

A Contribution to the Political Economy of Government Size: 'Demand', 'Supply' and 'Political Influence' ⁺

by

George Tridimas* and Stanley L. Winer**

November 4, 2003

Abstract

This paper contributes to the understanding of empirically-oriented work on the size of government by integrating the analysis of three basic elements: (i) the 'demand' for government stemming in part from attempts to coercively redistribute, often analyzed in a median voter framework; (ii) the 'supply' of taxable activities emphasized in Leviathan and other models of taxation; and (iii) the distribution of 'political influence' when influence and economic interests are distinct.

The role of the first two factors have been considered in recent empirical studies of government growth by Ferris and West (1996) and Kau and Rubin (2002). Estimates of the effect of unequal political influence on the size of government have been provided by Mueller and Stratmann (2003). We combine all three elements in a spatial voting framework of a sort that has not been well explored, and use the comparative static properties of the integrative model to shed light on the analytical and empirical literatures.

JEL classification: D70, H0, H3

Keywords: size of government, coercive redistribution, home production, political influence, probabilistic voting

+ We are indebted to Steve Ferris and Therese McGuire for helpful comments. Tridimas wishes to thank Carleton University for its hospitality in the early stages of this research. Winer wishes to thank the Centre for Economic Studies, University of Munich, for providing a hospitable environment during July 2003. The Canada-United States Fulbright program at Duke University generously supported Winer's research during the fall term of 2003. An earlier version of this paper was presented at the 2003 IIPF Congress in Prague.

* (corresponding author)

School of Economics and Politics
University of Ulster, Shore Road, Newtownabbey
Co. Antrim BT37 0QB, UK
Tel: + 44 (028)90368273, Fax: + 44 (028) 90366847
e-mail: GTridimas@aol.com

** School of Public Policy and Department of Economics
Carleton University, Ottawa, Canada K1S5B6
Tel: (613)520-2600 ext. 2630. Fax: (613)520-2551
e-mail: stan_winer@carleton.ca

1. Introduction

A systematic account of the size of government in democratic countries will consider at least three basic elements. First, there is the 'demand' for government, stemming from attempts to use the fiscal system to coercively redistribute as well as from the ordinary demand for public services. Second, it is necessary to investigate the role of the 'supply' of activities on which taxation may be levied. A third key factor is the distribution and role of political influence, as distinct from the economic interests of individual voters.

The first two of these elements have recently been considered in empirical studies of the growth of government by Ferris and West (1996) and Kau and Rubin (2002). Estimates of the effect of unequal political influence on the size of government have recently been made by Mueller and Stratmann (2003)¹. In this paper, we combine all three elements in a spatial voting model where complex policy platforms reflect a politically motivated balancing of the economic interests of heterogeneous citizens.

Our purpose is twofold: first, to contribute towards a more complete political economy of the size and growth of government; and second, to use the integrative model as a basis for further insight into selected results in the empirical literature.

The paper proceeds as follows. Section 2 reviews selectively recent literature on the size of government in the light of the demand-supply-collective choice framework, and acknowledges other important issues and factors determining the size of government that are not studied here. Section 3 presents the model. Briefly, the building blocks of the model are as follows: 'Demand' for government originates from voters with unequal incomes and unequal political powers who demand public goods and who also attempt to use the fiscal system to coercively redistribute in their favour. The supply of taxable activities originates with voters who pay taxes on their market activities only, and who also engage in valuable non-market actions. Thus, in addition to the deadweight loss from taxation and its implications for the welfare of voters, political parties take into account the fact that tax

¹ The Mueller and Stratmann paper also allows to some extent for supply and demand though it does not emphasize the role of these factors. Our discussion of this paper assumes that participation in elections is closely related to political influence. See also the work of Bassett, Burkett and Putterman (1999), who identify income with influence in different ways, and consider the effect of influence so defined on transfer payments.

revenues vary with the choices that individuals make between market and non-market activities. The equilibrium of a competitive political process is modelled using a probabilistic spatial voting framework in which the influence and interests of voters are heterogeneous, and no single voter or group of voters is decisive.

Section 4 analyses the comparative static properties of the integrative model concerning the size of government, and uses these results to comment on selected aspects of the empirical literature. (The progressivity of the equilibrium tax system is examined in an Appendix). Section 5 provides a further sense of how the integrative model differs from its analytical and empirical predecessors by contrasting the determinants of government size in the model with comparable median voter and Leviathan frameworks. Section 6 concludes.

2. A Selective Review of Literature

Early work on the 'demand' for government, following Wagner (1958), Peacock and Wiseman (1967), Bird (1970) and others, emphasizes the role of factors such as income, urbanization, and wars determining the ordinary or traditional demand for commodities provided through the public sector. This voluminous literature is primarily empirical in nature, and interesting contributions continue to appear. We return to this work below.

Following the seminal contributions of Stigler (1971), Romer (1975), Roberts (1977), and Meltzer and Richard (1981), much of the theoretical and empirical research on the 'demand' for government shifted to a concern with the role of income inequality in shaping the way in which the fiscal system is used to coercively redistribute under majority rule. If preferences are single-peaked and the issue space is uni-dimensional, the median voter (usually assumed to have median income) emerges as the Condorcet winner. The median voter thus sets the tax rate, the size of public expenditure, and hence the amount of redistribution. In this framework, the size of government and the extent of redistribution are limited only by behavioural responses to taxation. With the distribution of income skewed to the right, an increase in the ratio of mean to median income in this framework leads to expansion of the public sector, a result confirmed empirically by Meltzer and Richard (1983), following earlier work in the same median voter tradition by Bergstrom and Goodman (1977) and Borcharding and Deacon (1977). Expansion of the franchise down the income scale has the same effect, as shown in studies by Husted and Kenny (1997) and Lott and Kenny (1999).

In contrast to the median voter literature on coercive redistribution, the work of Baumol (1967, 1993), Brennan and Buchanan (1980), and Kau and Rubin (1981) focuses on the supply side, while ignoring or downplaying the limits to coercive redistribution posed by the existence of competition for political support from voters who do not like to pay taxes. Several empirical studies of the size of government or of tax structure since, including Ferris and West (1996), Becker and Mulligan (1998), Kenny and Winer (2002) and Kau and Rubin (2002) have investigated the role of the capacity to raise tax revenue as a factor determining the size or structure of the public sector. As a group, these studies appear to indicate that the availability of tax revenue, and hence the size of government, varies with the structure of the economy, including for example, the extent of oil reserves and female labour force participation. Expansion of potential tax bases allows reductions in the full economic cost of raising a given amount of revenue, and also attenuates political opposition by reducing tax burdens relative to the costs of political organization². Kau and Rubin (2002), for example, suggest that the major determinant of the growth of government spending in the United States since 1930 is the increased participation of women in the labour force (where they can be taxed), accounting for about 60% of the total change in government revenue.

Most of the studies of coercive redistribution and of the role of supply, as well as many others in the tradition initiated by Wagner and Peacock and Wiseman, including Ram (1987), Gemmel (1990), Tridimas (1992), Kristov and Lindert (1992), Courakis, Moura-Roque, and Tridimas (1993), and Borcharding, Ferris and Garzoni (2001), also provide mixed evidence concerning the longest standing theory of government growth - Wagner's Law: that the income elasticity of the demand for government is greater than one. A large number of differing estimates of the income elasticity of demand for government have appeared over the years, and this mixed evidence continues to accumulate.³

The role of the distribution of political influence, the third of the factors we emphasize in this paper, has only recently been the focus of empirical research. The work on the extension of the franchise cited above is obviously relevant here. Even more recently, using cross-country data Bassett, Burkett and Putterman (1999) consider the relationship between income shares and transfer payments in a cross section of countries. They assume that political influence and income is positively correlated in various ways.

² Of course political opposition is not of concern to a Leviathan. It does play a role in other models of tax structure such as Kenny and Winer (2002).

³ The literature on Wagner's law is far too large to cover even in a perfunctory manner here. For further discussion, see the surveys of work on growth of government by Holsey and Borcharding

Perhaps the most robust conclusion is that their results are consistent with an influence type theory rather than the simple median voter theory⁴. Mueller and Stratmann (2003) hypothesize that more political participation (implying that poorer voters take a more active interest in politics), leads to more redistribution and to a larger public sector. Their results, based on pooled cross-national, time series evidence, show that in countries with well-entrenched democratic institutions, this is indeed the case. However, in weak democracies, greater participation does not lead to bigger government, implying that politically privileged groups can block redistributive policies.

