Policy Myopia and Economic Growth*

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Abstract

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Keywords: Myopia; growth; public goods; electoral accountability.

JEL Classification: D72; D82.

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Abstract

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1 Introduction

Are democratic governments likely to be short-termist in their policies? Should rational voters tolerate, or even expect their elected representatives to behave myopically? This paper develops a theory of second best policy myopia to answer some of these questions. Policy myopia arises when rational voters set performance standards that allow elected politicians to distort the portfolio of public investments towards short-term investments.

An early, and eloquent argument that systematic under-investment led to "public squalor" in the midst of private prosperity was made by Galbraith (1969). Since then, the growth of government expenditures has been a striking feature of most industrial democracies. As Tanzi and Schuknecht (2000: Table I.1) document, general government expenditure as a percentage of GDP grew from 28% in 1960 to about 43% in 1980 in 17 industrial countries with comparable expenditure data and has stabilized at that level since. It would seem, at first pass, that the rumors of public squalor were grossly exaggerated. The fact that governments grew rapidly does not say very much about whether they are too large or too small or whether government spending has the wrong composition, however. One might nevertheless be tempted to deduce that the extent of under-investment has fallen in the decades following 1960. That deduction would be false; the rapid growth of government since 1960 is due almost entirely to increases in transfer payments, including unemployment benefits, pensions, and producers' subsidies (Tanzi and Schuknecht, 2000: Table II.4). These transfers can be thought of as taxes paid back to the private sector; the remaining tax revenue is available for the production of public goods and investments, possibly spread over time by borrowing. Transfers are one of several methods of redistribution; earlier in the century, governments of these countries often invested in health, education, and housing for redistribution purposes (Lindert, 1994; Aidt et al. 2005). These require long-term investment, so that the move to transfers starting in the 1930s and accelerating in 1960s and 1970s may be a sign of myopia. A related piece of evidence of under-investment in public services comes from comparing patterns of public expenditure across the world today. In Table 1, we report the results of cross-country regressions for a sample of about 80 countries in 1996, looking for the correlations between a measure of democratic accountability (*voice*) and central government expenditures on three difference categories.[1] We distinguish between transfer payments ($\frac{TR}{Y}$) measured as spending on social security and welfare; expenditures on public goods ($\frac{PG}{Y}$) measured as spending on goods and services; and spending on long-term public goods ($\frac{LPG}{Y}$) measured as capital expenditures, all relative to GDP (Y). We include a number of other likely determinants of government expenditure in the regression: real GDP per capita at international prices ($\frac{GDP}{CAP}$); the proportion of the population aged above 65 (*old*); the size of the total population (*pop*); a measure of openness to trade (*open*), suggested by Rodrik (1998), and a control for the overall size of government (total tax revenues out of GDP, $\frac{T}{Y}$). We find that *voice* increases spending on transfers, but more surprisingly that it reduces expenditures on public goods, both short-term and long-term public goods.[2] The first result is to be

[1] The Data Appendix contains detailed information on i) the measure of democratic control (voice), which has been constructed by a research team at the World Bank and is documented in Kauffman et al. (1999); ii) the other variables used in the regression analysis; and iii) the robustness of the regression results to changes in specification and to the choice of sample size.

[2] Lassen (2000) reports that societies with more (or better) democratic voice tend to have larger gov-

expected, as pressures to redistribute are more likely to be effective if governments are more responsive to their constituents (Meltzer and Richard, 1981). The second – that more democratic societies spend *less* on public goods – is more of a puzzle and is surely a pointer to policy myopia.[3]

The purpose of this paper is to present a theory of under-investment in public goods. Under-investment is, of course, relative to some norm. In the analysis, we compare investment patterns of democratic governments to dynamically efficient paths chosen by a benevolent planner. For a positive theory of public expenditures, the benevolent planner is a myth. Nevertheless, any such positive theory should explain systematic departures from efficiency. In a representative democracy, one might ask why would the electorate elect, and re-elect governments pursuing myopic policies? To rephrase the question, are there circumstances where rational voters cannot do better than to accept short-termism, that is, can policy myopia be constrained efficient? Do we expect to observe changes in second-best myopia over time in a growing economy?

In our theory, politicians in power can generate rents for themselves by diversion of tax revenues as in Persson et al. (1997). This alone does not induce myopic behavior because politicians can divert funds from all forms of public spending. In a democracy, the electorate can limit wasteful public spending by setting performance standards for what is required to gain reelection (Ferejohn, 1986). The problem, however, is that the electorate can only observe the level of actual output. By comparing this with reported inputs, they can deduce the extent of waste, and dismiss politicians who have diverted too much. For this reason, politicians are careful where they "steal" from; they are more likely

ernments as measured by total tax revenues raised by general government (as a proportion of GDP). He argues that this may be so because rational voters are willing to trust their politicians with more funds in societies where elections provide a more effective accountable mechanism.

[3] The data on spending on public services and on capital investments includes military spending. The negative correlation is, however, not driven by differences in spending on this category. Using spending on education, health, housing, and general public services, but excluding spending on public order, as the measure of investments in public services gives rise to similar results. It is, however, true that societies with low democratic voice tend to spend relatively large amounts on public order, including the military.

to be caught diverting funds from short-term projects, as outcomes are observed more or less at the same time as expenditures. Longer term projects – that take 5 or 10 years to mature – are safer to "steal" from, as the politician may be able to convince voters to reelect him in intermediate elections. Voters, of course, realize this, and we might expect them *deliberately* to ask politicians to be myopic in the sense of providing a portfolio of public goods with an over-emphasis on short-term public projects. We use the term *policy myopia* to refer to situations in which this happen.

Our analysis demonstrates that second best policy myopia is not an inevitable implication of the fact that voters cannot observe immediately how much their politicians divert from investments in long-term public projects; rather it is the interaction between observation lags, economic growth and binding revenue constraints that forces rational voters to accept a short-term bias in public spending. We demonstrate in Proposition 1 that second best policy myopia is absent in economies that operate below their tax capacity. In such economies, rational voters can use electoral incentives effectively to eliminate any short-term bias in public spending. More importantly, we demonstrate in Proposition 2 that this is not true in economies that have reached the limits of their tax capacity but continue to experience economic growth. In such economies, rational voters deliberately ask their politicians to be myopic and, as a consequence, public spending is biased against long-term investments. We stress that when policy myopia arises in our theory, it is constrained efficient: voters cannot do better that accepting the short-term bias in public spending. An implication of the analysis is that as societies develop and government involvement in the economy expands, policy choices become more myopic: societies grow myopic over time. We would therefore expect to observe policy myopia more often in "mature" societies that operate at the limits of their tax capacity. We argue that growth in government and policy myopia are closely related social phenomena.

Myopic policies can, of course, take many forms and arise for many other reasons than those considered in this paper and there is a large literarture on the subject. Some induce "short horizons" for the private sector, because of profits taxation, or industrial regulation that increases the cost of entry for new firms (Parente and Prescott, 2000). Governments may borrow "too much", especially when they are likely to lose elections for other reasons and want to change the constraint set of future politicians (Persson and Svensson, 1989, Alesina and Tabellini, 1990). Policies may "overreact" to current events, and become costly to reverse when the environment changes, as in reforming funding patterns of social security during a stock-market boom, or introducing capital controls in the wake of currency crises, and inefficient policies may be allowed to persist (Coate and Morris, 1999). A short-term bias can also arise when governments try to please voters before elections (Nordhaus, 1975). Although rational voters should be able to see through such strategies, imperfect information about the policy environment or the intentions of politicians can lead to similar inefficiencies (Rogoff, 1990; Coate and Morris, 1995). Contractual imperfections that prevent current majorities from writing contracts with future ones can be an additional source of under-investment in public goods in a representative democracy (Leblanc et al., 2000). Gersbach (2004) shows in a study related to our's that voters cannot motivate politicians with a low discount rate to invest in long-term public projects and argues that incentive contracts can eliminate this problem. In our analysis, voters and politicians have the same discount rate, and we show how myopia is generated by the interaction between economic and political factors. A final source of policy myopia is political uncertainty or instability. Darby et al. (2004), for example, show how this may induce incumbent governments to bias the portfolio of spending away from investments towards current consumption because they realize that they may not be in office when the investments yield fruits.

