DOCUMENT DE RECHERCHE

EPEE

CENTRE D'ETUDE DES POLITIQUES ECONOMIQUES DE L'UNIVERSITÉ D'EVRY

Time Consistency and Dynamic Democracy

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01 – 06

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This paper analyses how democratic institutions can help mitigate time inconsistency problems. We illustrate the ideas in a simple model of capital taxation. Voters delegate policy decisions to a politician and employ a retrospective voting rule to hold the elected politician accountable for its policy actions while in office. We show that non-expropriating tax policies can be sustained in Markov Perfect Equilibrium. If voters elect politicians that care enough about power or if they are willing to pay politicians a sufficiently high wage, capital is not expropriated in equilibrium.

Keywords: Performance voting, capital taxation, time consistency.
JEL classification: H21; D72

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‡We would like to thank the ESRC for financial research support and Jayasri Dutta, Martin Daunton and Vania Sena for many helpful comments and suggestions. We have also benefied from comments from the participants in seminars at University of Birmingham.

1 Introduction

The path-breaking paper by Kydland and Prescott (1977) made the importance of time consistency in economic policy clear. As is now well-known, the time inconsistency problem arises when the policymaker's *ex ante* and *ex post* incentives are not the same, i.e., when the policymaker wants to change his mind once decision makers in the private sector have undertaken certain actions. Realizing this *ex ante*, the decision makers in the private sector adopt their behavior. This adaptation usually results in a loss of social welfare and moves the economy from a second to a third best. Following the lead by Kydland and Prescott (1977), a substantial literature investigating how societies can and do deal with such problems has emerged. Examples include the idea of delegation of monetary policy to a conservative central banker (Rogoff, 1985; Lohmann, 1992); reputation effects (Barro, 1986); and self-enforcing social norms (Kotlikoff, Persson, and Svensson, 1988).

This paper is concerned with the time inconsistency problem in a dynamic democracy and argues that the democratic institution can, at least partly, solve the problem. By a dynamic democracy, we understand a set of institutions that facilitates repeated democratic elections where voters elect representatives using majority rule. We focus on two key properties of a dynamic democracy. First, voters elect politicians who implement policies on their behalf. Politicians are, in general, unable to commit themselves to a particular policy plan at times of election and so, voters and, more generally, decision makers in the private sector, expect politicians to act in their self-interest once in office. Voters can and do, however, respond to the *observed* behavior of the politician and thereby seek to protect their economic interests via political mobilization. In particular, they can elect politicians on the understanding that they will only be reelected if they perform up to a certain standard during their current tenure (i.e., they can use an implicit incentive contract). The idea that voters hold politicians accountable for actions taken when in office has received considerable empirical support (see, e.g., Lewis-Beck, 1988; Nannestad and Paldam, 1994) and the theory of performance voting has been developed by Barro (1973), Ferejohn (1986), Austen-Smith and Banks (1989), Reed (1994) and Persson et al. (1997) among others. Second, politicians care about holding political office. They do so for many reasons. One is that they like the power and prestige that come with political office for its own sake. Another is that political office can provide earning potential that compares favorably with private sector

alternatives. Voters can exploit the politicians' desire for political office to promote efficient economic policies.

We develop this argument formally in a simple model of capital taxation. The capital levy problem is well-known (see, e.g., Fischer, 1980; Benhabib and Rustichini, 1997). We formulate a model in which the politician has an incentive to tax capital heavily after investments have been sunk in order to increase the provision of a public good. Households realize this *ex ante* and reduce investments to inefficiently low levels. However, since the households are also voters, they have an incentive to use their political power to protect themselves against expropriation. They do so by holding politicians accountable for their policy actions and, in particular, by voting them out of office if they "overtax" capital. In Markov Perfect Equilibrium, we show that the performance standard is credible and so, households invest based on the belief that the capital tax is going to be set according to the standard and the politician finds it optimal to implement the required policy *ex post* as well as *ex ante*. In setting the standard, voters trade-off two effects. On the one hand, if they set a standard that is too tough, the politician is tempted to forgo the value of holding office in the future and to expropriate the capital stock today. On the other hand, if they set a standard that is too soft, the politician would be willing to reduce the capital tax further (toward the second best) but does not do so as he can increase the tax rate to the level specified by the standard without jeopardizing reelection prospects. We show that voters, in general, are able to move the economy away from the third best toward the second best. In particular, we show that voters can implement the second best capital tax if they elect politicians who value power sufficiently or if they are willing to paying politicians a sufficiently high salary. The analysis, therefore, demonstrates that a dynamic democracy can by an appropriate choice of stick and carrot solve the capital levy problem – and other time inconsistency problems that arise where voters delegate decisions to elected representatives.

The rest of this paper is organized as follows. In section 2, we provide a brief literature review. In section 3, we develop a simple model of capital taxation. The model has the minimum properties needed to formalize our argument and is chosen for transparency. The argument itself is much more general than the model suggests. As a benchmark, we show (Proposition 1) that a politician with life-time tenure *and* power to commit tax rates would want to tax capital income but not expropriate it completely. Without commitment power, the politician wants to expropriate capital completely with

disastrous consequences for social welfare. In section 4, voters mobilize to protect themselves against expropriation. They set performance standards that terminate the tenure of a politician if he or she perform below expectations. We prove formally that performance voting in a dynamic democracy can solve the capital levy problem (Proposition 2). In section 5, we analyze the effectiveness of voter control (Proposition 3). In section 6, we discuss how societies provide incentives by offering a wage to elected politicians. In section 7, we conclude with a discussion of unresolved issues.