Most of this interesting empirical work is based on analytical frameworks that, in our view, are incomplete in the following sense. Work on the 'supply' side has, on our reading, downplayed the role of the demand for coercive redistribution, while the literature on coercive redistribution has been notably constrained by the assumption that the fiscal system is essentially uni-dimensional (or that one of two instruments is determined by the government budget constraint), so that the median voter theorem can be applied.⁵ Moreover, as in all median voter models, there is no real distinction between the economic interests and the political influence of various voters, since one voter is politically decisive. This is a serious drawback, since economic interests and political influence can evolve in different ways for various reasons (as discussed, for example, in Downs 1957). The work of Hinich (1977), Coughlin and Nitzan (1981), Hinich and Munger (1997), Hettich and Winer (1999), Hotte and Winer (2001), Tridimas (2001) and others using the probabilistic spatial voting model relaxes both these conditions. But the details of coercive redistribution and its relation to the size of government have usually been suppressed in such models in the pursuit of other matters. Finally, one may note that despite its success in moving toward a broader perspective, the recent empirical work on the role of political participation is not founded on a well-explored analytical model that includes all of the three basic elements emphasized here.

(1997), Peacock and Scott (2000) and Mueller (2003, chapter 21).

⁴ See especially, Bassett, Burkett and Putterman (1999, p. 216)

⁵ Extension of the median voter model to deal with more than two fiscal instruments is possible. Establishing existence of an equilibrium in such cases requires either that further restrictions be placed on the nature of voter preferences (see Roberts 1977, Meltzer and Richard 1981, and Gans and Smart 1996), or it must be assumed that each fiscal parameter is decided by majority rule in a separate 'committee' of a legislature or in a separate election in which the median voter is decisive (as in Meltzer and Richard 1985). The restriction on preferences is related to the Mirrlees-Spence single crossing property, so that incomes and abilities of all voters are monotonically related. The application of this kind of restriction to allow another dimension of policy in the median voter model is reviewed in Boadway and Keen (2000). It appears that such restrictions cannot be used to allow a median or decisive voter model to extend to the analysis of complex fiscal systems.

There are other important determinants of the size of government besides those acknowledged above, including the specific institutions which set the terms within which the political contest occurs. Three such arrangements have recently attracted attention. First, the formal electoral rule, that is, whether a majoritarian (first-past-the-post) or a proportional representation electoral rule applies (for example, Milesi-Ferreti, Perotti and Rostagno 2002, Persson, Roland and Tabellini 2000, Austen-Smith 2000, and Persson and Tabellini 1999). Second, the structure of executive – legislative relations for policy making; that is, whether government taxing and spending decisions are made in a presidential regime characterised by separation of powers, or a parliamentary regime characterised by its dependence on a confidence vote (see, for example, Persson and Tabellini 1999, and Persson, Roland and Tabellini 2000). A third branch of the literature that explores the importance of governance for the size of government focuses on the results of legislative bargains intended to limit the uncertainties associated with distributive politics under majority rule (for example, to list just two studies among many, Shepsle, Weingast and Johnson 1981, and Baqir 2002).

In this paper, we focus on analytical and empirical implications of the interaction of 'demand', 'supply' and 'political influence' in a spatial voting framework. This mixture of analytical elements and of theoretical and empirical work proves to be sufficiently complex on its own, and we leave the incorporation of other or detailed aspects of governance for further research.

3. Analytical Framework

We suppose that individuals vote and make choices regarding market and non-market activity in two interrelated stages. In the first, every individual participates in a political process that results in the level of a pure public good and tax rates for every person in the polity. In a second stage, each household takes the fiscal system as given, and chooses among work (market goods), leisure and home production. Decisions at both stages must be consistent with each other in the political equilibrium. This two stage analysis, which is common in the literature, allows us to analyze private and collective choice before combining them to determine the overall political - economic equilibrium. We begin with the second stage.

3.1 *The individual voter/home-producer*

Each person i , who is a voter, a taxpayer and a home-producer, is assumed to maximise a quasi-linear utility function defined over a private consumption good Z_i , leisure L_i and a publicly provided good G :

$$U_i = Z_i + \beta \ln L_i + \gamma \ln G \quad (1)$$

To account for the possibility of shifts in the taxable capacity of the economy originating from changes in home production (or from informal labour employment), as suggested by Kau and Rubin (1981, 2002), we divide labour supply into two components; formal work in the market place, denoted as a fraction of the day by N_i , which yields an income subject to taxation; and informal work for home production, denoted as fraction of the day by H_i , which is left untaxed. The time endowment constraint requires that

$$N_i + H_i + L_i = 1 \quad (2)$$

Private consumption goods and services Z_i can either be bought in the market or produced at home. Let Q be the quantity bought in the market at a price P . Home production takes place by using time as the only input under a logarithmic technology. Formally, home production is $\alpha \ln H$, where α is a positive coefficient measuring household productivity. Writing $Z_i = Q_i + \alpha \ln H_i$ and using (1), the utility function for person i can be written:

$$U_i = Q_i + \alpha \ln H_i + \beta \ln L_i + \gamma \ln G. \quad (1')$$

The parameters of utility functions are assumed to be identical for all individuals. Voters do, however, differ in their productivities and, thus, incomes⁶. Denoting the wage rate of voter i by W_i , his or her income is $Y_i = W_i N_i$. Assuming that each voter- home-producer pays an income tax rate t_i the budget constraint is written as

⁶ Hence in this formulation, when political influence is uniformly distributed, differences in income are politically the most salient characteristic. Generalizing the model to allow for distributions of tastes very substantially complicates the framework, and we must leave such generalizations of the present model for further research. For an initial attempt to deal with such distributions when political influence and economic interests are essentially coincident, see Usher (1977).

$$PQ_i = (1-t_i)W_i(1-L_i-H_i). \quad (3)$$

The assumption that each voter faces a tax at rate t_i is intended as a metaphor for actual tax systems. Actual tax structures differentiate in many ways among taxpayers by appropriate use of a multi-dimensional skeleton that includes multiple tax bases, separate rate structures for each base, and many special provisions such as deductions and exemptions which selectively alter the definition of bases and rate structures for particular groups. Hettich and Winer (1999) show how this full tax skeleton will emerge in a model of the kind used here when there are various administration costs that place a wedge between tax revenues collected and public services delivered. The present formulation captures this differentiation in a simple manner, by assuming there is one (distortionary, proportional) tax rate that can be directed towards each taxpayer. To incorporate fully the complete tax skeleton in the present context would complicate the model substantially, and this task is left for further research.

Maximizing the utility function (1') subject to (3) yields individual demand functions for market purchases, home production and leisure respectively:

$$Q_i = [(1-t_i)W_i - (\alpha+\beta)P]/P, \quad H_i = \alpha P/(1-t_i)W_i \quad \text{and} \quad L_i = \beta P/(1-t_i)W_i.$$

Household income and the indirect utility function can then be written respectively as:

$$Y_i = W_i - [(\alpha+\beta)P/(1-t_i)] \quad (4a)$$

$$V_i = [(1-t_i)W_i/P] - (\alpha+\beta) + (\alpha+\beta)\ln P + \alpha\ln\alpha + \beta\ln\beta - (\alpha+\beta)\ln(1-t_i)W_i + \gamma\ln G \quad (4b)$$

For later use, we note that on differentiating the latter two equations with respect to tax rates and the level of public provision, we have that:

$$\partial Y_i / \partial t_i = -(\alpha+\beta)P/(1-t_i)^2 \quad \text{and} \quad \partial V_i / \partial t_i = -Y_i/P \quad (4c)$$

$$\partial Y_i / \partial G = 0 \quad \text{and} \quad \partial V_i / \partial G = \gamma/G \quad (4d)$$

From the above expression for Y_i , we see that for $W_i \leq W_0 \equiv (\alpha+\beta)P/(1-t_i)$, the household does not work and, therefore, $Y_i=0$. Note that as t_i rises so does W_0 . Individuals with earning ability below or equal to W_0 will not make any market purchases ($Q_i=0$) and rely on home

production only for their consumption. For ease of exposition in what follows, we assume that $Y_i > 0$ for all taxpayers $i, i=1,2,\dots,I$ although for some, income may be very low.

3.2 *Collective choice*

Voting behaviour by each of I citizens is assumed to be probabilistic *from the viewpoint of the political parties*.⁷ Each of two political parties chooses the levels of policy instruments which are expected to maximize its expected political support (its expected vote or expected plurality), given the probability densities f_i describing the voting behaviour of each individual (assumed to be common knowledge to the parties), and subject to the response of voters to the fiscal system, the budget constraint of the government and the anticipated policy proposal of the other party contesting the election.

Let f_i depend only on the difference in utilities that would result from the adoption of the proposals of the incumbent party (1) and the opposition (0), and be continuous and twice differentiable. Then the probability Π_i that voter i votes for the incumbent is given by the continuous function

$$\Pi_i = f_i[V_i^1 - V_i^0] \quad (5)$$

where $V_i^J, J=1,0$, denotes the utility that voter i expects to derive when party J implements its platform. The expected total vote for the incumbent is $EV_1 = \sum_i \Pi_i = \sum_i f_i[V_i^1 - V_i^0]$, while for the opposition it is $EV_0 = I - EV_1$, where I is the total number of voters.

