if $\mu^*(T) > 1$ (i.e. $\sigma_i > 1$) and $\mu^*(t)$ is a decreasing function of t, i.e., $\rho_i < \omega_i/\sigma_i$, then , $\mu^*(t) > 1$ for all $t \leq T$. We thus obtain the following result:

Proposition 4: *Under the unitary case, if (i) the politician attaches a high terminal value σ_i per unit of esteem, (ii) he is patient (i.e. ρ_i is small), and (iii) the weight attached to instantaneous esteem is high, then dynamic incentive restricts the politician vis-à-vis the static case.*

3.2 Relative Evaluation

Under relative evaluation, the equation of motion becomes

$$\dot{S}_i = U(\tau_i - r_i) - C(\tau_i) - \theta_i v_i(r_i - \kappa_i r_j)$$

Since the rate of change in the stock of esteem S_i depends not only on r_i but also on r_j, the optimal time path of rent extraction by one provincial government depends on what it expects the the rent extraction path of the neighboring government will be. Thus the two provincial governments are engaged in a differential game. (See Dockner et al. (2000) for a comprehensive treatment of differential games, with many applications in economics.) The optimality conditions are then, for $i = 1, 2$,

$$\frac{\partial H}{\partial \tau_i} = \mu_i \left[U'(\tau_i - r_i) - C'(\tau_i)\right] = 0 \tag{23}$$

$$\frac{\partial H}{\partial r_i} = B'(r_i) - \mu_i \left[U'(\tau_i - r_i) + \theta_i v_i'(r_i - \kappa_i r_j)\right] = 0 \text{ for } j \neq i \tag{24}$$

$$\dot{\mu}_i = \rho_i \mu_i - \omega_i$$

$$\mu_i(T) = \sigma_i$$

Again, we can solve for the optimal time path of the shadow prices:

$$\mu_i(t) = \frac{\omega_i}{\rho_i} + \left(\sigma_i - \frac{\omega_i}{\rho_i}\right) e^{-\rho_i(T-t)} \text{ for } i = 1, 2 \tag{25}$$

Use (23) to express τ_i as function of r_i (independent of μ_i), and substitute into (24) to get

$$B'(r_i) - \mu_i \left[U'(\tau_i(r_i) - r_i) + \theta_i v_i'(r_i - \kappa_i r_j)\right] = 0 \text{ for } j \neq i \tag{26}$$

This equation yields the reaction function

$$r_i = R_i\left(r_j; \mu_i, \kappa_i\right) \tag{27}$$

with derivative dr_i/dr_j given by

$$\left\{B''(r_i) - \mu_i U''\left[\tau_i' - 1\right] - \mu_i \theta_i v_i''\right\} dr_i + \kappa_i \mu_i \theta_i v_i'' dr_j = 0$$

Thus, if $\kappa_i \neq 0$

$$1 > \frac{dr_i}{dr_j} = \frac{\partial R_i}{\partial r_j} = \frac{\kappa_i \mu_i \theta_i v_i''}{\mu_i \theta_i v_i'' + \left[\mu_i(\tau_i' - 1)U'' - B_i''\right]} > 0.$$

Thus the rents are complements, as before.

Note that

$$\frac{\partial R_i}{\partial \mu_i} = -\frac{\theta_i v_i'}{\mu_i \theta_i v_i'' + \left[\mu_i(\tau_i' - 1)U'' - B_i''\right]} < 0$$

The intersection of the two reaction functions $r_i = R_i\left(r_j; \mu_i, \kappa_i\right)$ and $r_i = R_j(r_i, \mu_j, \kappa_j)$ determines the rents obtained at time t when we substitute the value for $\mu_i(t)$ and $\mu_j(t)$ from equation (25).

Now let us show how an increase in σ_j (hence an increase in $\mu_j(t)$) affects the equilibrium rents at time t in all provinces. Using equation (27), we write the system of equations

$$r_1^N(t) - R_1(r_2^N(t), \mu_1(t), \kappa_1) = 0$$

$$r_2^N(t) - R_2(r_1^N(t), \mu_2(t), \kappa_2) = 0$$

Holding $\mu_1(t)$ constant, differentiate the system with respect to $\mu_2(t)$:

$$\begin{bmatrix} 1 & -\frac{\partial R_1}{\partial r_2^N} \\ -\frac{\partial R_2}{\partial r_1^N} & 1 \end{bmatrix} \begin{bmatrix} \frac{dr_1^N}{d\mu_2} \\ \frac{dr_2^N}{d\mu_2} \end{bmatrix} = \begin{bmatrix} 0 \\ \frac{\partial R_2}{\partial \mu_2} \end{bmatrix}$$

Hence

$$\frac{dr_1^N}{d\mu_2} = \frac{1}{\Delta} \frac{\partial R_2}{\partial \mu_2} < 0$$

where

$$\Delta \equiv 1 - \frac{\partial R_2}{\partial r_1^N} \frac{\partial R_1}{\partial r_2^N} > 0$$

Thus we have proved the following proposition.

Proposition 5: *The higher is the neighboring incumbent's shadow value of esteem ($\mu_j(t)$), the lower is $r_i(t)$ in province i.*

4 Conclusion

In this paper, we analyzed the extent to which elections can make a politician benevolent. We assume that politicians provide a local public good to their constituency and appropriate some rent. The public good and the rent are financed by taxing the local populace. The tax imposes distortion cost on the local populace. If the politicians appropriate rent, they are likely to lose their reputation. What is crucial here is how the electorate views politicians' performance. Depending on the electorates' institutional structure, there are two possibilities. It may be the case that politicians' absolute performance matters: this is the case for unitary electorate, e.g. a nation, or when information about the neighboring electorate is costly. On the other hand, the voters may compare the incumbent's performance with that of the neighboring electorate's incumbent. This is more prominent within a federal country or a confederation of countries (such as E.U.), where such information is readily available. We discussed the conditions under which a unitary criterion does strictly better than a relative criterion. We found that when performance evaluation depends on the difference between rents, the unitary criterion (that closely mimics the corresponding relative criterion) does strictly better than the relative criterion. However, introduction of dynamic considerations imposes more restrictions on the politicians, through the shadow price effect, under the relative evaluation than unitary performance evaluation.

We would like to mention some areas to which the current research may be extended. The first issue is theoretical in nature. In the present paper, the public good is a flow, but often there exist public goods which exhibit dynamic build-up over time. If politicians' reputation depends on both public good and rent, a 'stock' public good may allow for more rent diversion.

Second, the following testable hypotheses emerge, which can be evaluated using real world data:

(a) In a democracy where elections are *very* frequent (such that, at the limit, the decision making process degenerates into a static setting), incumbents may be less honest than in a country where the incumbents are appointed for a longer term.

(b) Within countries where the incumbents are appointed for a longer term (i.e. dynamic considerations matter), politicians in a federal country (where the voters employ relative performance evaluation) are likely to be more honest than their unitary-nation counterparts.

Thus there exists a challenging agenda for future research.

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