2 The Literature

Before turning to the formal analysis, we briefly relate the present paper to the branches of the literature on which it builds. First, the fact that democratic institutions can mitigate time inconsistency problems has been pointed out previously in the literature. To our knowledge, however, this paper is the first to analyze the role played by performance voting in a dynamic democracy.

Persson and Tabellini (1994) show that delegation of decision making power in a representative democracy can provide a solution to the capital levy problem in a two-period median voter model. They show that the median voter wants to delegate decision making power to a "conservative" politician because that provides insurance against expropriation of capital. The logic is this. The median voter realizes that by electing a politician with similar preferences as herself, the elected politician will, after investments have been made, have an incentive to tax capital at a higher rate than the median voter would have preferred *ex ante*. Hence, by electing a representative with a stronger dislike for capital taxation than herself, the median voter can reassure investors that the capital tax *ex post* will be equal to the second best capital tax that the median voter would have liked to implement if she could have committed to a particular tax structure *ex ante*.

While our model is also based on the notion that voters delegate decision making power to politicians in a representative democracy, the role of delegation is fundamentally different. In our model, voters use the fact that elections can be used to hold elected politicians *accountable* for their policy choices. The election is, thus, similar to an implicit incentive contract and voting becomes retrospective, i.e., based on past performance of politicians. This mechanism is effective in providing protection against ex-

propriation when politicians value public office and have a sufficiently long time horizon. Hence, instead of allowing the median voter to delegate decision making power to an individual with a stronger aversion towards capital taxation (than the median voter himself), voters, in our model, exploit the fact that politicians like to be reelected. An implication of this is that our mechanism does not require heterogeneity among voters to be effective. It is the fact that individuals once elected enjoy being in power that is the driving force.

Another key difference to Persson and Tabellini is the role of elections in providing commitment power. Persson and Tabellini make use of the commitment power that arises naturally in a representative democracy because voters cannot change their minds until the next election. Although the median voter would like to elect another representative once all investments have been made, she cannot do so immediately and so, is (until the next election) "committed" to support the choice of politician made before investments were sunk. An implication of this, acknowledged by Persson and Tabellini, is that delegation to a more "conservative" policymaker is only successful in solving the capital levy problem if investments are made after the relevant election. Our model does not make use of this type of commitment. In fact, the only type of commitment required is that associated with the democratic institution itself: voters can and do elect and reelect politicians in a sequence of democratic elections holding them accountable for observed behavior.

Garfinkel and Lee (2000) analyze the role of lobby groups in solving the capital levy problem. They argue that individuals with a high stake in capital taxation have an incentive to form lobby groups in order to protect themselves against high capital taxes. The lobby groups "bribe" the government to tax capital more lightly by providing, say, campaign finance. This mechanism – based on mobilization of the potential victims of expropriation – can partly solve the capital levy problem. Our model shares the idea that the potential victims are going to take political action to prevent expropriation. However, in our model, the potential victims voice their concern via democratic elections, while in Garfinkel and Lee's model influence or lobbying activities is what provides voice. Garfinkel and Lee use the common agency model – developed by Bernheim and Whinston (1986) and popularized in political economics by Grossman and Helpman (1994) – to show their point. This implies that they assume that the lobby groups can commit to particular contribution functions and promise to pay specific sums of money depending on the policy being implemented. Without exogenous commit-

ment power these contribution schedules are not time consistent. Therefore, while Garfinkel and Lee, on the one hand, argue that politicians cannot commit to particular policies, they, on the other, endow the lobby groups with substantial commitment power.

Second, our paper also builds on ideas developed in the literature on incentive contracts for central banks (Persson and Tabellini, 1993; Walsh, 1995). This literature analyses how politicians can provide incentives for central bankers by means of an appropriately designed wage contract and/or a dismissal rule. By employing the idea of performance voting – developed by Barro (1973) and Ferejohn (1986) and others – we analyze how *voters* by means of a dismissal rule can provide incentives for *politicians*. The literature on incentive contracts has be criticized by, for example, McCallum (1995). He points out that the question of who enforces the incentive contract shifts the commitment problem from one layer to another. While this critique is relevant to our model as well as to the literature on performance voting more generally, it is less serious because the commitment power needed to enforce performance voting rules is embodied in the democratic institution itself and written into the constitution. Once voters have decide on a rule, they cannot do better than following it in the next election.

Finally, our paper has links to the literature on repeated games as well. Chari and Kehoe (1990) show how the use of *history dependent* policy and allocation plans in an infinite horizon version of the Fischer (1980) model can help sustain non-expropriating capital tax policies including, if the discount rate is sufficiently large, the Ramsey rule. This line of reasoning is based on the idea that the politician wants to protect his reputation for not expropriating capital because if he lost it (by, say, unexpectedly expropriating capital), private agents would expect expropriation to take place in every period thereafter. Our approach is different. We focus on Markov strategies and so, we do not allow voters to base their expectations on the payoff irrelevant parts of the history of the game. Instead we allow voters to punish politicians by throwing them out off office and, to the extent that politicians like being in office, this is what help sustain non-expropriating capital tax policies. Moreover, our approach complements that of Chari and Kehoe by supplying institutional details describing how agents in the private sector can discipline politicians via political mobilization in a dynamic economy.