The budget constraint of the government requires that public expenditure equal revenue from taxation. Each taxpayer is assumed to pay an income tax at a proportional rate t_i . It is also assumed that the government is able to discriminate perfectly among different tax payers. (The latter assumption is dictated by mathematical necessity rather than choice, since including a self-selection constraint in the present framework introduces intractable polynomials in what follows).

Denoting the unit cost of producing the public good by C , the budget constraint of the government is:

⁷ Another assumption about uncertainty is that it applies at the aggregate level, to knowledge by parties about the distribution of the total vote for each party. See Roemer (2001).

$$CG = \sum_i t_i Y_i, \quad i=1, \dots, I. \quad (6)$$

Given the policy proposals of the opposition, the incumbent party maximizes expected votes EV_1 subject to (6) which yields the following first order conditions for t_i and G , where μ denotes the relevant Lagrange multiplier:

$$(\partial f_i / \partial V_i) (\partial V_i / \partial t_i) = \mu [Y_i + t_i (\partial Y_i / \partial t_i)] \quad I \text{ equations} \quad (7.1)$$

$$\sum_i (\partial f_i / \partial V_i) (\partial V_i / \partial G) = \mu C \quad (7.2)$$

Analogously for the opposition party. Note that in deriving (7.2) it is assumed that the public good does not affect the level of income.

A Nash equilibrium in pure strategies, $\{[t_1^1, \dots, t_I^1, G^1], [t_1^0, \dots, t_I^0, G^0]\}$, defined by the first order-conditions for each party exists if the expected-vote function for each party is continuous on the space of all policies and quasi-concave in its own policy instruments for each given choice of instruments by the other party. We assume this to be the case.

Since the indirect utility function V_i above is concave in each t_i and in G ⁸, concavity of the expected vote function is assured if the concavity of density f_i depends essentially on the concavity of V_i . Such would be the case, for example, if $V_i =$ [a non-random (concave) component of utility + a random component independent of policy choices], with the random element being uniformly distributed, as for example in Coughlin, Mueller and Murrell (1990 a, b). The random element might represent a party's beliefs about how voters assess their credibility and the non-policy characteristics of its candidates.

Since voting depends only on the difference in utilities, the platforms of the parties will be identical in the Nash equilibrium if the expected vote functions are strictly concave in own policy choices. For convenience we make this stronger assumption as well. Party platforms then must converge in the equilibrium (see Enelow and Hinich 1989 for proof, and for further discussion of the concavity issue), and we may drop the subscript denoting party. Alternatively, we may note that since $EV_0 = I - EV_1$, the first order conditions for the opposition are essentially the same as those for the incumbent, since we have assumed common knowledge of voting densities, and hence both parties will choose the same,

politically optimal policies in the Nash equilibrium.

3.3 Electoral equilibrium

Following Coughlin and Nitzan (1981) and Hettich and Winer (1999), the political equilibrium outlined above can be conveniently represented as the solution to the problem of choosing policy instruments to optimise a synthetic political support function

$$S = \sum_i \theta_i V_i \quad (8)$$

subject to the same budget constraint that faces each political party, where $\theta_i \equiv \theta_i' / \sum_i \theta_i'$ and the $\theta_i' = \partial f_i / \partial V_i$ measure the sensitivity of the probability that voter h will vote for the proposed policy at the Nash equilibrium. Note that $\sum_i \theta_i = 1$, so that $\bar{\theta} = 1/I$.

The intuition for this representation theorem is straightforward (see Coughlin 1992 or Hettich and Winer 1999 for proofs): Voters care about their economic welfare. Thus if a party can find a Pareto-improving platform it will advance its electoral chances of success by adopting it. Competition forces the parties to seek out such policies, and in an equilibrium no such platforms remain to be found.⁹

It should be noted that this does not mean that all voters will be treated alike (hence the *weighted* sum of utilities in S). In moving towards the Pareto frontier, parties find it advantageous to give special attention to the demands of voters who are relatively politically sensitive (whose θ_i' is relatively high).

Using the representation theorem, the first order conditions (7.1) and (7.2) at a Nash equilibrium can be written as

$$\theta_i (\partial V_i / \partial t_i) \div [\partial (t_i Y_i) / \partial t_i] = \mu \quad \text{for each } i = 1, 2, \dots, I$$

⁸ Note that $\partial^2 V_i / t_i^2 = -(\alpha + \beta) / (1 - t_i)^2 < 0$ and $\partial^2 V_i / G^2 = -\gamma / G^2 < 0$.

⁹ The support function S is not a social welfare function: Its linear form and the weights in it are determined within the model, and not on the basis of some exogenous social goal or norm. It should also be noted that the efficiency of equilibrium can be relaxed by introducing various kinds of decision externalities. (See for example, Hettich and Winer 1999, chapter 6). We do not consider the implications of this for the size of government here.

$$\sum_i \theta_i (\partial V_i / \partial G_i) \div C = \mu \quad i = 1, 2, \dots, I$$

These conditions replicate the first order conditions for each party at a Nash equilibrium. The former represents the marginal political cost (or loss in votes) per dollar of tax revenue raised from each taxpayer. The latter represents the marginal political benefit (or gain in votes) per dollar of public expenditure. In a political equilibrium, the marginal political loss will be the same across all taxpayers and equal to the marginal political benefit.

Using the indirect utility function (4b) and the derivatives (4c) and 4(d), the above conditions become:

$$\theta_i Y_i / P = \mu [Y_i - P(\alpha + \beta)(t_i / (1 - t_i)^2)] \quad I \text{ equations} \quad (9.1)$$

$$\sum_i \theta_i \gamma = \mu C \quad (9.2)$$

After rearranging as a quadratic equation, (9.1) becomes $(\theta_i - \mu P) Y_i t_i^2 - [(2Y_i(\theta_i - \mu P) - \mu(\alpha + \beta)P^2)] t_i + (\theta_i - \mu P) Y_i = 0$ or, more compactly, $A t_i^2 - [(2A - B)] t_i + A = 0$. The solution for t_i is:

$$t_i = \{(2A - B) \pm \sqrt{[(2A - B)^2 - 4A^2]}\} \div (2A) = \{(2A - B) \pm \sqrt{[B^2 - 4AB]}\} \div (2A) \Rightarrow$$

$$t_i = \{(2A - B) \pm B \sqrt{[1 - 4(A/B)]}\} \div (2A).$$

Using the approximation $\sqrt{1 + px + qx^2} \approx 1 + (p/2)x + (1/2)[q - (p^2/4)]x^2$, with $p = -4$, $x = A/B$ and $q = 0$, we obtain $t_i \approx \{(2A - B) \pm [B - 2A - (2A^2/B)]\} \div (2A)$, which yields the roots $t_{i1} = (\mu P - \theta_i) Y_i / \mu(\alpha + \beta) P^2$ and $t_{i2} = 2 - [\mu(\alpha + \beta) P^2 / (\theta_i - \mu P) Y_i] + [(\theta_i - \mu P) Y_i / \mu(\alpha + \beta) P^2]$ ¹⁰

Before proceeding we check whether a unique economic solution can be obtained. Assuming that $0 < t_{i1} < 1$, t_{i2} can be a second acceptable solution if also $0 < t_{i2} < 1$. Noting that $t_{i2} = 2 + (1/t_{i1}) - t_{i1}$, or equivalently, $t_{i2} = -(t_{i1}^2 - 2t_{i1} - 1) / t_{i1}$, after the relevant manipulations we obtain that for $t_{i2} > 0$ it must be $0 < t_{i1} < 1$, and that when $t_{i2} < 1$, it must be that $t_{i1} > (1 + \sqrt{5}) \div 2 > 1$. We can then be certain that when $0 < t_{i1} < 1$, t_{i2} is not an acceptable root. Therefore in what follows we focus on t_{i1} .

¹⁰ A similar problem of dealing with two roots arises in the work of Meltzer and Richard (1981) and

Noting that $\sum_i \theta_i = 1$, using the budget constraint (6) and substituting in (9.2) we have that $\mu = \gamma / \sum_i t_i Y_i$. Inserting t_{i1} from the above in this and solving for μ we have that $\mu = [(\alpha + \beta)P^2 \gamma + \sum_i \theta_i Y_i^2] / P \sum_i Y_i^2$.