The rest of the paper is organized as follows. In section 2, we present the theoretical model. In section 3, we characterize sequences of incentive compatible performance standards. In section 4, we derive the main results and discuss the sources of policy myopia operating in our model. In section 5, we discuss some implications of our theory that sug-

Dep. variable	$\log(\frac{TR}{Y})$	$\log(\frac{PG}{Y})$	$\log(\frac{LPG}{Y})$
voice	$1.40^{\#}$ (.81)	-1.00^{**} (.37)	-1.70^{**} (.55)
$\log(\frac{GDP}{CAP})$	.17 (.16)	-.04 (.06)	$-.19^{*}$ (0.08)
old	4.80^{**} (1.54)	-1.33 (.85)	-.54 (1.43)
$\log(pop)$	-0.06 (0.06)	$-.14^{**}$ (.03)	$-.09^{\#}$ (.05)
$\log(\frac{T}{Y})$	1.65^{**} (.28)	$.99^{**}$ (.17)	.28 (.23)
$\log(open)$	$-.34^{*}$ (.16)	-.10 (.11)	.18 (.14)
R^2	.75	.59	.42
N	68	81	80
Note: ** = significant at the 1% level; * = significant at the 5% level; # = significant at the 10% level. Robust standard errors in parenthesis. All regressions estimated with OLS and constant term. See Appendix for data sources.			

Table 1: Regression Results

gest a close link between growth in the size of government and policy myopia. In section 6, we provide some concluding remarks and a discussion of the role credit constraints. Some proofs and derivations are contained in the Appendix.

2 The Model

The model has a continuum of infinitely lived and identical individuals with measure 1. Individuals work, consume private and public goods, and vote in elections. Their preferences are

$$\sum_{t=0}^{\infty} \beta^t (c_t + y_{1,t} + y_{2,t}) \tag{1}$$

where c_t is consumption of private goods, $y_{1,t}$ and $y_{2,t}$ are provision levels of two public goods, and $\beta \in (0,1]$ is the discount factor. Every period individuals can decide to work either in the market or in the home production sector. In the market sector, individuals earn the wage rate $w_t = a_t$, where a_t is productivity. The wage income is taxed at the rate τ_t, so net income is $a_t - \tau_t$. In the home production sector, productivity is lower than in the market sector, but earnings can be hidden from tax collectors. The gross (and net) earnings are θa_t with $\theta < 1$. All income, net of taxes, is spent on private consumption:

$$c_t = \max[a_t - \tau_t, \theta a_t]. \tag{2}$$

Individuals decide to work in the market sector if, and only if $a_t - \tau_t \geq \theta a_t$. An implication then is that taxes are paid only if $\tau_t \leq a_t(1-\theta) \equiv \mathcal{T}_t$. Thus, $\mathcal{T}_t$ defines the *revenue constraint* of the economy at time t. Productivity grows over time, due to technological progress:

$$a_t = a_0(1+g)^t \tag{3}$$

with $g \geq 0$ and $a_0 = 1$. We notice that $\mathcal{T}_t$ increases over time, in line with productivity, as does national income, $Y_t = w_t$.

Individuals elect a politician each period to run the government. The official task of the elected politician is to collect taxes, $\tau_t \leq \mathcal{T}_t$, and to produce public goods, $y_{1,t}$ and $y_{2,t}$. These goods are non-rival, and the entire population consumes $y_{1,t}$ and $y_{2,t}$ as available. The expenditures on public goods are financed out of current tax revenue. The two public goods are produced by the following production technologies

$$y_{1,t} = b_t x_{1,t}^{\alpha}, \tag{4}$$

and

$$y_{2,t} = b_t x_{2,t-1}^{\alpha}, \tag{5}$$

where $x_{1,t}$ and $x_{2,t-1}$ are public investments and $\alpha \in (0,1)$.[4] Productivity growth in the public sector evolves according to

$$b_t = a_t^{\pi} \tag{6}$$

[4] The functional forms are introduced to simplify the calculations. The simplification is not critical for our main results. What is important is that production of public goods displays decreasing returns.

where $\pi \geq 0$ determines the relative speed by which improvements take place in the public relative to the private sector. If π is less than one, productivity growth in the public sector lags behind that of the private sector and vice versa.[5]

We make two fundamental assumptions about the production of public goods. First, individuals cannot observe the investments made by the politician directly, but they will eventually be able to infer how much was invested in each good from observed provision levels. Second, it takes time for investments to mature and turn into actual provision, but the lag is not equally long for all public services. We make a distinction between good 1 (y_1) which is a *short-term* public good and good 2 (y_2) which is a *long-term* public good.[6] Investments in the short-term public good leads to immediate provision of services. Individuals can therefore infer from $y_{1,t}$ how much was invested in this good in period t. Investments in the long-term public good, on the other hand, leads to provision only with a time lag. As a consequence, individuals cannot infer how much was invested in this good until later when they observe the provision levels generated by past investments.[7] Specifically, we assume that it takes one period for the investment to mature, and the provision of y_2 at time t is then determined by the investment made at time $t-1$.[8]

Once elected, the politician has an incentive to exploit public office to divert public funds away from spending on public goods, either because doing so benefits him personally or because it benefits a very narrow constituency of his.[9] The "rent" generated by diverting

[5] To insure that discounted utility is bounded, we need to assume that $\max\{\beta(1+g), \beta(1+g)^{\pi}\} \leq 1$.

[6] In reality, not all public services fall neatly into these two categories and in many cases, classification is a matter of degree. Nevertheless, public spending on transfers and social security mostly falls into the category "short-term public goods", while spending on education, health, and public capital would mostly be spending on long-term public goods.

[7] A related problem, discussed by Ferejohn (1999), arises when the task undertaken by the politician can only be observed via a noisy signal. What we have in mind is something different, namely that voters can eventually observe perfectly the consequences of past policy decisions, but only after some time have passed.

[8] The one-period lag is introduced for convenience. What really matters is that the output of long-term public goods is observed less often than elections.

[9] This formulation of the conflict of interest between voters and politicians is due to Persson et al. (1997) and used extensively in Persson and Tabellini (2000). It should be understood as a metaphor for the more general phenomenon that politicians can divert their efforts towards activities that are not in

public funds is called z_t and corresponds to the difference between current revenues and expenditures:

$$z_t = \tau_t - x_{1,t} - x_{2,t}. \tag{7}$$

We assume that politicians care only about their "consumption" of z_t. A politician, who is voted out of office, receives a fixed level of utility, normalized to 0 and never runs for office again.

Elections are held every period. In each election, the incumbent politician runs against a challenger and the candidate who wins the majority takes office in the next period. Politicians cannot commit to fiscal policies when running for office, but they do face the electorate when seeking re-election, and can be held accountable after the fact. As in the dynamic accountability model developed by Ferejohn (1986), we allow voters to commit to a sequence of performance standards that they require the incumbent to satisfy in order to qualify for reelection. We study sequences of incentive compatible performance standards based on observable policy implementations and focus on those which maximize voters' lifetime utility, i.e., those which are constrained efficient. The question of interest is: do constrained efficient performance standards allow politicians to make myopic policy choices?

To evaluate this question, we need a benchmark to which we can compare. Our benchmark is the dynamically efficient path of taxes and public investments chosen by a benevolent planner whose objective it is to maximize the lifetime utility of a representative citizen (equation (1)) subject to the budget constraint ($x_{1,t} + x_{2,t} \leq \tau_t$) and to the revenue constraint ($\tau_t \leq \mathcal{T}_t$). The efficient portfolio of public goods is characterized in Lemma 1. We note that it is stationary and independent of whether or not the revenue constraint is binding.