3 The Model

We consider an economy that is populated by a continuum of identical, infinitely-lived households with measure L. The economy has two productive sectors. The C-sector is perfectly competitive and produces a consumption good. The concumption good can be used for private (c_t) or public (g_t) consumption. The consumption good (y_t) is produced by means of a linear technology using human capital accumulated by households in the previous period (k_{t-1}) as the only input

$$y_t = Rk_{t-1}, \tag{1}$$

where $R > 0$ is the (constant) marginal product of capital. The I-sector is a household sector that produces human capital by means of a linear (private) technology using *effort* (l_t) as the only input. In each period, the investment in human capital per household is

$$I_t = l_t. \tag{2}$$

We assume that human capital (k_t) depreciates fully after one period ($k_t = I_t$). That is, each new generation of a household dynasty needs to accumulate its own human capital. In period 0, $k_0 > 0$ is given.

In period t, each household rents its human capital to firms and receives capital income, Rk_{t-1} in return. The government levies a proportional tax, $\tau_t \in [0, 1]$, on capital income. After-tax capital income is $(1 - \tau_t) Rk_{t-1}$. The household spends this on private consumption goods:

$$c_t = (1 - \tau_t) Rk_{t-1}. \tag{3}$$

The tax revenue, $L\tau_t Rk_{t-1}$, is used, by the government, to produce public consumption

$$Lg_t = L\tau_t Rk_{t-1}, \tag{4}$$

where g_t is public consumption per household. Each household derives utility from private and public consumption and disutility from exterting effort to accumulate human capital. The per-period utility function is assumed to take the following form

$$u(c_t, g_t, l_t) = c_t - l_t^{1+\chi}/(1 + \chi) + \gamma g_t, \tag{5}$$

where $\chi > 1$ and $\gamma > 0$ indicates the importance of public consumption relative to private consumption.

For a given sequence of actual and expected taxes, $\{\tau_t\}_{t=1}^{\infty}$ and $\{\tau_t^e\}_{t=1}^{\infty}$, each household maximizes $\sum_{t=0}^{\infty} \beta^t u(c_t, g_t, l_t)$, where $\beta \in (0,1)$ is the discount factor, subject to the constraints given by equations (2), (3) and $(c_t, k_t, l_t) \geq 0$ for all t. The solution to this optimization problem and the associated level of public consumption per household are given by

$$c_t(\tau_t, \tau_t^e) = R(1-\tau_t)\left[\beta R(1-\tau_t^e)\right]^{\frac{1}{\chi}}; \tag{6}$$

$$l_t(\tau_{t+1}^e) = \left[\beta R\left(1-\tau_{t+1}^e\right)\right]^{\frac{1}{\chi}}; \tag{7}$$

$$g_t(\tau_t, \tau_t^e) = \tau_t R\left[\beta R(1-\tau_t^e)\right]^{\frac{1}{\chi}}. \tag{8}$$

Due to the simple structure of the model, the effort decision in period t is based on expectations about the tax rate that will prevail in period $t+1$, denoted τ_{t+1}^e, only. It is convenient to define the following indirect utility function:

$$U(\tau_t, \tau_t^e) \equiv u(\tau_t, \tau_t^e) - \frac{l_{t-1}(\tau_t^e)^{1+\chi}}{\beta(1+\chi)}, \tag{9}$$

where

$$u(\tau_t, \tau_t^e) \equiv c_t(\tau_t, \tau_t^e) + \gamma g_t(\tau_t, \tau_t^e). \tag{10}$$

The function $U(\tau_t, \tau_t^e)$ shows how the indirect utility of a household is affected by the actual tax rate implemented and the tax rate expected to prevail in period t. The latter determines the effort invested in human capital accumulation in period $t-1$ and so, the tax base in period t. It is important to notice that the two-sector structure of the model in conjunction with the assumption of full depreciation imply that the model can be analyzed as a sequence of two-period models.

Before we turn to the analysis of performance voting and capital taxation in a dynamic democracy, we characterize, as a benchmark, the tax policy chosen by a politician with *life-time tenure* i) when he *can* commit (the second best) and ii) when he *cannot* commit (the third best) to a particular tax policy. The objective of the politician is to maximize the welfare of a representative household.[1]

[1] One easily verifies that if lump-sum taxation is possible, then (for $\gamma > 1$) the first best allocation is $c_t^{fb} = 0$, $l_t^{fb} = (\gamma\beta R)^{\frac{1}{\chi}}$, $g_t = \gamma^{\frac{1}{\chi}} (\beta R)^{\frac{1+\chi}{\chi}}$.

Proposition 1 *Let $\gamma > 1$. The second best tax policy is stationary and given by*

$$\tau^{sb} = \frac{(\gamma - 1)\chi}{(\gamma - 1)\chi + \gamma} \in (0, 1). \tag{11}$$

The third best (time consistent) tax policy is stationary and given by

$$\tau^{tb} = 1. \tag{12}$$

Proof. With commitment power, the second best tax problem is

$$\max_{(\tau_t)_{t=0}^{\infty}} \sum_{t=0}^{\infty} \beta^t U(\tau_t, \tau_t^e). \tag{13}$$

subject to equations (6)-(8) and the commitment technology ($\tau_t = \tau_t^e$). This reduces to $\tau^{sb} = \arg\max_\tau U(\tau, \tau)$ with the solutions given above. Without commitment power, the third best tax problem is to solve equation (13) subject to equations (6)-(8) taking τ_t^e as given. This reduces to solving $\tau^{tb} = \arg\max_\tau \{1 + \tau(\gamma - 1)\}$ with the solutions given above. ■