To solve for t_{i1} and G , we then substitute into the expression for t_{i1} , and then use (6) to solve for G . Denoting $\sigma_{\theta Y}^2 \equiv \text{covariance}(\theta_i, Y_i^2)$, $\sigma_Y^2 \equiv \text{variance}(Y_i)$ and $\bar{Y} \equiv \sum_i Y_i / I$ (the mean value of Y_i), and noting that $\sum_i \theta_i Y_i^2 = (I \sigma_{\theta Y}^2 + \sigma_Y^2 + \bar{Y}^2)$ and $\sum_i Y_i^2 = I(\sigma_Y^2 + \bar{Y}^2)$, we have that:

$$t_{i1}^* = \frac{(\alpha + \beta)\gamma P^2 + I \sigma_{\theta Y}^2 + (\sigma_Y^2 + \bar{Y}^2)I(\bar{\theta} - \theta_i)}{(\alpha + \beta)\gamma P^2 + I \sigma_{\theta Y}^2 + \sigma_Y^2 + \bar{Y}^2} \frac{Y_i}{(\alpha + \beta)P} \quad (10)$$

$$G^* = \frac{\gamma I (\sigma_Y^2 + \bar{Y}^2)}{(\alpha + \beta)\gamma P^2 + I \sigma_{\theta Y}^2 + \sigma_Y^2 + \bar{Y}^2} \frac{P}{C} \quad (11)$$

In the equilibrium, tax rates depend on: the size and distribution of income, represented respectively by \bar{Y} and σ_Y^2 ; the number of voters taxpayers I ; consumer tastes for leisure β (and therefore indirectly for private goods) and for the public good γ ; household productivity in home production α ; the political influence of the voter in comparison to the mean political influence, $\bar{\theta} - \theta_i$; the distribution of political influence in relation to the distribution of income, captured by $\sigma_{\theta Y}^2$; and the price of private consumption P .

The provision of the public good G also depends on the same set of factors except for the political weights by themselves θ_i . Given the structure of our model, where G is jointly and uniformly consumed by all voters and utility is separable in G , the political weights θ_i do not affect the equilibrium level of public expenditure by themselves - only their covariance with income, $\sigma_{\theta Y}^2$, does. In what follows special attention is given to the role of the covariance of influence and income which, as we shall see, does not enter the median voter analogue to the present model.

It is interesting to note that in the optimal tax literature, the analogue of $\sigma_{\theta Y}^2$ is referred to as the covariance of the “social valuation of income” and taxpayer income, and is determined by social justice criteria. In the present setting, $\sigma_{\theta Y}^2$ reflects how voter income

Cukierman and Meltzer (1991).

and political influence vary in relation to each other, and is determined within the model by voting densities and the factors determining the distribution of income. We are aware that in a more complex model, this covariance may depend on a variety of institutional and political factors.

4. The Relative Size of Government and Implications of the Integrative Model for Empirical Research

The relative size of the public sector in the integrative model may be defined as $s \equiv CG / I \bar{Y} = (1/I)(G / \bar{y})(C/P)$ where \bar{y} is average real income, which upon substituting from (11) and rearranging gives:

$$s^* = \frac{\gamma P (\sigma_Y^2 + \bar{Y}^2)}{[(\alpha + \beta) \gamma P^2 + I \sigma_{\theta Y}^2 + \sigma_Y^2 + \bar{Y}^2] \bar{Y}} \quad (12)$$

Here the main determinants of s^* are: consumer tastes; consumer productivity in home production; mean income; income inequality (captured by the variance of the distribution of income, σ_Y^2); and political inequality in relation to income inequality (captured by the covariance, $\sigma_{\theta Y}^2$).

4.1 Comparative statics and empirical work

We proceed to investigate the comparative static properties of (12), both as a way of understanding the model and as a basis for drawing out implications of the model for empirical work. Further understanding of the integrative model is provided in the next section by contrasting the solution for the relative size of government in (12) with that in comparable median voter and Leviathan frameworks.

Differentiating (12) with respect to mean income, we have that:

$$1. \text{ Sign } (\partial s^* / \partial \bar{Y}) = \text{ Sign } \{ [P^2 \gamma (\alpha + \beta) + I \sigma_{\theta Y}^2] (\bar{Y}^2 - \sigma_Y^2) - (\sigma_Y^2 + \bar{Y}^2)^2 \} = ?$$

In the present framework, the effect of an increase in mean income on the size of government is ambiguous: it depends on the relative strength of the taste, inequality and income factors identified here. This result stands in contrast to Wagner's law of increas-

ing state activity: that as per capita income increases, the share of public expenditure in income increases too.

The complexity of this comparative statics result offers a possible explanation of the wide variety of often conflicting income elasticity estimates which have been reported in the empirical literature. It is possible that some of the variation arises from the failure to, or difficulties of controlling for all of the factors that determine the effect of changes in average income and that play a role in determining the size of government in the present, more general, setting.

$$2. \quad \text{Sign} (\partial s^*/\partial \alpha) = \text{Sign} \{ -\gamma P^2 s^* / [(\alpha+\beta)\gamma P^2 + I \sigma_{\theta Y}^2 + \sigma_Y^2 + \bar{Y}^2] \} < 0$$

The less productive the household in home production, the larger the relative size of government. This result provides a formalization of the 'supply side' explanation of government growth, proposed in empirical studies by Kau and Rubin (1981, 2002). Technological progress in the formal market sector, which can be interpreted as a fall in α , causes household labour supply in the informal sector to fall and labour supply in the formal sector to increase. This in turn increases tax revenue and reduces the excess burden of taxation; as a result the income tax base available to finance public expenditure increases.

$$3. \quad \text{Sign} (\partial s^*/\partial \beta) = \text{Sign} \{ -\gamma P^2 s^* / [(\alpha+\beta)\gamma P^2 + I \sigma_{\theta Y}^2 + \sigma_Y^2 + \bar{Y}^2] \} < 0$$

That is, the stronger the preference for *leisure*, the smaller the relative size of government. The effect is exactly the same as that when α changes, and for the same reason. Thus if one estimates a non-linear regression equation based on (12), it will not be possible to distinguish whether the parameter on P^2 reflects the technological coefficient by which households “transform” time into output α , or the preference for leisure β . This raises the question of exactly what is captured in empirical studies, such as that of Kau and Rubin, which show that growth of government is strongly related to entry of women into the labour force.

$$4. \quad \text{Sign} (\partial s^*/\partial \gamma) = \text{Sign} \{ I \sigma_{\theta Y}^2 + \sigma_Y^2 + \bar{Y}^2 \} > 0$$

The stronger the preferences for the public good, the larger the relative size of government, since $I\sigma_{\theta Y}^2 + \sigma_Y^2 + \bar{Y}^2 = \sum_i \theta_i Y_i^2 > 0$. Hence an increase in the intensity of the taste for the public good will unequivocally increase the relative size of the public sector, a result which accords well with the intuition of demand theory.

$$5. \quad \text{Sign} (\partial s^*/\partial P) = \text{Sign} \{ I\sigma_{\theta Y}^2 + \sigma_Y^2 + \bar{Y}^2 - (\alpha + \beta)\gamma P^2 \} = ?$$

This result bears on Baumol's (1967, 1993) productivity effect and empirical work that has attempted to investigate its strength. Whether a decrease in the relative price of private consumption, as might follow productivity advance in the private sector that is faster than in the public sector, increases the relative size of government is ambiguous, and depends on the strength of political inequality, the variance of income, mean income, the strength of preferences for private and public goods and the productivity of home production.

It should be noted that the way the productivity effect is captured here differs from the standard approach in the literature. Studies of government expenditure growth typically specify an equation of the form $\ln G = c_0 + e_p \ln P_G + e_Y \ln Y + \dots$ (e.g. Borchering 1985, Mueller 2003). If the price of public services P_G rises (equivalently, P in our model falls) and demand is price inelastic ($-1 < e_p < 0$), then public expenditure grows in relative terms. If growth in income is also taken into account the relative size of government output will increase when the income elasticity exceeds the absolute value of the price elasticity of demand for G ¹¹.

From equation (11) above, the equilibrium price elasticity of G is -1 , which is the result of the log-linearity of the utility function, so the productivity effect, if it leads to a larger public sector, cannot work through this elasticity in the present model. Comparative statics result 5 postulates a more complicated relationship between the relative size of

¹¹ Assume that labour is the only input into both the private and the public sector and that labour productivity in the private sector rises by r while it does not rise at all in the public sector (that is, $Q_t = e^{rt} L_{Qt}$ and $G_t = L_{Gt}$, where e = the basis of natural logs and t = time). With $W = W_0 e^{rt}$, we have that $P_G = W L_{Gt} / G_t = W_0 e^{rt}$, which rises through time at the rate r , while the price of Q remains constant. Similarly, real income $Q + P_G G = e^{rt} L_{Qt} + e^{rt} L_{Gt}$ rises at the rate r . From $\ln G = c_0 + e_p \ln P_G + e_Y \ln Y$ we have that the rate of growth of G is $d \ln G = (dG/G) = e_p (dP_G/P_G) + e_Y (dY/Y)$. Hence, $dG/G = (e_p + e_Y) r$ which is greater, smaller or equal to zero as the absolute value of e_Y is greater, smaller or equal to e_p . That is, if the income elasticity of demand for government sector output exceeds the absolute value of the price elasticity of demand for government output, the rate of growth of government output exceeds the rate of growth of income and, consequently, the relative size of government will be increasing as the economy grows.

public expenditure and the productivity lag than that described in standard demand specifications. One may note that the ambiguity of the effect of a change in the price of public consumption on the size of government has been acknowledged before in the literature. Kenny (1978) shows that whether an increase in income will increase the growth of public consumption, depends on the strength of the income elasticity of demand and the elasticity of substitution between private and public consumption. However in his model, the increase in the price of public consumption is attributed to an increasing voter income only, rather than the broader set of changes in technology and costs identified here, which may occur independently of changes in income. Again, as for work on Wagner's Law, and in view of the difficulties of controlling for all of the factors that determine the effect of changes in relative prices, it is not surprising that empirical estimates will vary from study to study.

$$6. \quad \text{Sign } (\partial s^*/\partial \sigma_Y^2) = \text{Sign } \{(\alpha+\beta)\gamma P^2 + I\sigma_{\theta Y}^2\} = ?$$

Whether a mean preserving increase in income inequality increases the relative size of government depends on the relative strength of preferences and productivity in home production and on the covariance of political influence and income.