Lemma 1 *The efficient portfolio of public goods that would be chosen by a benevolent*

the interests of their electorate.

planner is

$$\frac{x_2^*}{x_1^*} = (\beta(1+g)^\pi)^{\frac{1}{1-\alpha}} \textit{ for all } t = 0, 1, ... \tag{8}$$

Proof. *See Appendix* ■

A low discount rate shifts the efficient portfolio towards the short-term good because the rewards of investing in the long-term good are not enjoyed immediately. High productivity growth in the public sector ($(1+g)^\pi$) has the opposite effect and shifts the portfolio towards the long-term good. This is because the rewards of investments in the long-term good are augmented by the increase in productivity that takes place between the time the investment is sunk and the provision actually takes place.[10] Lemma 1 allows us to define precisely what we mean by policy myopia: the portfolio choice at time t is myopic if, and only if

$$\frac{x_{2,t}}{x_{1,t}} < \frac{x_2^*}{x_1^*}.$$

3 Incentive Compatible Performance Standards

Recall that voters cannot observe actual investments $x_{i,t}$ or the amount diverted z_t, but that they do observe outputs in the public sector and the amount of revenue raised. Thus, at time $t = 1, 2...$, voters observe τ_t, $y_{1,t}$ and $y_{2,t}$. From this, and from their memory of earlier observations, they can deduce $x_{1,t}$, $x_{2,t-1}$, and z_{t-1}. At time $t = 0$, they observe only τ_0 and $y_{1,0}$ as no investment in the long-term public good could have been made. Voters can base their plans to reelect the incumbent politician on *current* investments in short-term public goods, x_1, and *retrospectively* on investments in the long-term good, x_2 and inferred diversion z. Voters announce a sequence of performance standards $\widehat{s}_t = \{\widehat{\tau}_t, \widehat{x}_{1,t}, \widehat{x}_{2,t}\}$ of the following type: if $x_{1,0} \geq \widehat{x}_{1,0}$ and $\tau_0 \leq \widehat{\tau}_0$ is observed after period 0, then the incumbent politician is reelected for a second term; if $x_{1,t} \geq \widehat{x}_{1,t}$, $x_{2,t-1} \geq \widehat{x}_{2,t-1}$ and $\tau_t \leq \widehat{\tau}_t$ is observed

[10] If we assume that $y_{2,t} = b_{t-1} x_{2,t-1}^\alpha$, then the efficient portfolio would not depend on g. The precise specification of the production technology for the long-term public good does, however, not matter for any of our results.

after the second, or any subsequent term, the incumbent politician is reelected. If any of these conditions fail, the politician is not reelected and a challenger takes office.

We begin the analysis by characterizing the sequence of incentive compatible performance standards of the type defined above. We characterize the portfolio choices in the following section. Suppose that voters announce a sequence of standards $\widehat{s}_{t+k} = \{\widehat{\tau}_{t+k}, \widehat{x}_{1,t+k}, \widehat{x}_{2,t+k}\}$ and define $\widehat{z}_{t+k} = \widehat{\tau}_{t+k} - \widehat{x}_{1,t+k} - \widehat{x}_{2,t+k}$ as the rent allowed by these standards for $k = 0, 1, 2, ...$ Consider the politician in office at time t. His lifetime payoff is

$$V_t = \sum_{k=0}^{\infty} \beta^k \varphi_{t+k} z_{t+k} \tag{9}$$

where $\varphi_t = 1$ if he is in office, and $\varphi_t = 0$ otherwise. The politician can choose between three strategies at time t:[11]

1. **Full compliance:** Meet the standard $\widehat{s}_t$. We call this strategy C, with

$$x_{1,t}(C) \geq \hat{x}_{1,t}, \quad x_{2,t}(C) \geq \hat{x}_{2,t}; \quad z_t(C) \leq \hat{z}_t$$

2. **Partial defection:** Meet just enough of the standard $\widehat{s}_t$ to be re-elected at the upcoming election, but be defeated next period. We call this strategy $D1$, with

$$x_{1,t}(D1) \geq \hat{x}_{1,t}, \quad 0 \leq x_{2,t}(D1) < \hat{x}_{2,t}, \quad \hat{z}_t + \hat{x}_{2,t} \geq z_t(D1) > \hat{z}_t.$$

3. **Defection:** Not meet the standard $\widehat{s}_t$ at all and be defeated in the up-coming election. We call this strategy $D0$, with

$$0 \leq x_{1,t}(D0) < \hat{x}_{1,t}, \quad 0 \leq x_{2,t}(D0) < \hat{x}_{2,t}, \quad \mathcal{T}_t \geq z_t(D0) > \hat{z}_t.$$

The politician maximizes V_t which combined with the fact that $z_t = \tau_t - x_{1,t} - x_{2,t}$ and $\tau_t \leq \mathcal{T}_t$ implies that

$$x_{1,t}(C) = x_{1,t}(D1) = \hat{x}_{1,t}; \quad x_{1,t}(D0) = 0;$$

[11] These three strategies are the only strategies relevant at time t; a strategy where the politician complies for $k-1$ periods and then defects, is individually rational only if $(D0)$ is rational at $t+k$, or $(D1)$ at $t+k-1$.

$$x_{2,t}(C) = \hat{x}_{2,t}; \quad x_{2,t}(D1) = x_{2,t}(D0) = 0;$$

$$z_t(C) = \widehat{z}_t; \quad z_t(D1) = \hat{z}_t + \hat{x}_{2,t}; \quad z_t(D0) = \mathcal{T}_t.$$

Let $V_t(C), V_t(D1)$ and $V_t(D0)$ be the value of each strategy and define

$$V_t^* = \max[V_t(C), V_t(D1), V_t(D0)]. \tag{10}$$

We can then characterize the payoff associated with each strategy as follows. A politician that decides to comply (C) at time t gets

$$V_t(C) = \widehat{z}_t + \beta V_{t+1}^* \tag{11}$$

where V_{t+1}^* is the continuation value of holding office. We notice that future payoffs are discounted by β as politicians have the same discount factor as citizens.

A politician who decides to comply partially $(D1)$ delivers $x_{1,t} = \widehat{x}_{1,t}$ and raises $\tau_t = \widehat{\tau}_t$ at time t but under-provides the long-term good. This is not discovered by voters until period $t+1$, and they would not terminate his tenure until the election held at time $t+2$. In the meantime, the politician is reelected at the election held at time $t+1$. Knowing, however, that he is going to be terminated after his "second term", the politician diverts the maximum possible tax revenue at time $t+1$. Accordingly, his expected payoff, discounted to time t, is

$$V_t(D1) = \widehat{z}_t + \widehat{x}_{2,t} + \beta \mathcal{T}_{t+1}. \tag{12}$$

Finally, a politician who decides to defect $(D0)$ at time t is, of course, discovered immediately by voters, and at the next election at time $t+1$, his tenure is terminated. Thus, his payoff is

$$V_t(D0) = \mathcal{T}_t. \tag{13}$$

The politician chooses full compliance only if

$$V_t(C) = V_t^* \geq \max[V_t(D1), V_t(D0)]$$

for every t. With the additional assumption that politicians comply when indifferent, this is necessary and sufficient. We obtain, by routine substitutions, that $V_t(C) \geq \max\{V_t(D1), V_t(D0)\}$ if, and only if the following conditions hold at each $t = 0, 1, 2, ...$:

$$\mathbf{(IC0)_t} \quad \sum_{k=0}^{\infty}(\beta)^k \hat{z}_{t+k} \geq \mathcal{T}_t; \tag{14}$$

$$\mathbf{(IC1)_t} \quad \sum_{k=0}^{\infty}(\beta)^k \hat{z}_{t+k} \geq \hat{z}_t + \hat{x}_{2,t} + \beta\mathcal{T}_{t+1}. \tag{15}$$

Further, we can rewrite equation (15) as

$$\sum_{k=0}^{\infty}(\beta)^k \hat{z}_{t+1+k} \geq \frac{\hat{x}_{2,t}}{\beta} + \mathcal{T}_{t+1} \geq \mathcal{T}_{t+1}. \tag{16}$$

We obtain, from this, that $(\mathbf{IC1})_t \Rightarrow (\mathbf{IC0})_{\mathbf{t+1}}$. It follows that the standard $\hat{s}_t$ is incentive compatible if, and only if, $(\mathbf{IC0})_0$ and $\{(\mathbf{IC1})_t\}_{t=0}^{\infty}$ are satisfied. Thus, we have established the following fundamental result about the sequence of incentive compatible performance standards.