In the (unrealistic) case where the politician can commit tax policy, the (second best) tax rate is positive, but less than one. The politician trades off the negative effect of capital taxation on investment with the welfare gain associated with higher public consumption ($\gamma > 1$). The second best tax rate is increasing in the valuation of public consumption (γ). As γ tends to 1^+, τ^{sb} tends to zero and when γ goes to infinite, τ^{sb} goes to $\chi/(1+\chi)$ – the value of τ that maximizes the (per-period) tax revenue. Lack of commitment power has disastrous consequences for economic welfare as an excessive capital tax ($\tau^{tb} = 1$), which discourages investment altogether, is being levied. This is the capital levy problem: after the private sector has undertaken its investments, taxing the capital stock is no longer distortionary and so, the politician has an incentive ($\gamma > 1$) to increase the tax on capital income to augment the supply of public consumption. Realizing this incentive *ex ante*, the private sector reduces its investment to inefficiently low levels ($l_t = 0$) and $c_t = g_t = 0$ for all t. Welfare is reduced from $W(\tau^{sb}) = \sum_{t=0}^{\infty} \beta^t U\left(\tau^{sb}, \tau^{sb}\right) > 0$ to zero.[2]

[2] If $\gamma \leq 1$, the capital levy problem does not arise because the politician has no incentive to tax capital income to provide public consumption. Therefore, $\tau^{sb} = \tau^{tb} = 0$.

4 Capital Taxation with Performance Voting

In most modern democracies, the tax rate on capital income is relatively modest and has been decreasing since World War II in the UK and the US (Dutta, Sefton and Weale, 1998; Hettich and Winer, 1999, chapter 7). This suggests that democratic institutions in one way or the other have resolved the capital levy problem and provided a workable substitute for the lack of policy-specific commitment power. As discussed in section 2, this idea has previously been investigated by Persson and Tabellini (1994) and Garfinkel and Lee (2000). Here we propose an alternative model of dynamic democracy that can help us understand how the capital levy problem is solved in a democratic society.

4.1 Political Equilibrium

Our model is based on two important features of political decision making in a dynamic democracy. First, voters delegate decision making power to elected politicians, who cannot commit to policy actions at election times. Voters can and do respond to observed behavior of a politician and try to protect themselves against expropriation by electing politicians on the understanding that they will only be reelected if they perform up to a certain standard during their current tenure. Hence, the cornerstone of our model is the idea of performance voting. The theory of performance voting in dynamic democracies has been developed by Barro (1973), Ferejohn (1986), Austen-Smith and Banks (1989), Reed (1994) and Persson et al. (1997). Formally, there is an election at the beginning of each period. The incumbent politician runs at the beginning of each period against a challenger, and the majority rule determines whether he is reelected for another term. Voters would like to elect a politician who would implement the second best tax policy in every period. To this end, they set a performance standard, τ_t^s, immediately after the election in period $t-1$ and let the newly elected (or reelected) politician know that he is only reelected in the election held in period t if he implements a policy, τ_t^I, that is found satisfactory compared to the set standard.

Second, politicians care about holding office. They do so for many reasons. Here, we focus on one particular reason and return to some others in section 6. We assume that politicians like power for its own sake – a factor that we call m for megalomania and refer to as the ego-rent. The idea is that the mere fact of holding office gives the politician pleasure. In addition, we

assume that an elected politician continues his private sector activities while in office.[3] A politician's per-period utility is thus given by

$$m + u(\tau_t, \tau_t^e) - \frac{l_t(\tau_{t+1}^e)^{1+\chi}}{1+\chi}. \tag{14}$$

It is clear that the m-factor gives the politician a desire to be re-elected, and this is what allows voters to influence policy choices. Although m is likely to vary across individuals, we shall retain, for simplicity, the assumption that m is the same for all individuals. Politicians discount the future at the same rate as households.

We can now define the game between the elected politician and voters – the dynamic democracy – more specifically. Politicians are drawn from the pool of households. A voting strategy is a performance standard $\tau_t^s \in [0,1]$ and a vote function, where $\eta(\tau_t^I, \tau_t^s)$ indicates whether or not the incumbent is reelected. An implementation strategy of the incumbent is a policy rule that maps every performance standard into a policy implementation (τ_t^I). The timing of events is illustrated in Figure 1.

At the outset of each period, the incumbent politician implements a policy (τ_{t-1}^I). This is observed by voters who in the upcoming election compare the implemented policy with the performance standard set after the previous election (τ_{t-1}^s). If the politician satisfies the requirements, he is reelected; otherwise the challenger enters office.[4] Immediately after the election in period $t-1$, the performance standard for the election in period t is set and announced publicly. Next, households form expectations about the policy to be implemented at the beginning of period t (τ_t^e) and undertake investments (l_{t-1}). At the beginning of period t, the elected politician implements the policy, τ_t^I, and a new election is held where voters hold the politician accountable for his policy implementation according to the standard (τ_t^s). After that the sequence of events repeats itself.

Following Coates and Morris (1999), we define political equilibrium as Markov Perfect Equilibrium. A Markov Perfect Equilibrium path is a sequence of capital tax implementations, performance standards and voting

[3] If we think of the unit of analysis as a household, then this basically means that the politician continues to care about the welfare of the household to which he belongs after having entered political office.

[4] Challengers play no active role in the model. They are important only because they serve as substitutes for the incumbent. The value of holding office must be sufficiently high to ensure positive supply of office-seeking challengers. This is true whenever $m > 0$.