With $\sigma_{\theta Y}^2 \geq 0$, so that influence is distributed in a pro-rich manner, $\partial s/\partial \sigma_Y^2 > 0$. A related analytical result - which, however, omits the role of $\sigma_{\theta Y}^2$ - is found by Cukierman and Meltzer (1991) using a median voter model with a tax schedule that is quadratic ($T = -r + tY + aY^2$), and where all taxpayers face the same tax and transfer parameters. Both here and in the earlier model, this result occurs because the structure of the equilibrium tax structure is such that as the variance of income increases, the government gets more taxes from the rich than it loses from the poor following a mean preserving increase in income inequality. (This interpretation is supported by the comparison of models in section 5).

For values of the covariance such that $\sigma_{\theta Y}^2 < -(\alpha+\beta)\gamma P^2 / I$, then $(\partial s^*/\partial \sigma_Y^2) < 0$. In this case, politically influential and now poorer voters use their influence to insure that the public sector does not divert income away from their consumption of desired privately supplied goods. Accordingly, as the condition above indicates, the stronger the taste for public goods (γ), the more pro-poor must the distribution of influence be for this particular result to hold.

Cross-national regressions of the effect of inequality on size of government (see, for example, the simple regression in Bjorvatn and Cappelen (2003) for a sample of OECD countries) show that more inequality, as measured by the pre-tax income GINI coefficient, is associated with *smaller* government.¹² (Here one immediately thinks of the United States which has a relatively high GINI and also a relatively small s). The sign of the coefficient on the income GINI could be a reflection of the comparative static result for σ_Y^2 with sufficiently small $\sigma_{\theta Y}^2$. This explanation requires that all or most countries in the sample have similar pro-poor distributions of influence. A quite different, and perhaps more likely, explanation for the regression result is that countries with more unequal income distributions also have more pro-rich distributions of political influence. In this case, the income GINI in a cross-section of countries may just be a proxy for the role of the covariance of income and influence, which is discussed immediately below.

$$7. \quad \text{Sign} \left(\frac{\partial s}{\partial |\sigma_{\theta Y}^2|} \right) = \text{Sign} \left\{ -\gamma P(\sigma_Y^2 + \bar{Y}^2) \right\} < 0$$

The more unequal the distribution of political influence *in relation to* the distribution of income, the higher the relative size of government. This effect is stronger the greater is the variance of incomes because of the interaction of income inequality, tax structure and government size reflected in result 6. The role of the covariance of influence and income is not at all surprising, but it cannot be revealed in a median voter framework, where one voter is politically decisive, and it is useful to remember this when studying growth in government in situations where political influence is skewed or where its distribution is changing.

For example, let us compare two states. In the first state there is complete political equality, so that the distribution of political power is independent of the distribution of income and hence $\sigma_{\theta Y}^2 = 0$. In the second the political arrangements have redistributed power in favour of the lower income groups, so that $\sigma_{\theta Y}^2 < 0$. Our model predicts that the latter state will be characterised by a larger public sector as a result of the greater extent to which lower income voters use the fiscal system to coercively redistribute in their favour. Result 7 thus replicates analytically the empirical regularity documented in the work of Mueller and Stratmann (2003) that the size of government rises with political participation, assuming that such participation involves greater numbers of the poorer

¹² In the integrative model used here, the variance of incomes arises endogenously, rather than the GINI coefficient, even though the latter is a better measure of income inequality.

voters engaging in political activity. It is also consistent with the work of Husted and Kenny (1997) and Lott and Kenny (1999) on the effects of the extension of the franchise.

Considering results 6 and 7 together suggests that empirical work, whether using cross-section, time series or pooled data should include both a measure of the distribution of income as well as a measure of the covariance of influence and income (or political participation) in the *same* regression for the size of government. To our knowledge, such work has not yet been attempted.

Finally, we turn to a complication in the analysis of comparative static results 6 and 7 that is not explicitly reflected in the present model. With the exception of the case where income and political influence are distributed independently, a change in income inequality within a country will also involve a change in $\sigma^2_{\theta Y}$ ¹³. Since the equilibrium size of government depends both on income inequality and on how income varies in relation to political influence, a change in the variance of income will thus affect the size of government through two routes: a direct route captured by result 6, and an indirect route operating through result 7.

It is instructive to trace the full effect of a change in income inequality allowing for this complication. Assuming first $\sigma^2_{\theta Y} > 0$, a mean preserving fall in σ^2_Y will decrease the size of government (the 'direct' effect, due to the connection between the variance of incomes and tax revenues). But, keeping political weights fixed, the fall in the variance implies that the covariance of incomes and influence decreases as influence and income is reshuffled among the same voters, leading to an 'indirect effect': at each level of influence, people find their interests have now changed and the parties will respond accordingly by increasing government size.

¹³ This can be seen from the relevant formulas for variance and covariance, $\sigma^2_Y = (\sum_i Y_i^2 / I) - \bar{Y}^2$ and $\sigma^2_{\theta Y} = (\sum_i \theta_i Y_i^2 / I) - (\sum_i \theta_i / I)(\sum_i Y_i^2 / I)$, where the political weights remain constant as the distribution of Y_i changes. It is probably best shown by using a simple numerical example. Let us suppose a three-voter economy, where the poor are more sensitive politically (this is the most complicated case). The incomes and respective political weights (Y_i, θ_i) of the three voters are assumed to be (5, 0.5); (8, 0.3) and (14, 0.2). The corresponding income variance and income – influence covariance are $\sigma^2_Y = 14$ and $\sigma^2_{\theta Y} = -8.05$. Consider a mean preserving increase in the variance of income, so that the income – influence pairs become (4, 0.5); (8, 0.3) and (15, 0.2). It is easily checked that the resulting income variance and income – influence covariance become $\sigma^2_Y = 20.66$ and $\sigma^2_{\theta Y} = -9.82$, so that the mean preserving increase in the variance of income is followed by a fall in the covariance of income and influence. Since the political weights are endogenous they may also change as the distribution of income varies, so that the final effect on the covariance may differ from that suggested by the numerical example. The latter, nevertheless, does not negate the predicted change in $\sigma^2_{\theta Y}$ following the change in σ^2_Y .

Similarly, assuming a sufficiently negative covariance ($\sigma_{\theta Y}^2 < -(\alpha+\beta)\gamma P^2/I$), a mean preserving fall in σ_Y^2 will increase the size of government via interaction with tax structure and revenue, and will also reduce the absolute value of the covariance of influence and income which tends to decrease the size of government in this case. These combined effects of a change in income inequality on the equilibrium size of government under the different assumptions are summarised in Table 1.

Table 1. The Effects of Income Inequality on the Size of Government

Assume	$\sigma_{\theta Y}^2 > 0$			
Then as	$\sigma_Y^2 \downarrow \Rightarrow$	\Rightarrow	$s^* \downarrow$	(direct effect – result 6)
	$\Rightarrow \sigma_{\theta Y}^2 \downarrow \Rightarrow$	\Rightarrow	$s^* \uparrow$	(indirect effect – result 7)
Assume	$\sigma_{\theta Y}^2 < -(\alpha+\beta)\gamma P^2/I < 0$			
Then as	$\sigma_Y^2 \downarrow \Rightarrow$	\Rightarrow	$s^* \uparrow$	(direct effect – result 6)
	$\Rightarrow \sigma_{\theta Y}^2 \downarrow \Rightarrow$	\Rightarrow	$s^* \downarrow$	(indirect effect – result 7)

In both cases the two effects oppose each other, and whether the final outcome will be an increase or decrease in the size of government becomes in practice an empirical issue¹⁴. The empirical consequences of the relationship between the distributions of income and of influence are not known.

5. Comparison with the Median Voter and Leviathan

Since the present framework is one of multi-dimensional policy choices, the median voter theorem is not applicable. There are two ways around this problem if we want to do a comparative analysis of the models as a way of understanding how the integrative model differs from extant models in the literature.