Lemma 2 *A sequence of performance standards $\{\widehat{s}_t\}_{t=0}^{\infty}$ is incentive compatible if, and only if*

$$V_0(C) \geq V_0(D0) \text{ and } V_t(C) \geq V_t(D1) \qquad t = 0, 1, 2, ... \tag{17}$$

We note that the sequence of incentive compatible performance standards must satisfy two conditions. First, the very first politician elected by the society has an incentive to defect ($D0$) as well as an incentive to choose partial defection ($D1$), and so to insure full compliance, $V_0(C)$ must be (weakly) greater than both $V_0(D0)$ and $V_0(D1)$.[12] Second, in any subsequent period, incentive compatibility only requires that $V_t(C)$ is (weakly) greater than $V_t(D1)$. This is because $V_{t-1}(C) \geq V_{t-1}(D1) \Rightarrow V_t(C) \geq V_t(D0)$. The intuition is that the politician is tempted to pretend to be complying by only complying partially and then reveal himself in the second term. This temptation is larger than the temptation to

[12] Notice that $(IC0)_0$ is redundant if $\beta(1+g)$ is close to 1.

defect and be discovered immediately. Consequently the relevant incentive constraints are $V_0(C) \geq V_0(D0)$ and $V_t(C) \geq V_t(D1)$ for $t = 0, 1, 2, ...$ From this the following result can be derived.

Lemma 3 *For a given sequence of public investments* $\{x_{1,t}, x_{2,t}\}_{t=0}^{\infty}$*, full compliance requires that the sequence of performance standards allow politicians to divert at least*

$$\widehat{z}_t = (1 - \beta(1 + g))\mathcal{T}_t + \frac{\widehat{x}_{2,t-1}}{\beta} - \widehat{x}_{2,t} \tag{18}$$

at time $t = 0, 1, 2, ...$ *with* $x_{2,-1} = 0$*.*

Proof. For a given sequences of public investment, $\{x_{1,t}, x_{2,t}\}_{t=0}^{\infty}$, voters choose $\hat{z}_t$ to minimize $\sum_k \beta^k \widehat{z}_{t+k}$ subject to incentive compatibility constraints $\mathbf{IC0}_0$ and $\{(\mathbf{IC1})_t\}_{t=0}^{\infty}$. This yields

$$\sum_{k=0}^{\infty} (\beta)^k \hat{z}_k = \mathcal{T}_0;$$

$$\sum_{k=0}^{\infty} (\beta)^k \hat{z}_{t+1+k} = \frac{\hat{x}_{2,t-1}}{\beta} + \mathcal{T}_t;$$

for $t = 0, 1, 2, \cdots$. Substitutions yield

$$\hat{z}_0 = \mathcal{T}_0 - \beta\mathcal{T}_1 - \hat{x}_{2,0};$$

$$\hat{z}_t = \mathcal{T}_t - \beta\mathcal{T}_{t+1} + \frac{\hat{x}_{2,t-1}}{\beta} - \hat{x}_{2,t},$$

for $t = 0, 1, 2$ with $\hat{x}_{2,t-1} = 0$. Note that $\mathcal{T}_t - \beta\mathcal{T}_{t+1} = \mathcal{T}_t(1 - \beta(1 + g))$ ■

The politician must be allowed to divert (at least) the rents defined by equation (18) to guarantee implementation of the sequence $\{x_{1,t}, x_{2,t}\}_{t=0}^{\infty}$ of investments in the two public goods.[13] This is the standard agency cost that arises when decisions are delegated to opportunistic politicians (Persson et al. 1997). Importantly, we note that the rent at time t depends positively on the investment in the long-term public good made in period

[13] We note that the rent could be negative. Intuitively, in an economy with $\beta(1 + g)$ close to 1, the politician is willing to pay at the beginning of his tenure to be allowed to keep office. In what follows we rule this out. A sufficient condition is provided in the Appendix.

$t-1$ but negatively on the investment made in period t. Thus, the politician is rewarded retrospectively for investments in long-term public goods. The rent at time t is increasing in the tax potential of the economy because the temptation to defect is larger in an economy in which more tax revenues can be diverted. Interestingly, we note that the growth rate (g) reduces the rent required for full compliance, ceteris paribus. This is because politicians face a sustained incentive to postpone defecting in an economy where the tax potential is growing. Combining the budget constraint $\hat{\tau}_t = \hat{z}_t + \hat{x}_{1,t} + \hat{x}_{2,t}$ with equation (18) implies that the tax revenues required to support $\{x_{1,t}, x_{2,t}\}_{t=0}^{\infty}$ are

$$\hat{\tau}_t = (1-\beta(1+g))\mathcal{T}_t + \hat{x}_{1,t} + \frac{\hat{x}_{2,t-1}}{\beta}.$$

Clearly, this may exceed the tax capacity of the economy ($\mathcal{T}_t$) and actual tax revenues are $\min\{\hat{\tau}_t, \mathcal{T}_t\}$.

4 The Second Best Portfolio

We can characterize the sequence of second best portfolio choices by solving the electorate's maximization problem:

$$\max_{\{x_{1,t},x_{2,t}\}} \sum_{t=0}^{\infty} \beta^t \left[w_t - \tau_t + a_t^{\pi} x_{1,t}^{\alpha} + \beta \left[a_t(1+g) \right]^{\pi} x_{2,t}^{\alpha} \right] \tag{19}$$

subject to the sequence of incentive compatibility constraints defined by equation (18), the revenue constraints

$$\tau_t \leq \mathcal{T}_t, \text{ for } t = 0, 1, 2, ... \tag{20}$$

and non-negativity constraints, $x_{i,t} \geq 0$ and $\tau_t \geq 0$ for $t = 0, 1, 2...$ The solution to this problem depends critically on whether or not the revenue constraint is binding. The details are given in the Appendix. Below we focus on the key question: is the second best portfolio myopic?

We begin by considering the case of an economy that is not revenue constrained ($\widehat{\tau}_t <$

$\mathcal{T}_t$).[14] In this economy, the Kuhn-Tucker conditions imply that

$$\frac{\widehat{x}_{2,t}}{\widehat{x}_{1,t}} = \frac{x_2^*}{x_1^*}\left(\frac{\beta\lambda_{1,t}}{\lambda_{1,t+1}}\right)^{\frac{1}{1-\alpha}} \tag{21}$$

$$\widehat{\tau}_t = (1-\beta(1+g))\mathcal{T}_t + \widehat{x}_{1,t} + \frac{\widehat{x}_{2,t-1}}{\beta}. \tag{22}$$

$$\lambda_{1,t} = \beta^t,\ \lambda_{2,t} = 0 \tag{23}$$

where $\lambda_{1,t}$ and $\lambda_{2,t}$ are the Lagrange multipliers on the incentive and the revenue constraint in period t discounted back to $t = 0$, respectively, and $\frac{x_2^*}{x_1^*}$ is the efficient portfolio defined in Lemma 1. We see from equation (21) that the second best portfolio is efficient at time t if, and only if

$$\lambda_{1,t+1} = \beta\lambda_{1,t}. \tag{24}$$

Since $\lambda_{1,t} = \beta^t$, this condition is satisfied along the constrained efficient path of this economy, and we get the result that the public sector portfolio is efficient:

Proposition 1 *(Efficiency) In an economy with a non-binding revenue constraint, the second best portfolio is efficient, i.e.,*

$$\frac{\widehat{x}_2}{\widehat{x}_1} = \frac{x_2^*}{x_1^*}. \tag{25}$$

The proposition demonstrates that short-termism is not an inevitable consequence of the fact that some government activities can be observed more frequently than others; in economies that operates below their tax capacity, voters can still use elections to motivate their politicians to invest in the efficient portfolio despite observation lags.[15]

Equations (18) and (21) are the key to understand this result. A politician who invests in the long-term public good has to wait one period to get his reward. The politician

[14] The constraint does not bind in period 0 if
$1-\theta > \alpha^{\frac{1}{1-\alpha}}\frac{(1+\beta^{\frac{\alpha}{1-\alpha}})}{\beta(1+g)}$ and it will never become binding if, in addition, $\pi \leq 1-a$.