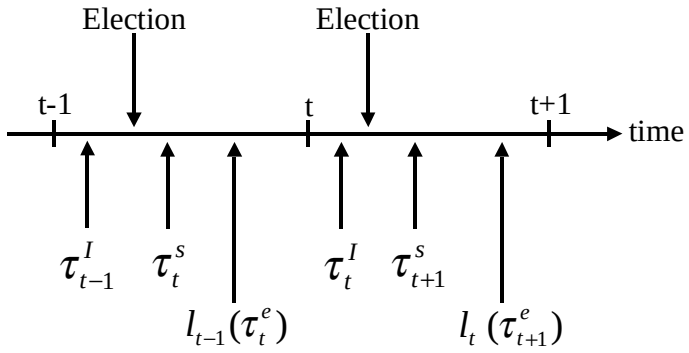

Figure 1: The timing of events

outcomes which are best responses to each other. In Proposition 2, we show that the unique (pure-strategy) Markov Perfect Equilibrium of the model is stationary and may implement the second best tax policy.

Proposition 2 *(Equilibrium with performance voting) A stationary Markov Perfect Equilibrium exists and is characterized by the following voting and implementation strategies. The voting strategy is*

$$\eta(\tau, \tau^s) = 1 \text{ iff } \tau \leq \tau^s, \tag{15}$$

$$\eta(\tau, \tau^s) = 0 \text{ iff } \tau > \tau^s, \tag{16}$$

where the performance standard (τ^s) is defined by

$$\tau^s = \max\left\{\tau^{sb}, \min_{\tau}\left[\frac{\beta m}{1-\beta} - \phi(\tau) \geq 0\right]\right\} \tag{17}$$

with $\phi(\tau) \equiv u(1,\tau) - u(\tau,\tau)$. The implementation strategy followed by the incumbent is

$$\tau^I = \tau^s \tag{18}$$

and the incumbent is reelected every period.

Proof. First, we show that the implementation strategy is a best response to the voting strategy. If the incumbent politician plays according to (18), he will get reelected every period. The incumbent has an incentive to increase the tax rate up to τ^s and this is anticipated by the households. Hence, we can write the payoff associated with equilibrium play as

$$u(\tau^s, \tau^s) + m + \frac{\beta\left(U\left(\tau^s, \tau^s\right) + m\right)}{1-\beta}. \tag{19}$$

If the incumbent decides to deviate from the specified strategy and play some $\tau > \tau^s$, he is voted out of office and returns to the private sector. The payoff associated with this is

$$\max_{\tau} \left\{ u(\tau, \tau^s) + m + \beta \sum_{i=0}^{\infty} \beta^i (U\left(\tau^s, \tau^s\right) \right\} \quad \text{s.t. } \tau > \tau^s. \tag{20}$$

The households expected to see τ^s implemented during the (final) tenure of the deviating incumbent and have invested accordingly. Hence, any $\tau > \tau^s$ is unexpected. The continuation payoff is not affected by the deviation because the current incumbent is voted out of office and a new politician, who is expected to play according to the proposed equilibrium strategy, is elected. The incumbent wants to deviate to $\tau^I = 1$ and so, the payoff can be written as

$$u(1, \tau^s) + m + \frac{\beta U\left(\tau^s, \tau^s\right)}{1-\beta}. \tag{21}$$

Combining equations (19) and (21), the incumbent will play according to the candidate equilibrium strategy, i.e., $\tau^I = \tau^s$, if and only if

$$\frac{\beta m}{1-\beta} - \phi(\tau^s) \geq 0, \tag{22}$$

where $\phi(\tau^s) \equiv U(1, \tau^s) - U(\tau^s, \tau^s) = u(1, \tau^s) - u(\tau^s, \tau^s)$. We notice that the function $\phi(\tau)$ has the following properties i) $\phi(0) > 0$; ii) $\phi(1) = 0$; and iii) $\frac{\partial \phi(.)}{\partial \tau} < 0$ for all $\tau \in [0, 1]$. We refer to equation (22) as the participation constraint and to $\phi(\tau^s)$ as the value of the deviation.

Second, we show that the voting strategy is a best response to the implementation strategy. Voters design the performance standard to solve the following problem:

$$\max_{\tau} \frac{U(\tau, \tau)}{1-\beta} \tag{23}$$

subject to equation (22). The Lagrangian is

$$L = \frac{U(\tau,\tau)}{1-\beta} + \lambda\left[-\phi(\tau) + \frac{\beta m}{1-\beta}\right]. \tag{24}$$

The K-T conditions (ignoring non-negativity constraints) are

$$\frac{\partial L}{\partial \tau} = \frac{1}{1-\beta}\frac{\partial U(\tau,\tau)}{\partial \tau} + \lambda\frac{\partial \phi(\tau)}{\partial \tau} = 0, \tag{25}$$

$$\frac{\partial L}{\partial \lambda} = -\phi(\tau) + \frac{\beta m}{1-\beta} \geq 0, \tag{26}$$

$$\frac{\partial L}{\partial \lambda}\lambda = 0. \tag{27}$$

If $\lambda = 0$ (the participation constraint is not binding), it follows from equation (25) that

$$\overline{\tau}^s = \tau^{sb}. \tag{28}$$

If $\lambda > 0$ (the participation constraint is binding), we notice that $\tau^s > \tau^{sb}$ because $\frac{\partial L}{\partial \tau} \mid_{\tau^{sb}} = -\lambda\frac{\partial U(1,\tau^{sb})}{\partial \tau} > 0$. Moreover, the performance standard is designed to satisfy $\frac{\partial L}{\partial \lambda} = 0$ and so,

$$\underline{\tau}^s = \arg\min_{\tau}\left[\frac{\beta m}{1-\beta} - \phi(\tau) \geq 0\right], \tag{29}$$

where $\frac{\beta m}{1-\beta} > 0 \Rightarrow \underline{\tau}^s < 1$. Combing equations (28) and (29) yields equation (17).