We can assume some sort of imposed separation of dimensions (e.g., due to the operation

¹⁴ Basset, Burkett and Putterman (1999) have also considered these two effects informally in their empirical work. In terms of our model, their argument supposes a positive covariance between income and political influence and assumes that income equality increases. We can see from Table 1, that these assumptions imply that there are then two opposing factors in operation.

of legislative rules), and assume that there is a median income voter equilibrium in each policy dimension treated separately. Or, we can simplify the probabilistic voting model by assuming there is a single income tax rate and a single level of public expenditure, with the two related through the government budget constraint. In this case, the median voter theorem is also valid, and it seems reasonable then to compare the resulting equilibria. We proceed with the latter line of inquiry.

With one tax rate, the budget constraint of the government is now

$$CG = \sum_i tY_i, \quad i=1,\dots,I. \quad (5')$$

Here the tax rate t is also equal to the relative size of government; $t = CG / \sum Y_i$. In the probabilistic voting setting, the equilibrium can again be determined by maximizing $S = \sum_i \theta_i V_i$, subject to (5'). Working in a manner similar to the one described above, after the relevant manipulations, we obtain the simplified probabilistic voting equilibrium tax rate as

$$t^* = \frac{\gamma P \bar{Y}}{(\alpha + \beta) \gamma P^2 + I \sigma_{\theta Y}^2 \bar{Y} + \bar{Y}^2}, \quad (13)$$

where this time $\sigma_{\theta Y}^2$ is the covariance between θ_i and Y_i . Thus the politically optimum income tax rate, and thus the relative size of public expenditure, depends positively on the consumer tastes for the public good, and negatively on the parameters of taste for leisure, the productivity in home production and the covariance between income and political power. The latter implies that in electorates where the rich have more political influence than the poor, the income tax rate will tend to be lower and vice versa. Here the effect of an increase in mean income is ambiguous, since $\text{sign}(\partial t^* / \partial \bar{Y}) = \text{sign}(\gamma P [\gamma(\alpha + \beta) P^2 - \bar{Y}^2])$. All these results are identical to those obtained from equation (12). However, in contrast to the multi-tax rate setting, in the present simplified case the equilibrium tax rate is independent of the variance of income σ_Y^2 , since the latter cannot be as fully taken into account in the setting of a single rate.

It is also interesting to note that it does not appear possible to establish whether the size of government will be higher when the tax system discriminates among taxpayers, or when there is a single flat rate, except when there is no correlation between influence and

income. Assuming that mean income is the same under the two versions of the probabilistic model¹⁵, upon comparison of equations (12) and (13), we obtain that (where $\sigma_{\theta Y}^2$ is the covariance between θ_i , and Y_i^2 from equation (12))

$$\text{sign} \{s^* - t^*\} = \text{sign} \{[(\alpha+\beta)\gamma P^2 + I \bar{Y}[\sigma_{\theta Y}^2(\sigma_Y^2 + \bar{Y}^2) - \bar{Y}\sigma_{\theta Y}^2] \},$$

which cannot be signed unambiguously. If income and influence are independent, then a situation with the more complex tax system will clearly lead to a larger public sector. But this sort of independence would be an unusual situation in advanced democratic societies.

Now we derive the median voter analogue to (13). In a median voter context, the Condorcet winner maximises the utility function of the median voter V^M , subject to the budget constraint (5'). In the present model, there is an one-to-one relationship between voter income and the tax rate that maximises utility: $t^i = \gamma P \bar{Y} / [(\alpha+\beta)\gamma P^2 + \bar{Y}Y^i]$.

If the median voter has median income, the median voter analogue to (13) is

$$t^M = \frac{\gamma P \bar{Y}}{(\alpha+\beta)\gamma P^2 + \bar{Y}Y^M} \quad (14)$$

This result can also be thought as a special case of the probabilistic voting equilibrium, where $\theta_M = 1$ and $\theta_i = 0$ for all $i \neq M$, so that only the preferences of the median count in determining public policy, while those of all other voters are ignored. Note that the variance of income does not enter, but its skewness as represented by the ratio of mean to median income does.

As before, the tax rate (14) and size of government depends positively on the taste for public goods, and negatively on the parameters of taste for leisure and the productivity in home production. On the other hand, contrary to (13), we obtain that the sign of $(\partial t^M / \partial \bar{Y}) = \text{sign} (\gamma^2(\alpha+\beta)P^3)$, which is unambiguously positive, as is required for Wagner's law. This is a standard median voter result, where an increase in mean income relative to a given median leads the decisive voter to choose an increase in taxation and public expenditure in order to coercively redistribute income in his or her favour.

¹⁵ Actually solving out for the tax rates in each case is not possible here, since doing so involves

Assuming that mean income is the same under both the probabilistic – single tax rate equilibrium and the median voter equilibrium¹⁶, by comparing (13) and (14) we obtain that

$$t^M \geq t^* \quad \text{when} \quad \gamma P \bar{Y}^2 [(\bar{Y} - Y^M) + I\sigma_{\theta Y}^2] \geq 0.$$

Since in practice the distribution of income is positively skewed, $\bar{Y} > Y^M$. Thus the above expression implies that when the rich have more political influence than the poor, or when income and political influence are distributed independently of each other, that is, when $\sigma_{\theta Y}^2 \geq 0$, the median voter equilibrium will result in a larger income tax rate, and correspondingly larger size of the public sector, than will the comparable probabilistic voting equilibrium constrained so that there is only one tax rate. The reason is that when the rich wield relatively more political influence, they protect their wealth by securing a lower tax rate and government size than would have prevailed if the preferences of the (poorer) median voter were decisive. Once again we see the difference between a model where one voter is decisive, and one where political influence is effectively spread more widely in the electorate.

5.2 *Comparison with Leviathan*

To complete the comparative analysis, we derive the equilibrium tax rates that would prevail under a Leviathan-type government and compare the equilibrium with that of the probabilistic voting model. A Leviathan government is defined as one which sets tax rates (one for each person) at the levels which maximise tax revenue, irrespective of voter demands for public expenditure. The government is only constrained by the efficiency cost of taxation which adversely affects the size of the tax base. Existence of a voting equilibrium is not an issue in this framework.

If Leviathan is assumed to discriminate perfectly between different taxpayers and charge each one of them a different tax rate, its maximisation problem is formally expressed as choosing the t_i values which maximise $R = \sum_i t_i Y_i$. Differentiating tax revenue with

solving polynomials of third degree.

¹⁶ The caveat of the previous footnote applies again.

respect to each tax rate, recalling that Y_i is endogenous in t_i , and assuming for convenience that tax bases are independently determined, we obtain that for each i ¹⁷

$$t_i^L = \frac{Y_i}{(\alpha+\beta)P} \quad (15)$$

Given the separability between private consumption and public goods in the utility function (1), the labour supply function is independent of γ , so that Leviathan tax rates are independent of consumer tastes for the public good. As a result, Leviathan, who is only interested in maximizing the tax revenue extracted, does not care about the provision of public goods.

The relative size of Leviathan, $s^L = \sum_i t_i Y_i / \sum_i Y_i$, is:

$$s^L = \frac{\sigma_Y^2 + \bar{Y}^2}{(\alpha+\beta)P \bar{Y}} \quad (16)$$

s^L is increasing in mean preserving changes in income variance, but ambiguous in the level of mean income. Assuming again identical mean incomes for the probabilistic and Leviathan equilibrium, comparison of equations (12) and (16) yields

$$\text{Sign} (s^L - s^*) = \text{sign} \{ (\sigma_Y^2 + \bar{Y}^2)(I\sigma_{\theta Y}^2 + \sigma_Y^2 + \bar{Y}^2) \} > 0$$

which implies sensibly that the relative size of the public sector is larger under Leviathan than in a competitive political system.

If a single flat tax rate is somehow imposed on Leviathan, as Buchanan and Congleton (2000) recently propose, its problem then is to choose the value of t which maximises $R = t \sum_i Y_i$. After the relevant manipulations this problem yields

$$t^L = \frac{\bar{Y}}{(\alpha+\beta)P} \quad (17)$$

¹⁷ Note that Leviathan in the present setup will never operate on the backward bending part of any Laffer curve.

In this case, the size of government varies positively with the size of mean income and is independent of income inequality: when one rate is imposed, there is nothing that can be gained by playing on the fact that taxpayers' behaviour varies with the distribution of income and, as a result, $t^L < s^L$.

Finally, comparing equations (13), (14) and (17), and assuming average income is the same across models, we see that $t^L > t^M > t^*$. Since Leviathan always imposes a higher tax rate than will occur in either the median voter or the probabilistic voting models, and higher rates reduce income, the full equilibrium rates will be closer together than is implied by a comparison at a common average income.