[15] The fact that some government activities cannot be observed as well as others does not, as in Holmstrom and Milgrom (1991), force voters (the principal) to provide low-powered incentives. The reason is that investments in long-term public goods can eventually be observed and that allows voters to reward this activity explicitly.

discounts the future by β. Therefore, an investment of 1 in the long-term public good in period t must be rewarded by $\frac{1}{\beta}$ units of rent in period $t+1$ to make it worthwhile for the politician to do. Investments in the short-term public good, on the other hand, are rewarded immediately and the politician is compensated with one unit of rent per unit of investment.

Now, suppose that voters ask the politician to invest one unit of tax revenues in the short-term public good at time t. The associated (discounted) utility cost is $\lambda_{1,t}$. If they instead ask the politician to investment one unit of tax revenues in the long-term public good, the associated (discounted) utility cost is $\frac{\lambda_{1,t+1}}{\beta}$ because the politician needs $\frac{1}{\beta}$ units of rent in period $t+1$ in compensation for making this investment. The relative cost of the two investments is therefore $\frac{\beta\lambda_{1,t}}{\lambda_{1,t+1}}$ which, we recall from above, in the economy with a non-binding revenue constraint is equal to 1. Return to the problem faced by the social planner. From his point of view, the relative (discounted) utility cost of making an investment in the two goods is always 1 because he finances both investments out of current tax revenues.[16] The implication then is that voters and the social planner face the same relative cost of investment and thus voters have no reason to bias the portfolio choice.

Next, consider an economy in which the revenue constraint is binding. In this economy, voters cannot allow politicians to raise more tax revenue than $\tau_t = \mathcal{T}_t$ at time t.[17] As a consequence, they have to scale down their investment demands. One possibility is that they ask their politician to cut down on investments proportionally thereby preserving the efficient portfolio. While this is exactly what they do in a stationary economy, in a growing economy they have an incentive to bias the portfolio, and this may lead to policy

[16] The social planner faces the budget constraint $\tau_t = x_{1,t} + x_{2.t}$ each period. Thus, the relative utility cost of investing in the two goods is $\frac{\widetilde{\lambda}_{1,t}}{\widetilde{\lambda}_{1,t}} = 1$ where $\widetilde{\lambda}_{1,t}$ is the present value Lagrange multiplier on the revenue constraint at time t in the planner's optimization problem (see Appendix).

[17] The constraint binds in period 0 if
$1-\theta < \alpha^{\frac{1}{1-\alpha}} \frac{(1+\beta^{\frac{\alpha}{1-\alpha}})}{\beta(1+g)}$ and it continues to bind if, in addition, $\pi \geq 1-a$.

myopia. To see this, we note that the Kuhn-Tucker conditions imply that

$$\frac{\widehat{x}_{2,t}}{\widehat{x}_{1,t}} = \frac{x_2^*}{x_1^*}\left(\frac{\beta\lambda_{1,t}}{\lambda_{1,t+1}}\right)^{\frac{1}{1-\alpha}} \tag{26}$$

$$\beta\mathcal{T}_{t+1} = \widehat{x}_{1,t} + \frac{\widehat{x}_{2,t-1}}{\beta} \tag{27}$$

$$\lambda_{1,t} = \beta^t + \lambda_{2,t}. \tag{28}$$

From equation (26), we note that an efficiency portfolio choice requires that $\lambda_{1,t+1} = \beta\lambda_{1,t}$. A simple calculation shows that

$$\frac{\beta\lambda_{1,t}}{\lambda_{1,t+1}} = \phi$$

where $\phi = (1+g)^{1-\alpha-\pi}$. Thus, unless $\phi = 1$, the portfolio is inefficient. In particular, in a growing economy ($g > 0$) in which productivity growth in the public sector is sufficiently high $\pi > 1-\alpha$, the portfolio is biased against investments in the long-term public good ($\phi < 1$). We summarize this result in the next proposition.

Proposition 2 *(Policy Myopia) Suppose the revenue constraint is binding, $g > 0$ and $\pi > 1-\alpha$. Then, the second best portfolio is myopic and given by*

$$\frac{\widehat{x}_2}{\widehat{x}_1} = (1+g)^{\frac{1-\alpha-\pi}{1-\alpha}}\frac{x_2^*}{x_1^*}.$$

To understand why policy myopia arises in this economy, we need to understand why economic growth makes it expensive for voters to demand long-term public goods. The main point is that the revenue constraint in binding *and* that the gap between what voters would have liked politicians to raise $\widehat{\tau}_t$ and the tax capacity $\mathcal{T}_t$ of the economy widens over time whenever $\pi > 1-\alpha$. This, in a sense, increases the scarcity of tax revenues as time unfolds and, as a consequence, the utility cost of providing incentives for the politician to make appropriate investments.[18] Since politicians are rewarded for making investments

[18] The lagrange multiplier on the incentive constaint is given by $\frac{\lambda_{1,t}}{\beta^t} = a_t^{\pi+\alpha-1}\left[\frac{\beta(1+g)(1-\theta)}{1+\beta^{\frac{1}{1-\alpha}}}\right]^{\alpha-1}$ and is increasing over time for $\pi > 1-\alpha$.

in the long-term public one period after they made the investment, the relative cost of long-term public goods goes up. This, in turn, causes voters to deliberately ask their politician to make myopic portfolio choices. It is important to stress that policy myopia is *constrained* efficient: it occurs because voters cannot do better than allowing politicians to divert funds, and allowing them to divert relatively more funds from long-term investments.

It is clear, however, that a binding revenue constraint is not sufficient for policy myopia to arise. Economic growth is also needed. If, for example, $g = 0$, then $\phi = 1$ and the portfolio would not be biased. Moreover, productivity growth in the public sector cannot lag too much behind that of the private sector. This is the significance of the condition $\pi > 1-\alpha$. If, for example, $\pi < 1-\alpha$, the portfolio would be biased against the short-term public good. However, as we shall discuss in more detail in the next section, the condition $\pi > 1-\alpha$ implies that desired tax revenues $\widehat{\tau}_t$ grow faster than both national income and the tax potential of the economy. This means that the revenue constraint will eventually become binding in an economy in which the size of government grows relative to GDP.

5 Size, Policy Myopia and Growth

Our theory offers insights into the forces that drive the expansion of government spending over time and the link between the size of government and policy myopia.[19] The conventional measure of the size of government is tax revenues out of GDP:

$$\frac{\tau_t}{Y_t} \tag{29}$$

where $Y_t = w_t = a_t$ and $\tau_t = \min\{\widehat{\tau}_t, \mathcal{T}_t\}$. Consider an economy in which the revenue constraint is not binding at time $t = 0$. For any subsequent t such that the revenue constraint remains non-binding, the size of government is

$$\frac{\widehat{\tau}_t}{Y_t} = \alpha^{\frac{1}{1-\alpha}} \left[1 + (\beta)^{\frac{\alpha}{1-\alpha}}\right] a_t^{\frac{\pi+\alpha-1}{1-\alpha}} + (1-\theta)\left[1 - \beta(1+g)\right]. \tag{30}$$

[19]Tridimas and Winer (2005) survey and integrate the theoretical and empirical literature on the size of government.