Third, we notice that the equilibrium voting strategy (weakly) dominates any other voting strategy. This implies that the voters have no (strict) incentive to deviate from the announced performance standard at the election day and vote an incumbent that played according to the equilibrium implementation strategy out of office or keep an incumbent that deviated ■

The Proposition is illustrated in Figure 2. Democratic elections and voter control are effective in reducing the equilibrium capital tax rate below the third best level whenever politicians value the future ($\beta > 0$) and derive utility from being in power ($m > 0$) and may implement the second best tax (a point we return to in the next section). The intuition is straight forward.

The elected politician faces the temptation to increase the capital tax to 1 after the election in order to exploit that investments have already been sunk. This temptation is, however, balanced against the desire to stay in office in order to earn the ego-rent in the future. Voters take advantage of this fact and set a performance standard that requires the incumbent to reduce the capital tax in order to be reelected. In doing so, the voters reason as follows. If they set a too tough performance standard, then the politician is tempted to forgo the future ego-rent and to tax away current capital completely. If, on the other hand, they set a too soft performance standard, the politician would be willing to reduce the tax rate further but does not do so as he can increase the tax to the level specified by the standard without jeopardizing the reelection prospect. The optimal performance standard insures that the incumbent is indifferent between, on the one hand, complying with the standard and getting reelected and, on the other, not complying, implementing the third best capital tax and being voted out of office. The private sector realizes that the politician will, in equilibrium, stick to the standard and so, base their investment decisions on this.

Finally, we notice that the performance standard is credible in the sense that voters have no incentive to change their minds. They cannot do better in the election at the end of a politician's tenure than sticking to the standard they announced at the beginning of his tenure. This implies that the solution to the capital levy problem provided by a dynamic democracy assumes little more in terms of commitment power than what is embodied in the democratic institution itself.[5]

5 The Effectiveness of Voter Control

Proposition 2 shows that the political equilibrium *can* sustain and implement for ever, the second best capital tax. To gain more information about when this happens, Proposition 3 examines how the effectiveness of voter control relates to the structural parameters of the economy, m, β, R, and γ.

[5]It is clear that we assume that voters can coordinate on a particular preformance standard. In addition, we make the assumption that voters, as a group, act as a strategic player. This implies that they coordinate on the best possible performance standard. If voters act non-strategically – a case which could be treated along the lines of Chari and Kehoe (1990) – they might not be able to coordinate on the best possible standard.

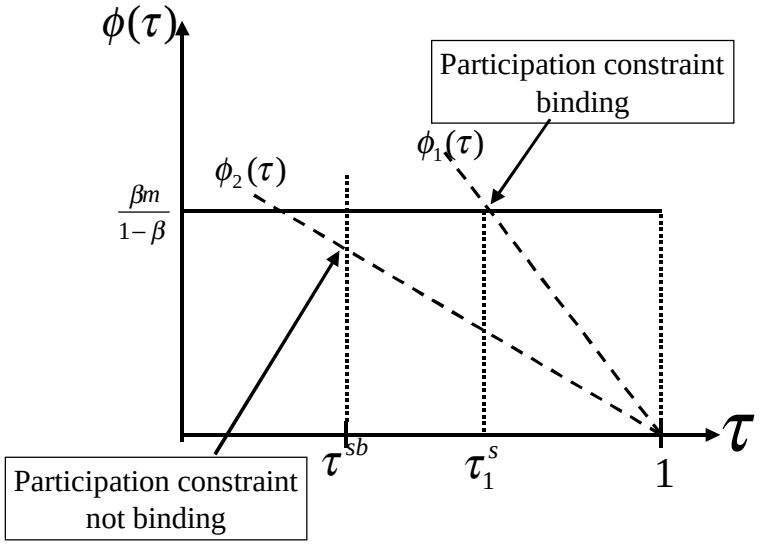

Figure 2: The Political Equilibrium

Proposition 3 *Define* $v = \frac{\beta^{1-\frac{1}{\chi}} m}{1-\beta} > 0$, *and let* $R > 0$ *and* $\gamma > 1$. *Then there exists a cut-off function,* $\overline{v}(R, \gamma) > 0$, *such that for* $v \geq \overline{v}(.)$, *the second best capital tax is always implemented in a dynamic democracy. Moreover,* $\frac{\partial \overline{v}}{\partial R} > 0$ *and* $\frac{\partial \overline{v}}{\partial \gamma} > 0$ *for* $R > 0$.