Our comparative analysis of the different models is summarized in Figure 1. The figure presents an approximate comparison of the models, because equilibrium average income and the Laffer curve is assumed to be the same in each case, and because no allowance is made for the change in the covariance of income and influence when the variance of income changes. Assuming a positive covariance of income and political influence, an increase in its value decreases the equilibrium rate of taxation under probabilistic voting and the same change leaves the median and Leviathan equilibria unaffected, as shown in the Figure. The figure also illustrates the positive effect of an increase in the variance of income on the size of government in probabilistic and Leviathan models, while in the median voter model this variance plays no role.

6. Concluding Remarks

In this paper we investigate the interaction of 'demand', 'supply' and 'political influence' in determining the size of government, and draw out some of the implications of this integrative framework for the interpretation of extant analytical and empirical results.

The analysis emphasizes that government growth is a more complex phenomenon than implied by any one of the accounts we have considered on its own. In the more general model, where a political equilibrium reflects a balancing of heterogeneous interests in the electorate, the relative size of the public sector depends on preferences for leisure and public goods, productivity in home production, mean income, income inequality (captured by the variance of the distribution of income) and of particular interest, political

inequality in relation to income inequality reflected here in the covariance of political influence and the square of income. In this world, it is not surprising that studies which make use of data from different political jurisdictions, and which do not control for all of these factors, reach various conclusions regarding Wagner's law or the role of the distribution of income.

In contrast to the median voter models in the Meltzer and Richard (1981, 1983) tradition, we generalise the effect of income inequality on government size (captured in median voter models by the median to mean income ratio), by showing the importance of the variance of the distribution of income as well as its skewness. The variance enters as a result of the interaction of 'demand', the structure of taxation and the size of total tax revenues. In comparison to supply-side formulations in existing empirical work, we explore a model that formalises the market – nonmarket structure of individual economic activity and the consequences of the latter for raising tax revenue. Here we see that home productivity and the preference for leisure play similar roles, raising questions about the interpretation of existing empirical results. In comparison to probabilistic models of fiscal systems, such as that of Hettich and Winer (1988, 1999), the present study extends this mode of inquiry to include coercive redistribution. This synthetic approach leads to the analysis of the interaction of the distributions of income and influence and the structure of taxation in determining the relative size of government.

Even in the simple framework we have constructed, the size of government is a complex phenomenon, where several determinants that can be expected to vary across political jurisdictions or over time play important roles. While the existing literature on demand, supply and political influence has provided several insights concerning the size and growth of government, there appears to be ample room for additional empirical work accounting for the role of all of the factors underlying the growth of government that are identified here.

References

- Austen-Smith, David (2000). "Redistributing income under proportional representation". *Journal of Political Economy*, 108: 1235-1269
- Basset, William, F, John, P. Burkett and Louis, Putterman. (1999). "Income distribution, government transfers and the problem of unequal influence". *European Journal of Political Economy* 15: 207-228.
- Baumol, William J. (1967). "Macroeconomics of Unbalanced Growth: The Anatomy of Urban Crisis." *American Economic Review*, June, 415-426.
- Baumol, William J. (1993). "Health care, education and the cost disease: A looming crisis for public choice". *Public Choice* 77: 17-28.
- Baqir, Reza (2002). "Districting and government overspending". *Journal of Political Economy*, 110: 1318-1354.
- Becker, Gary, S. and Casey, B. Mulligan. (1998). "Deadweight costs and the size of government". National Bureau of Economic Research Paper #6789, Cambridge, MA.
- Bergstrom, Theodore C. and Robert P. Goodman (1973). "Private Demands for Public Goods," *American Economic Review* 63(3) (June): 280-96.
- Bird, Richard (1970). *The Growth of Government Spending in Canada*. Toronto: Canadian Tax Foundation
- Bjorvatn, Ketil, and Alexander, W. Cappelen (2003) "Redistributive tax policies and inequality: An assessment of recent country comparative studies". CESifo, DICE Report 1(1), Munich.
- Boadway, Robin, and Michael, Keen (2000). "Redistribution". In Anthony A. Atkinson and François Bourguignon, *Handbook of income distribution*, Elsevier, Vol.1: 677-789.
- Borcherding, Thomas F. and Robert T. Deacon (1972). "The Demand for the Services of Non-Federal Governments," *American Economic Review*, 62 (December): 891-901.
- Borcherding, Thomas, E. (1985). "The cause of government expenditure growth: A survey of the US evidence", *Journal of Public Economics*, 28: 359-382.
- Borcherding, Thomas, E., J. Stephen, Ferris and Andrea Garzoni. (2003). "Growth in the real size of government: 1970-1997". In Wagner and Backhaus (eds) *Handbook of Public Finance*. Kluwer Academic. Forthcoming.
- Brennan, Geoffrey and James, Buchanan (1980). *The Power to Tax: Analytical foundations of a Fiscal Constitution*. Cambridge University Press.
- Congleton, Roger, D. 1991. "Ideological conviction and persuasion in the rent-seeking society", *Journal of Public Economics*, 44: 55-86
- Courakis, Anthony, S., Fatima, Roque-Moura and George, Tridimas. (1993). "Public expenditure growth in Greece and Portugal: Wagner's Law and beyond". *Applied*

Economics, 25: 125-134.

Coughlin, Peter, J. and Shmuel, Nitzan (1981). "Electoral outcomes with probabilistic voting and Nash social welfare maxima", *Journal of Public Economics*. 16: 113-122

Coughlin, Peter J., Dennis C. Mueller and Peter Murrell (1990a). "Electoral politics, interest groups and the size of government". *Economic Inquiry*, 28(4): 682-705.

Coughlin, Peter J., Dennis C. Mueller and Peter Murrell (1990b). "A model of electoral competition with interest groups". *Economic Letters*, 32 (April): 307-11.

Cukierman, Alex and Alan H. Meltzer, (1991). "A political theory of progressive income taxation. in Meltzer, Alan, H., Alex Cukierman and Scott F. Richard. *Political Economy*. Oxford University Press: 77-108.

Dixit, Avinash and Agnar, Sandmo (1977). "Some simplified formulae for optimal income taxation", *Scandinavian Journal of Economics*, 49: 417-423.

Downs, Anthony (1957). *An Economic theory of Democracy*. New York: Harper and Row.

Enelow, James M. and Melvin J. Hinich (1989). "A General Probabilistic Spatial Theory of Elections, " *Public Choice*, 61(2): 101-13.

Ferris, Stephen and Edwin, G. West (1996). "Testing theories of government size: U.S. experience, 1959-89". *Southern Economic Journal*, 62: 537-553

Gans, J.S and M. Smart (1996). "Majority voting with single-crossing preferences" *Journal of Public Economics*, 59: 219-237.

Gemmel, Norman. (1990). "Wagner's law, relative prices and the size of the public sector". *The Manchester School*, 58: 361-377.

Hinich, Melvin, J. (1977). "Equilibrium in spatial voting: The median voter is an artifact". *Journal of Economic Theory*, 16: 208-219.

Hinich, Melvin J. and Michael C. Munger (1997). *Ideology and the Theory of Political Choice*. University of Michigan Press.

Hettich, Walter and Stanley, L. Winer (1999). *Democratic Choice and Taxation: A Theoretical and Empirical investigation*. Cambridge University Press.

Holsey, Cheryl, M. and Thomas, E. Borcherding (1997). "Why does government's share of national income grow? An assessment of the recent literature on the US,". In Dennis, C. Mueller (ed.), *Perspectives on Public Choice. A Handbook*, Cambridge University Press, 562-591,

Hotte, Louis and Stanley, L. Winer (2001). "Political influence, economic interests and endogenous tax structure in a computable equilibrium framework: With application to the United States, 1973 and 1983". *Public Choice* 109: 69-99.

Husted, Thomas, A. and Lawrence, W. Kenny (1997). "The effects of the expansion of

the voting franchise on the size of government". *Journal of Political Economy*, 105: 54-82.

Kau, James, B. and Paul, H. Rubin (1981). "The size of government". *Public Choice*, 37: 261-274.

Kau, James, B. and Paul, H. Rubin (2002). "The growth of government: Sources and limits". *Public Choice*, 113: 389-402.

Kenny, Lawrence, W. (1978). "The collective allocation of commodities in a democratic society: A generalization". *Public Choice*, 33: 117-120.

Kenny, Lawrence, W and Stanley, L. Winer (2002). "Tax systems in the world: An empirical investigation into the importance of tax bases, collection costs and political regime" paper presented to the 2001 Congress of the International Institute of Public Finances, Linz, Austria.

Kristov, Loenzo, Peter Lindert & Robert McClelland (1992). "Pressure groups and redistribution". *Journal of Public Economics*, 48: 135-163.

Lott, John, R. Jr. and Lawrence, W. Kenny (1999). "Did women's suffrage change the size and scope of government". *Journal of Political Economy*, 107: 1163-1198.

Meltzer, Alan, H and Scott, F. Richard (1981). "A rational theory of the size of government". *Journal of Political Economy*, 89: 914-927.

Meltzer, Alan, H and Scott, F. Richard (1983). "Tests of a rational theory of the size of government". *Public Choice*, 41: 403-418.