It is clear that growth in government depends crucially on the relative pace at which productivity progresses in the public relative to the private sector (as captured by π). The size of government is constant if $\pi = 1 - \alpha$ because productivity growth exactly off-sets the diminishing marginal product associated with production of public goods and is declining if $\pi < 1 - \alpha$.[20] Government involvement in the economy increases over time if $\pi > 1 - \alpha$. In this case, voters are willing to trust their politicians with an increasing share of GDP because productivity improvements in the public sector happen at a sufficiently high pace. Importantly, growth must come to an end when the tax potential is reached: attempts to raise more than $1 - \theta$ in taxes cause an exodus to the home production sector and a collapse in the provision of public services. Thus, differential productivity growth is an important determinant of growth in government. The same is true in the seminal study by Baumol (1967). He argues that growth in government can be attributed to relatively low productivity growth in the public sector. In our model, this phenomenon can cause growth in government, as long as the productivity difference is not too large: $\pi \in (1 - \alpha, 1)$. This is because the public sector, despite lagging behind the private sector, *does* become more efficient as time unfolds and, as a consequence, the electorate is willing to trust their politicians with a larger share of GDP. This mechanism is, of course, very different from the one envisaged by Baumol.[21] By the same token, our model predicts a positive relation between the size of government and economic development (as measured by GDP) whenever $\pi > 1 - \alpha$. This provides an alternative explanation of Wagner's Law (Wagner, 1883) – the phenomenon that the size of government grows as societies develop. The driving force in our model is, however, productivity growth, rather than a high income elasticity in the demand for public goods.

[20] In this case, the size of government converges to $(1 - \theta)\,[1 - \beta(1 + g)]$.

[21] Baumol (1967) argued that production of public goods is more labor intensive than production of private goods. As a consequence, productivity growth is likely to be slower in the public than in the private sector. If wages increase at the same rate in the two sectors, unit costs in the public sector would go up. Provided that the demand for public goods is sufficiently price inelastic, this would lead to growth in the size of government.

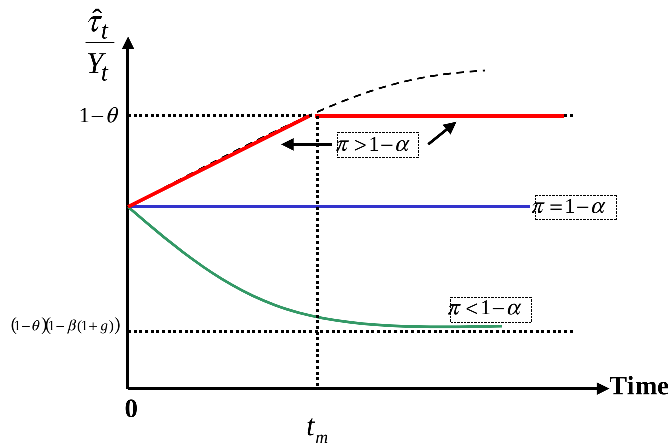

Figure 1: The Evolution of the Size of Government Over Time.

The three scenarios are illustrated in Figure 1. The stylized picture observed in the OECD countries over the past 130 years, however, strongly suggest that the path generated by $\pi > 1 - \alpha$ is the relevant one: in the 110 years following 1870 the average size of government increased from about 10 percent of GDP to about 40 percent, but around 1980 the expansion came to a hold and tax revenues as a share of GDP leveled out (Tanzi and Schuknecht, 2000, Table III.1). This has the important implication that societies grow myopic: a society that follows the path generated by $\pi > 1 - \alpha$ in Figure 1, for example, will invest efficiently in long-term public goods until time t_m when the revenue constraint becomes binding; thereafter investments in public goods suffer from a short-term bias. An implication then is that policy myopia is mostly a problem in rich societies that operate on the boundaries of their tax capacity.

6 Conclusion and Discussion

This paper presents a theory of second best policy myopia understood as a bias towards investments in short-term public goods. We show that policy myopia is not an inevitable consequences of long-term public goods, but arise because of complex interactions between observation lags, economic growth and revenue constraints. We only look at constrained efficient paths. There may be many *equilibrium* paths displaying policy myopia. One can therefore interpret our results as saying that voters even under fairly optimistic assumptions about what electoral accountability can deliver (absence of coordination problems among voters, commitment to long-term voting strategies etc.) must often accept short-term biases in public spending.

We assume that the politician cannot issue debt. The analysis can, however, easily be extended to cover cases where the politician has *limited* access to an international capital market and is able to borrow, say, a fraction income each period at a fixed interest rate and is expected to repay the debt the next period. The case in which the politician has access to a perfect capital market without any restrictions on borrowing than those imposed by the intertemporal budget constraint is more difficult to handle formally because it introduces a state variable into the model. Yet, two points can be made. First, a politician with free access to the capital market is harder to control: the temptation to collect the maximum rent is enhanced simple because the rent (including the present value of future taxes) is larger. Against this background, it is reasonable to suppose that international (as well as domestic) lenders will restrict access and that borrowing constraints, therefore, emerge endogenously to justify our initial assumption. Second, when the politician is constrained only by the intertemporal budget constraint, the logic of Barro (1979) suggests that the shadow price of public funds will be equalized across periods, thereby reducing the tendency for policy myopia in a growing economy.[22] Taken together, the two points suggest a trade-off between eliminating policy myopia via debt and controlling the scope for rent seeking. We conjecture that it is constrained efficient to impose borrowing constraints, as was indeed true throughout the nineteenth century in many Western European countries and today in the European Union, and that policy myopia therefore continues to be a potential problem.

[22] A further consideration is that politicians can affect – by creating "facts" – the policy decisions of future politicians. In this case, public debt can in itself be a source of policy myopia (Persson and Svensson, 1989; Alesina and Tabellini, 1990).

The interaction between credit market constraints and policy myopia is an interesting topic for future research that deserves more attention.

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7 Appendix

Proof of Lemma 1. The planner's maximization problem can be stated as follows:

$$\max_{\{\tau_t, x_{1,t}, x_{2,t}\}} \sum_{t=0}^{\infty} \beta^t \left[w_t - \tau_t + a_t^{\pi} x_{1,t}^{\alpha} + \beta a_t^{\pi} (1+g) x_{2,t}^{\alpha} \right]$$

subject to

$$x_{1,t} + x_{2,t} - \tau_t \leq 0 \quad \text{for} \quad t = 0, 1, 2...$$

$$\tau_t \leq a_t(1-\theta) \equiv \mathcal{T}_t \quad \text{for} \quad t = 0, 1, 2...$$

$$x_{1,t} \geq 0, \;\; x_{2,t} \geq 0, \; \tau_t \geq 0 \text{ for } \; t = 0, 1, 2...$$

$$x_{2,-1} = 0.$$

The Lagrangian function is

$$L = \sum_{t=0}^{\infty} \beta^t \left[w_t - \tau_t + a_t^{\pi} x_{1,t}^{\alpha} + \beta a_t^{\pi} (1+g) x_{2,t}^{\alpha} \right] + \sum_{t=0}^{\infty} \widetilde{\lambda}_{1,t} \left[\tau_t - x_{1,t} - x_{2,t} \right] + \sum_{t=0}^{\infty} \widetilde{\lambda}_{2,t} \left[a_t(1-\theta) - \tau_t \right]$$

where $\widetilde{\lambda}_{1,t} \geq 0$ and $\widetilde{\lambda}_{2,t} \geq 0$ are the multipliers. The Kuhn-Tucker conditions for $t = 0, 1, 2...$ are

$$\beta^t a_t^{\pi} \alpha x_{1,t}^{\alpha-1} - \widetilde{\lambda}_{1,t} \leq 0, \quad x_{1,t} \geq 0 \;\; \text{w.c.s.}$$

$$\beta^t \left[a_t(1+g) \right]^{\pi} \beta \alpha x_{2,t}^{a-1} - \widetilde{\lambda}_{1,t} \leq 0, \quad x_{2,t} \geq 0 \;\; \text{w.c.s.}$$

$$\widetilde{\lambda}_{1,t} - \beta^t - \widetilde{\lambda}_{2,t} \leq 0, \quad \tau_t \geq 0 \;\; \text{w.c.s.}$$

$$\tau_t - x_{1,t} - x_{2,t} \geq 0, \quad \widetilde{\lambda}_{1,t} \geq 0 \;\; \text{w.c.s.}$$

$$a_t(1-\theta) - \tau_t \geq 0, \quad \widetilde{\lambda}_{2,t} \geq 0 \;\; \text{w.c.s.},$$

where "w.c.s." means "with complementary slack". The Inada conditions imply that $x_{1,t} > 0$, $x_{2,t} > 0$ and $\tau_t > 0$ at the optimum, and so, $\widetilde{\lambda}_{1,t} > 0$. The precise solution depends on whether or not the revenue constraint is binding. Consider first the case with $a_t(1-\theta) - \tau_t > 0 \Rightarrow \lambda_{2,t} = 0$. Here, we find that