Proof. Write the participation constraint given by equation (22) as $v \geq (\gamma - 1)R^{1+\frac{1}{\chi}}[1 - \tau^S]^{1+\frac{1}{\chi}}$. Fix $R > 0$ and $\gamma > 1$ and define $\overline{v}(R, \gamma) = (\gamma - 1)R^{1+\frac{1}{\chi}}[1 - \tau^{sb}(\gamma)]^{1+\frac{1}{\chi}} > 0$, where $\tau^{sb}(\gamma)$ is defined by equation (11). Clearly, for $v \geq \overline{v}(.)$, $\tau^s = \tau^{sb}(\gamma)$. We notice that $\frac{\partial \overline{v}}{\partial R} > 0$, $\frac{\partial^2 \overline{v}}{\partial R^2} > 0$, $\overline{v}(0, \gamma) = 0$, and $\lim_{R \to \infty} \overline{v}(R, \gamma) = \infty$. In addition,

$$\frac{\partial \overline{v}}{\partial \gamma} = R^{1+\frac{1}{\chi}}[1 - \tau^{sb}(\gamma)]^{1+\frac{1}{\chi}} \left\{ 1 - \frac{\gamma - 1}{\gamma(\gamma - 1)\chi + \gamma^2} \right\} > 0 \tag{30}$$

as $\gamma^2 - \gamma + \frac{1}{1+\chi} > 0$ for $\gamma > 1$ ■

The Proposition is illustrated in Figure 3, which shows the cut-off function, $\overline{v}(.)$, as a function of R for given γ. We make a distinction between two regimes. In regime 1, the economy is located above the cut-off function and

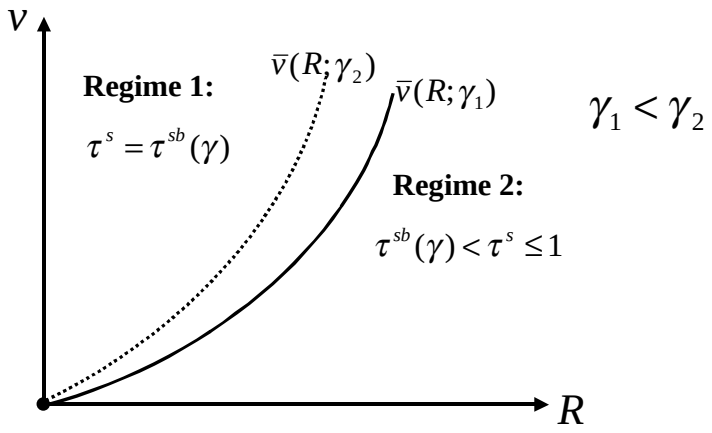

Figure 3: Voter control in political equilibrium

the second best capital tax is sustainable in equilibrium. This happens when the ego-rent and/or the discount rate are relatively large and/or the return to investment is small. The intuition is as follows. When the elected politician cares a lot about power and values the future, the short-term temptation to expropriate capital is relatively modest compared to the gain of holding on to power. Voters can, therefore, ask for a lot in order to reelect the politician. At one level this can be interpreted as an alternative version of the Folk Theorem: For a sufficiently high valuation of political office ($\frac{\beta m}{1-\beta}$), the second best tax rate can be sustained as a Markov Perfect Equilibrium.

In regime 2, the economy is located below the cut-off function and, although voters can, in general, get the politician to reduce the capital tax below 1, they cannot get him to implement the second best. The equilibrium tax rate is given by

$$\tau^s(v, R, \gamma) = 1 - \left[\frac{v}{(\gamma - 1) R^{1+\frac{1}{\chi}}}\right]^{\frac{\chi}{1+\chi}}. \tag{31}$$

It is easy to see that the difference between the equilibrium tax and the second best tax is decreasing in v and increasing in R and that the equilibrium tax

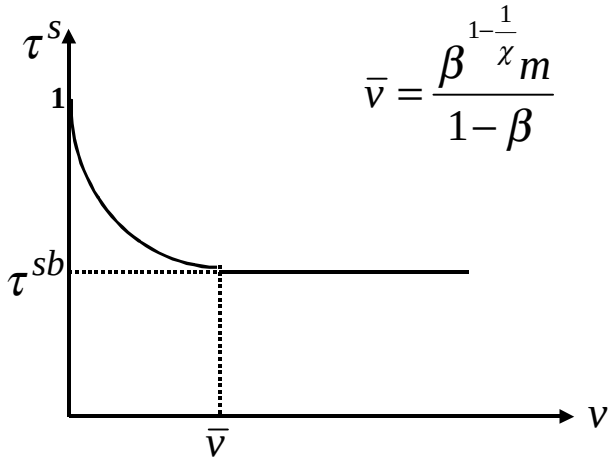

Figure 4: Equilibrium taxation and m and β.

is equal to the third best when $v = 0$ or $R \to \infty$. Although, it is harder to control politicians in societies in which the return to investment is large, an increase in R still has a beneficial impact on welfare as the negative welfare effect of a higher equilibrium tax rate is more than offset by the positive welfare effect of greater productivity. The relationship between v and the equilibrium capital tax is (for given $\gamma > 1$ and $R > 0$) shown in Figure 4, and the relationship between R and the equilibrium tax is (for $\gamma > 1$ and $v > 0$) shown in Figure 5. $\overline{R}$ is defined implicitly by $v = v(\overline{R}, \gamma)$

The degree of voter control also depends on the valuation of public consumption. An increase in γ has two effects. It makes it harder for voters to control the politician because the temptation to expropriate capital is increasing in γ. This is illustrated in Figure 3 where an increase in γ shifts $\overline{v}(R;\gamma)$ up (to the dotted line). This implies that a higher value of v or a lower value of R is required to implement the second best. The second effect is that the second best tax itself increases. It is, therefore, not clear that the difference between the equilibrium tax and the second best tax – in regime 2 – is increasing in γ.