Milesi-Ferretti, Gian Maria, Roberto Perotti and Massimo Rostagno (2002). "Electoral systems and public spending". *Quarterly Journal of Economics*, 117: 609-657.

Mirrlees, James, A. (1971). "An exploration in the theory of optimum income taxation". *Review of Economic Studies*, 38: 175-208.

Mueller, Dennis, C. (2003). *Public Choice III*, Cambridge University Press.

Mueller, Dennis, C. and Thomas, Stratmann (2003). "The economic effects of democratic participation". *Journal of Public Economics* 87: 2129-2155.

Peacock, Alan and Jack Wiseman (1967). *The Growth of Public Expenditure in the United Kingdom*. London: George Allen and Unwin.

Peacock, Alan and Alex, Scott. (2000). "The curious attraction of Wagner's law". *Public Choice*, 102: 1-17.

Persson, Torsten and Guido, Tabellini (1999). "The size and scope of government: Comparative politics with rational politicians". *European Economic Review*, 43: 699-733.

Persson, Torsten, Gerard Roland and Guido Tabellini.(2000). "Comparative politics and public finance", *Journal of Political Economy*, 108: 1121-1161.

Ram, Rati. (1987). "Wagner's hypothesis in time-series and cross-section perspectives: Evidence from 'real' data for 115 countries", *Review of Economics and Statistics*, Vol. 67, 194-204.

Roberts, Kevin, W.S. (1977) "Voting over income tax schedules". *Journal of Public Economics*, 8: 327-340.

Roemer, John (2001). *Political Competition: Theory and Application*. Harvard University Press.

Romer, Thomas (1975) "Individual welfare, majority voting and the properties of a linear income tax". *Journal of Public Economics*, 4: 163-185.

Tridimas, George (1992) "Budgetary deficits and government expenditure growth: toward a more accurate empirical specification". *Public Finance Quarterly*, 20: 275-297.

Tridimas, George (2001) "The economics and politics of the structure of public expenditures". *Public Choice*, 106: 299-316.

Usher, Dan (1977). "The welfare economics of the socialization of commodities". *Journal of Public Economics* 8(2), 151-168.

Wagner, Adolph (1958) "Three extracts on Public Finance" in R. Musgrave and A. Peacock (eds) in *Classics in the Theory of Public Finance*. Macmillan, Macmillan, London, 1-16.

Weingast, Barry R., Kenneth A., Shelpse and Christopher, Johnsen (1981). "The political economy or benefits and costs: A neoclassical approach to distributive politics". *Journal of Political Economy*, 89: 642-664.

Stigler, George, J. (1970). "Director's law of public income redistribution". *Journal of Law and Economics*, 13: 1-10

Appendix: The Progressivity of the Equilibrium Tax System

To complete the analysis of the integrative model, we investigate the nature of equilibrium tax progressivity in this Appendix. Tax progressivity here differs from that in a median voter model at least because the tax system is of high dimension. It differs from that in a Leviathan framework because the distribution of political influence plays an important role along with the nature of taxable activities.

The income tax system which emerges in the political equilibrium (10) is one in which marginal tax rates t_i for each taxpayer i depend on the level of his or her earned income Y_i . For each taxpayer the tax payment may be written as $T_i = [t_i^*(Y_i)]Y_i$, where $t_i^*(Y_i)$ is given by equation (10). The individual average tax rate then is $ATR = t_i^*(Y_i)$, and the marginal tax rate in equilibrium is $MTR = 2t_i^*(Y_i)$. (To derive this last result, we use equation (10) and its derivative with respect to Y_i .) Hence for each taxpayer, the marginal rate exceeds the average rate, implying that the set of rates, viewed as an income tax *system*, is progressive. An interesting question is: how progressive? That is, how does the marginal rate for the system change with income?

Define the progressivity of the marginal tax rate ($PMTR_i$) as the rate of change of the marginal tax rate with respect to income, that is, $PMTR_i \equiv \partial[t_i^*(Y_i)] / \partial Y_i$. From equation (10) we obtain that (where for simplicity we divide by 2):

$$PMTR_i = \frac{(\alpha+\beta)\gamma P^2 + I\sigma_{\theta Y}^2 + (\sigma_Y^2 + \bar{Y}^2)I(\bar{\theta} - \theta_i)}{[(\alpha+\beta)\gamma P^2 + I\sigma_{\theta Y}^2 + \sigma_Y^2 + \bar{Y}^2](\alpha+\beta)P} \quad (A1)$$

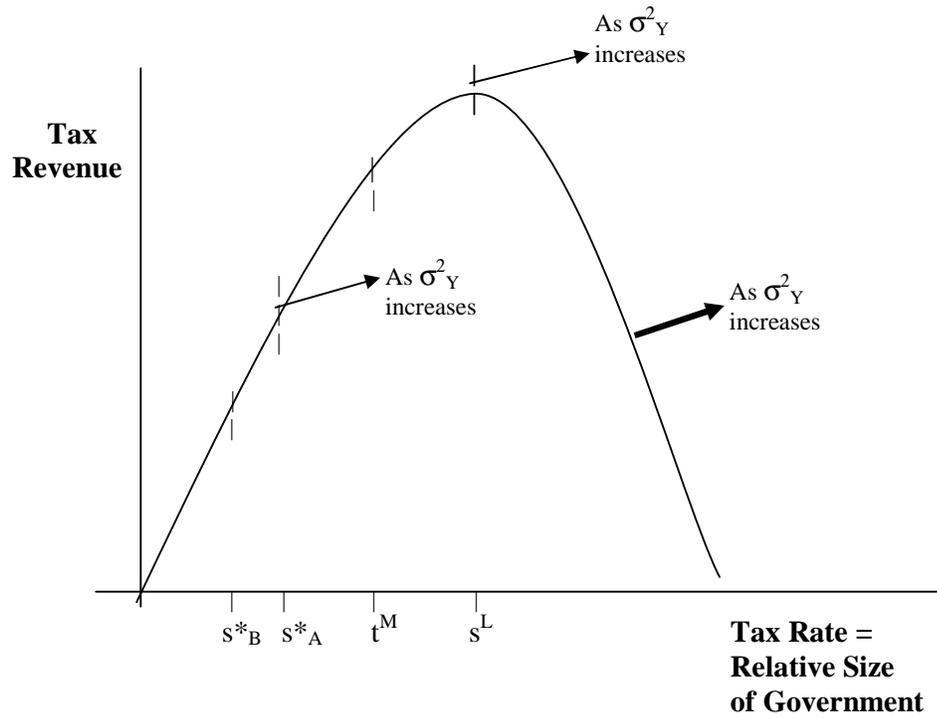
Other things being equal, the expression in (A1) reveals that the degree of progressivity of the marginal tax rate, for each individual, will vary with the pattern of the relation between the income of the taxpayer and his or her relative political weight.

For situations in which $\theta_i = \bar{\theta}$ for all i , and hence where $\sigma_{\theta Y}^2 = 0$, (A1) shows that there will be no marginal rate progressivity, though the marginal rate will still be greater than the average rate. This case is of special interest, because it indicates that marginal rate progressivity of some sort, possibly quite complicated in pattern, is to be expected in the present framework.

Assuming influence rises with income ($\sigma_{\theta Y}^2 > 0$), for taxpayers with political influence below the mean influence, that is for $\theta_i \leq \bar{\theta}$, it will be unambiguously that $PMTR_i > 0$. For $\theta_i > \bar{\theta}$, the degree of marginal rate progressivity will decline with income since $\partial PMTR_i / \partial (\bar{\theta} - \theta_i) < 0$. This is a situation that is more favourable to the rich, who use their influence accordingly and, in this case, income and marginal rate progressivity are inversely related and the pattern of tax rates is certainly complex.

Suppose instead that the highest influence is possessed by the individual with the lowest income, and so on, implying that as Y_i declines, θ_i rises, and so $\theta_i < \bar{\theta}$, for $Y_i > \bar{Y}$ and $\sigma_{\theta Y}^2 < 0$. In equilibrium (A1) indicates that these circumstances generate marginal tax rates which are increasing in income. Thus we see again the importance of the covariance of influence and income in determining the structure of the fiscal system.

Figure 1.
Comparison of Probabilistic Voting, Median Voter and Leviathan Equilibria,
Assuming A Single Tax Instrument



s^*_A : Probabilistic Voting equilibrium when the covariance between income and political influence is $\sigma^2_A > 0$. s^* is increasing in σ^2_Y

s^*_B : Probabilistic Voting equilibrium where the covariance between income and political influence is $\sigma^2_B > \sigma^2_A > 0$. s^* is increasing in σ^2_Y

t^M : Median Voter equilibrium tax rate. Only t^M is independent of σ^2_Y

s^L : Leviathan equilibrium tax rate. s^L is increasing in σ^2_Y

Note: All equilibrium tax rates have been drawn on the assumption that mean income is the same under the three different models of political equilibrium.