$$x_{1,t}^* = (a_t^{\pi} \alpha)^{\frac{1}{1-\alpha}}$$

$$x_{2,t}^* = \left(\left[a_t(1+g) \right]^{\pi} \beta \alpha \right)^{\frac{1}{1-\alpha}}$$

$$\tau_t^* = (a_t^{\pi} \alpha)^{\frac{1}{1-\alpha}} \left[1 + (\beta(1+g)^{\pi})^{\frac{1}{1-\alpha}} \right]$$

$$\widetilde{\lambda}_{1,t} = \beta^t.$$

Next, consider the case with $a_t(1-\theta) - \tau_t = 0$. Here $\tau_t^* = a_t(1-\theta)$ and $\widetilde{\lambda}_{2,t} > 0$. We find, using the fact that $\widetilde{\lambda}_{1,t} = \beta^t + \widetilde{\lambda}_{2,t}$, that

$$a_t^{\pi} \alpha x_{1,t}^{\alpha-1} = 1 + \frac{\widetilde{\lambda}_{2,t}}{\beta^t}$$

$$[a_t(1+g)]^\pi \beta\alpha x_{2,t}^{a-1} = 1 + \frac{\widetilde{\lambda}_{2,t}}{\beta^t}$$

$$a_t(1-\theta) - x_{1,t} - x_{2,t} = 0.$$

Solving these equations, we find the optimal provision levels as

$$x_{1,t}^* = \frac{\mathcal{T}_t}{1 + (\beta(1+g)^\pi)^{\frac{1}{1-\alpha}}}$$

$$x_{2,t}^* = \frac{\mathcal{T}_t(\beta(1+g)^\pi)^{\frac{1}{1-\alpha}}}{1 + (\beta(1+g)^\pi)^{\frac{1}{1-\alpha}}}$$

$$\lambda_{1,t} = \beta^t a_t^{\pi+\alpha-1}\alpha \left[\frac{(1-\theta)}{1 + (\beta(1+g)^\pi)^{\frac{1}{1-\alpha}}}\right]^{\alpha-1}$$

Notice that the efficient portfolio is the same in the two cases, namely

$$\frac{x_2^*}{x_1^*} = (\beta(1+g)^\pi)^{\frac{1}{1-\alpha}}$$

for all t. We note that the efficient portfolio is stationary. Furthermore,

$$\frac{\tau_t^*}{Y_t} = a_t^{\frac{\pi+\alpha-1}{1-\alpha}} \alpha^{\frac{1}{1-\alpha}} \left[1 + (\beta(1+g)^\pi)^{\frac{1}{1-\alpha}}\right]$$

as long as the revenue constraint is not binding and that $\frac{\tau_t^*}{Y_t} = 1-\theta$ if the constraint is binding.

Characterization of the second best portfolio. The electorate's problem is to find a sequence of performance standards, $\widehat{s}_t = \{\widehat{\tau}_t, \widehat{x}_{1,t}, \widehat{x}_{2,t}\}$ that solves

$$\max_{s_t} \sum_{t=0}^{\infty} \beta^t \left[w_t - \tau_t + a_t^\pi x_{1,t}^\alpha + \beta\left[a_t(1+g)\right]^\pi x_{2,t}^\alpha\right] + a_0^\pi x_{2,-1}^a$$

subject to

$$\tau_t \geq x_{1,t} + \frac{x_{2,t-1}}{\beta} + \mathcal{T}_t - \beta\mathcal{T}_{t+1}, \text{ for } t = 0,1,2,...$$

$$\tau_t \leq \mathcal{T}_t = a_t(1-\theta), \text{ for } t = 0,1,2,...$$

$$x_{1,t} \geq 0, \ \ x_{2,t} \geq 0, \ \tau_t \geq 0 \text{ for } \ t = 0,1,2...$$

$$x_{2,-1} = 0.$$

The Lagrangian for this problem is

$$L = \sum_{t=0}^{\infty} \beta^t \left[w_t - \tau_t + a_t^\pi x_{1,t}^\alpha + \beta\left[a_t(1+g)\right]^\pi x_{2,t}^\alpha\right]$$

$$+ \sum_{t=0}^{\infty} \lambda_{1,t}\left[\beta\mathcal{T}_{t+1} - \mathcal{T}_t + \tau_t - x_{1,t} - \frac{x_{2,t-1}}{\beta}\right]$$

$$+ \sum_{t=0}^{\infty} \lambda_{2,t}\left[\mathcal{T}_t - \tau_t\right]$$

where $\lambda_{1,t} \geq 0$ and $\lambda_{2,t} \geq 0$ are the multipliers. The Kuhn-Tucker conditions for $t = 0, 1, 2...$ are

$$\beta^t a_t^\pi \alpha x_{1,t}^{\alpha-1} - \lambda_{1,t} \leq 0, \quad x_{1,t} \geq 0 \text{ w.c.s.}$$

$$\beta^t \left[a_t(1+g)\right]^\pi \beta\alpha x_{2,t}^{a-1} - \frac{\lambda_{1,t+1}}{\beta} \leq 0, \quad x_{2,t} \geq 0 \text{ w.c.s.}$$

$$\lambda_{1,t} - \beta^t - \lambda_{2,t} \leq 0, \quad \tau_t \geq 0 \text{ w.c.s.}$$

$$\tau_t - x_{1,t} - \frac{x_{2,t-1}}{\beta} + \beta\mathcal{T}_{t+1} - \mathcal{T}_t \geq 0, \quad \lambda_{1,t} \geq 0 \text{ w.c.s.}$$

$$\mathcal{T}_t - \tau_t \geq 0, \quad \lambda_{2,t} \geq 0 \text{ w.c.s.}$$

The Inada conditions imply that $x_{1,t} > 0$, $x_{2,t} > 0$ and $\tau_t > 0$. Hence, $\lambda_{1,t} > 0$ for all $t = 0, 1, 2, ...$ The precise solution depends on whether or not the revenue constraint is binding. Suppose that it is not binding at time t. Then $\lambda_{2,t} = 0$ and $\lambda_{1,t} = \beta^t$. We find that

$$\beta^t a_t^\pi \alpha x_{1,t}^{\alpha-1} = \lambda_{1,t}$$

$$\beta^t a_t^\pi \alpha x_{2,t-1}^{a-1} = \frac{\lambda_{1,t}}{\beta}$$

$$\tau_t = x_{1,t} + \frac{x_{2,t-1}}{\beta} - \beta\mathcal{T}_{t+1} + \mathcal{T}_t.$$

Solving these equations yields

$$\widehat{x}_{1,t} = (a_t^\pi \alpha)^{\frac{1}{1-\alpha}} = x_{1,t}^*$$

$$\widehat{x}_{2,t-1} = (a_t^\pi \alpha\beta)^{\frac{1}{1-\alpha}} = x_{2,t-1}^*$$

$$\widehat{\tau}_t = (a_t^\pi \alpha)^{\frac{1}{1-\alpha}} \left[1 + (\beta)^{\frac{\alpha}{1-\alpha}}\right] + a_t(1-\theta)\left[1 - \beta(1+g)\right].$$

The portfolio is

$$\frac{\widehat{x}_{2,t}}{\widehat{x}_{1,t}} = \frac{x_2^*}{x_1^*} = (\beta(1+g)^\pi)^{\frac{1}{1-\alpha}}$$

for all t. Notice that

$$\frac{\widehat{\tau}_t}{\mathcal{T}_t} = \frac{\alpha^{\frac{1}{1-\alpha}} \left[1 + (\beta)^{\frac{\alpha}{1-\alpha}}\right] a_t^{\frac{\pi+\alpha-1}{1-\alpha}}}{(1-\theta)} + \left[1 - \beta(1+g)\right] \tag{31}$$

so the the revenue constraint is not binding in period 0 if $(1-\theta) > \frac{\alpha^{\frac{1}{1-\alpha}}(1+\beta^{\frac{\alpha}{1-\alpha}})}{\beta(1+g)}$. Note that $\frac{\widehat{\tau}_t}{\mathcal{T}_t}$ is increasing (non-increasing) over time is $\pi > 1-\alpha$ $(\leq 1-\alpha)$.