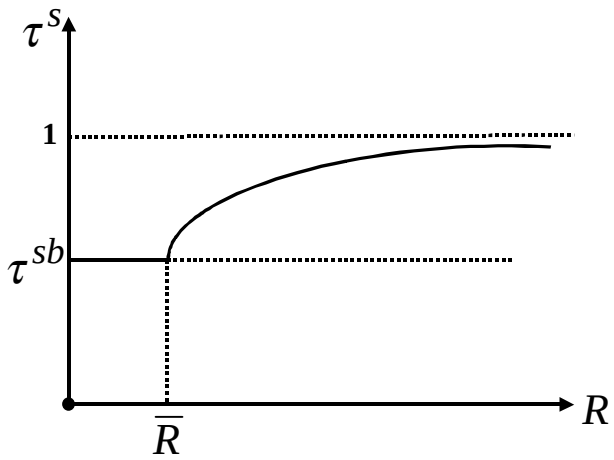

Figure 5: Equilibrium taxation and the real interest rate

6 Positive Rewards and Capital Taxation

The performance standard employed by voters is similar to an *implicit* incentive contract. It terminates the tenure of a politician if performance is too poor. This type of contract has power because politicians value the power and prestige that comes with public office. Politicians, typically care about public office for additional reasons as well. First, political office may be rewarded with an official wage (Barro, 1973). Second, holding political office may provide the platform from which politicians can generate substantial unofficial incomes, either in the form of bribes or other types of resource diversion (Persson et al., 1997; Aidt and Dutta, 2000). As opposite to the ego-rent, these factors can to some extent be controlled by the electoral and they may want to design the rewards of public office to promote accountability and provide insurance against expropriation.

To illustrate these ideas suppose that voters can commit to pay the politician a wage rate ω every period. The wage rate is decided on once and for all

at the beginning of the game using the unanimity rule.[6,7] Since the official wage has much the same impact on the political equilibrium as m, it is clear from Proposition 2 that voters can achieve better outcomes by agreeing to pay a wage to the elected politician. Doing so is, however, costly and the question is if voters would be willing to make the sacrifice required to implement the second best capital tax. To investigate this possibility in more detail, we assume that part of the revenue generated by taxing capital is used to finance a separate wage, w, to the politician:

$$w = \begin{cases} \overline{w} & \text{if } L\tau_t R k_{t-1} - \overline{w} > 0 \\ 0 & \text{if not} \end{cases}, \tag{32}$$

where $\overline{w}$ is the wage rate committed to at the beginning of the game. Public consumption per household becomes $g_t = \max\left\{\tau_t R k_{t-1} - \frac{\overline{w}}{L}, 0\right\}$. Note that the cost of a higher wage is a reduction of public consumption per household and that the equilibrium tax rate is (weakly) decreasing in $\overline{w}$. Voters are willing to pay a wage rate that solves the capital levy problem altogether if the population is large enough. A sufficient condition (which assumes that $m = 0$) is

$$L > \frac{\gamma(\gamma-1)(1-\beta)(1+\chi)}{\beta(1+\chi-\beta)}. \tag{33}$$

The cost of solving the problem is, in part, small because there are many voters which can share the burden and in societies where political office carries a large ego-rent, the cost per household can be trivial. It is important to notice, however, that even in very large societies it is crucial that politicians value the future ($\beta > 0$). If they do not, voters lose all control. With this proviso, we see that the combination of the stick (performance voting) and the carrot (a high wage) can be a powerful tool in solving time inconsistency problems.[8]

[6] The later assumption makes this line of reasoning subject to the critique that we are shifting the commitment problem from the policy implementation stage to a "constitutional" stage (see, e.g., McCallum, 1995).

[7] Notice that we do not consider the situation in which politicians can make the official wage contingent on performance or politicians can grant themselves pay increases.

[8] See also Persson and Tabellini (1993) and Walsh (1995).

7 Conclusion

This paper shows how performance voting in a dynamic democracy can solve the capital levy problem and, in principle, be a solution to other time inconsistency problems that arise when voters delegate decision making power to elected politicians. Our model is extremely simple, has many limitations and leaves important issues for future research. Below we discuss some of these.

- Our analysis is based on the idea that politicians value the future. If politicians face no future, voters are unable to control performance and high capital taxes result. Term limits, for example, reduce politicians time horizon and create a "last period" problem (see Barro, 1973). To the extent that politicians are to be identified with political parties this problem can, however, be overcome (see Alesina and Spear, 1988). This suggests that societies with less well-developed party systems and formal term limits will, *ceteris paribus*, have a tendency to resort to expropriating means of taxation.

- In societies where the democratic institution is not fully developed, politicians can, by rigging elections in various ways, avoid being voted out of office in response to poor performance. Formally, this corresponds to situations in which the vote strategy has a lower bound, i.e., $min\ \eta(.) > 0$, and suggests that societies with less well-developed democratic institutions will, *ceteris paribus*, have a tendency to resort to expropriating means of taxation.

- Politicians are all the same in our model. In reality, politicians differ in many ways and some personal characteristics makes for better leaders than others. This is captured in our model by the m-factor. Clearly, voters would like to elect and reelect leaders with a high m-factor since that would enable them to control the leader better. In a world with good and bad leaders, voters may want to search for good leaders (see Banks and Sundaram, 1993). This induces political instability and, at least initially until a good leaders is found, excessively high capital taxes.

- Our model assumes that all voters have the same preferences and that they can (unanimously) agree to a particular performance standard. When voters are heterogenous, they, however, face a more complicated

coordination problem. If voters use individual performance standards (ego-tropic voting), this reduces the scope for performance voting (Ferejohn, 1986). If, however, voters base their vote decision on some aggregate performance measure (socio-tropic voting), our results are robust to the introduction of voter heterogeneity.

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