Next, suppose that the revenue constraint is binding at time t. Then $\lambda_{2,t} > 0$ and $\lambda_{1,t} = \beta^t + \lambda_{2,t}$. We find that

$$a_t^\pi \alpha x_{1,t}^{\alpha-1} = \frac{\lambda_{1,t}}{\beta^t}$$

$$\beta a_t^\pi \alpha x_{2,t-1}^{a-1} = \frac{\lambda_{1,t}}{\beta^t}$$

$$\beta\mathcal{T}_{t+1} = x_{1,t} + \frac{x_{2,t-1}}{\beta}.$$

Solving these equations yields

$$\widehat{x}_{1,t} = \frac{1}{1+\beta^{\frac{\alpha}{1-\alpha}}}\beta\mathcal{T}_{t+1}$$

$$\widehat{x}_{2,t-1} = \frac{\beta^{\frac{1}{1-\alpha}}}{1+\beta^{\frac{\alpha}{1-\alpha}}}\beta\mathcal{T}_{t+1}.$$

$$\lambda_{1,t} = \beta^t a_t^{\pi+\alpha-1}\alpha\left[\frac{\beta(1+g)(1-\theta)}{1+(\beta(1+g)^{\pi})^{\frac{1}{1-\alpha}}}\right]^{\alpha-1}$$

Notice that

$$\frac{\widehat{\tau}_t}{Y_t} = 1-\theta.$$

and that the second best portfolio is given by

$$\frac{\widehat{x}_{2,t}}{\widehat{x}_{1,t}} = \beta^{\frac{1}{1-\alpha}}(1+g) = (1+g)^{\frac{1-\alpha-\pi}{1-\alpha}}\frac{x_2^*}{x_1^*}$$

for all t. To complete the analysis, we need to characterize the portfolio choice in a situation where the revenue constraint is not binding at t but becomes binding at $t+1$ and vice versa. We get

$$\frac{\widehat{x}_{2,t}}{\widehat{x}_{1,t}} = \frac{\beta^{\frac{2-\alpha}{1-\alpha}}(1+g)^2}{a_t^{\frac{\pi+\alpha-1}{1-\alpha}}\alpha^{\frac{1}{1-\alpha}}(1+\beta^{\frac{\alpha}{1-\alpha}})}.$$

Suppose the revenue constraint is binding at t but not at $t+1$. We get

$$\frac{\widehat{x}_{2,t}}{\widehat{x}_{1,t}} = \frac{\alpha^{\frac{1}{1-\alpha}}(1+(\beta)^{\frac{\alpha}{1-\alpha}})a_t^{\frac{\pi+\alpha-1}{1-\alpha}}}{(\beta)^{\frac{-\alpha}{1-\alpha}}(1+g)}.$$

Finally, in the analysis above we have not imposed any restrictions on z_t. A sufficient condition that insures that z_t is non-negative at equilibrium is $max\{(\beta(1+g)^{\pi}\alpha)^{\frac{1}{1-\alpha}} + \beta(1+g),\ \beta(1+g)^{\frac{\pi}{1-\alpha}}\} < 1$. We assume that this condition is satisfied.

8 Data Appendix

Definitions and sources. The definitions of the variables used in the regression analysis are listed below. All data are from 1996 or nearest year with available data.

- *voice* = voice and accountability index, normalized to range from 0 (low voice) to 1 (maximum voice). It measures aspects of political contestability and transparency and is constructed from survey data. The following aspects of voice are considered: orderly political transfers; transparency and fairness of the legal system; civil liberties; political rights; freedom of press; and democratic accountability. Source: Kauffman et al. (1999a, 1999b).

- TR = central government spending on social security and welfare as it appears in the table "Expenditure by function for consolidated central government". Source: IMF (2001a).

- PG = central government expenditure on goods and services as it appears in the table "Expenditure and lending minus repayments by economic type, consolidated central government". Source: IMF (2001a).

- LPG = central government capital expenditure as it appears in the table "Expenditure and lending minus repayments by economic type, consolidated central government". Source: IMF (2001a).

- Y = Gross Domestic Product (GDP) in local current prices. Source: IMF (2001b).

- T = total revenue for central government (excluding grants) as it appears in the table "Revenues and grants, consolidated central government". Source: IMF (2001a).

- *open* = ratio of exports of goods and services plus imports of goods and services over two times GDP. Source: Penn World Tables 5.6 update.

- *old* = the ratio of the population above 65 of age to the total population aged between 15 and 65. Source: World Bank (2000).

- *pop* = total population as of mid-1993. Source: World Bank (2000) and United Nations (2000).

- $POLITY$ = index of political regime type, normalized to range from -10 (most autocratic) to 10 (most democratic). Source: Marshall and Jaggers (2000).

- GDP/CAP = real GDP per capita in thousands of 1985 international dollars. Source: Penn World Tables 5.6. update.

Sample coverage The sample used in the regression analysis covers as many countries as data is available for. The sample therefore contains some countries which are dictatorships or monarchies. We have chosen to keep all countries in order to enlarge the variation in recorded voice. See the next section for a discussion of sensitivity to choice of sample. The sample covers the following countries (order according to their score on the (1990-96 average) $POLITY$ index, and if equal score, then in alphabetic order): Bahrain [score of -9], Kuwait, Syria, Bhutan, Burundi, Indonesia, Morocco, Rwanda, Iran, Zimbabwe, Burkina Faso, [score of -4 or better]: Cameroon, Croatia, Egypt, Tunisia, Singapore, Yemen, Malta, Peru, Zambia, Malaysia, Mexico, Russia, Nepal, Sri Lanka, Dominican Republic, Estonia, Nicaragua, Argentina, Belarus, Colombia, Paraguay, Romania, Brazil, Bulgaria, Chile, Latvia, Namibia, Pakistan, Venezuela, Bolivia, the Czech Republic, India, Madagascar, Mongolia, Panama, Poland, South Africa, Thailand, Trinidad and Tobago, Turkey, Australia, Austria, Belgium, Canada, Costa Rica, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, the Republic of Ireland, Israel, Italy, Japan, The Republic of Korea, Lithuania, Luxembourg, Mauritius, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, the United States, Uruguay and New Zealand [score of 10].

variable	Obs	mean	std. dev	min	max
voice	81	.59	.18	.23	.84
TR/Y	68	8.4	6.3	.09	22.6
PG/Y	81	10.0	4.8	.77	26.5
LPG/Y	80	3.9	3.6	.41	30.1
T/Y	81	26.5	9.9	10.4	52.9
open	81	79.2	46.3	17.5	287.3
old	81	.15	.6	0	.3
pop	81	39.7	106.8	.26	898.2
GDP/CAP	81	11164	9017	692	37511

Table 2: Summary Statistics of the Data Used in the Regression Analysis.

Estimation techniques and robustness The regressions are estimated with STATA 7.0 using OLS but adjusting the standard errors to allow for heteroscedasticity. The results are robust to changes in econometric specification. The log specification reported in Table 2 gives the best overall fit. Results are also robust to inclusion of a full set of regional dummies, a measure of the fraction of young people (aged less than 15), alternative measures of the size of government, and are not sensitive to exclusion of countries one at the time. The results are sensitive, however, to the choice of sample. Using $POLITY$ to rank countries on a scale from -10 (most autocratic) to +10 (most democratic), the results are robust to excluding the most autocratic countries (with a score of -10 to - 4 (for $\frac{TR}{Y}$ and $\frac{LPG}{Y}$) or -10 to -3 (for $\frac{PG}{Y}$)). Excluding more countries, reduces the significance of the estimated coefficients on voice but the signs are preserved. The sample with countries that scores -4 or better on the $POLITY$ index excludes countries like Zimbabwe and Indonesia. The most autocratic countries that remain in this restricted sample are Croatia, Cameroon, Egypt and Singapore.