Public Choice **97:** 159–177, 1998.

Does the median voter model explain the size of government?: Evidence from the states*

MIGUEL GOUVEIA[1] & NEAL A. MASIA[2]
[1]*Department of Economics, Portugese Catholic University, Lisbon, Portugal;*
[2]*The Advisory Board Company, 600 New Hampshire Ave. NW, Washington, DC 20037, U.S.A.*

Accepted 4 June 1996

Abstract. Despite an attempt by its own authors, it is difficult to argue that the influential model of the size of government developed by Meltzer and Richard (1981) has had convincing empirical backing. In this paper, we adapt that model to a model of state government size. The main testable hypothesis is that as income inequality grows, government size (as measured by the percentage of income devoted to government redistribution) grows. We test the model using panel data from the US states from 1979–1991. In contrast to the results found by Meltzer and Richard (1983), we find little evidence to support the model. The results are robust to several model specifications and estimation techniques.

1. Introduction

Building on results obtained by Romer (1975) and Roberts (1977), Meltzer and Richard (1981) (MR) used a majority rule voting model to explain the size of government, as measured by the volume of public income redistribution. The work by MR has been quite influential in the ensuing development of the political economy literature on government expenditure, taxation, and size (see Mueller, 1989: Ch. 17). However, despite an attempt by its own authors (Meltzer and Richard, 1983), it is difficult to argue that the model has been tested in a convincing empirical framework. Tullock (1983) presented the initial objections to MR's empirical work. One has only to compare citations for MR (1981) and MR (1983) to see that the empirical work has received much less attention than the theory. The main objective of this paper is to fill that gap.

We test an extended version of the MR model of the size of government using panel data for the 50 US states from 1979 through 1991. There are two reasons to believe that those data should provide excellent information

* The authors wish to thank Marcus Berliant, George Clarke, Eric Hanushek, Paul Rothstein, and an anonymous referee for helpful comments and suggestions, and Andy Dick for the use of his all-powerful computer. This work was completed before Masia joined The Advisory Board, and the views expressed here should in no way be attributed to the Advisory Board. All errors are our own.

regarding the empirical relevance of the model. First, the disaggregation of data at the state level provides a large number of observations, and there is a substantial amount of both interstate and intrastate variation in all of the relevant variables. That richness of data, coupled with panel data analysis techniques that filter out state idiosyncrasies, provides grounds for a powerful (in the statistical sense) test of the model. The second reason is related to changes in the income distribution. After a period of stability that began after 1945, the level of income distribution inequality has been changing in recent years. The 50 states have exhibited a wide range of income distribution changes. Since a positive correlation between the size of government and income inequality (more specifically, the ratio of mean to median income) is the major prediction of the MR model, that recent trend should make it easier to test the model. That is achieved by estimating regressions with specifications inspired by Meltzer and Richard (1983).

To properly take into account the characteristics of our observation unit, we first consider how to adapt the MR model in the context of state expenditures and taxes. Our model building and testing strategy proceeds in three stages. First, we take the MR model literally and estimate the same equations specified in MR (1983). Second, we recognize the importance of fiscal federalism and explicitly model the role of federal programs (e.g., matching grant programs) in the constraint faced by the median voter. Finally, we introduce an additional constraint faced by the median state voter that was not important at the federal level: the mobility of taxpayers. That is implemented empirically by introducing fiscal characteristics of neighboring states.[1]

Despite our various adaptations, simulations, and empirical techniques, we find throughout our analysis that there is little evidence to support the basic hypotheses of the (Meltzer-Richard style) model we develop. When we find coefficients on variables that are consistent with spirit of the theory, the magnitude of the estimates is small; it is more often the case that we find coefficients that are either statistically insignificant or that are significant but inconsistent with theory.

The structure of this paper is the following: Section 2 presents some basic stylized facts that motivate the model, the simulations, and the discussion that follows; in Section 3 we develop a Meltzer-Richard style model of state government that takes fiscal federalism into account; Section 4 uses numerical simulation techniques to generate model predictions from the (non-linear) equilibrium conditions derived in Section 3; Section 5 presents our empirical estimation and results; in Section 6 we consider the possible effects of migration constraints on the states, and re-estimate our equations accordingly; Section 7 contains discussion of our results, and addresses several potential criticisms of our approach; we present our conclusions in Section 8.

2. Some stylized facts

Explanations of government size range from theories of bureaucratic rent seeking to theories of political coalitions to the simple idea that government is luxury good, i.e., one for which the expenditure share increases with income. In any case, the simple fact of government growth cannot be denied. Data from the 50 states confirm that observation once again, as demonstrated by Table 1.

Table 1. Mean state government size, income distribution characteristics, and dependency rates, 1979 and 1991

Year	State government size (as % of total income)	Mean median income	Dependency rate (% of population on AFDC or SSI)
1979	.061	1.086	.041
1991	.076	1.149	.046

The model of state government size that we develop has several empirical implications, but there are two hypotheses of particular interest. First, both the MR model and our extension of it predict that as the ratio of the mean voter's income to the median voter's income increases, the size of government increases. In particular, the model predicts that redistributive spending will grow as income inequality increases. For our empirical work, we follow MR (1983) closely in our definitions of redistributive spending; our particular definitions are contained in an Appendix.

Second, with the increase in government size comes a predicted increase in the dependency rate. For the purposes of our model, the dependency rate is defined simply as the proportion of voters who choose not to work. In practice, we define the dependency rate to be the proportion of the adult population receiving benefits under either the Aid to Families with Dependent Children (AFDC) program or the Supplemental Security Income (SSI) program.

Table 1 suggests that the hypotheses of the model seem appealing. Government size, the dependency rate, and the ratio of the mean to the median income have all increased over the course of the sample, an occurrence completely consistent with the predictions of the model. However, we see below that the hypotheses that emerge from our model of government size, even after some modifications, are not confirmed empirically.

3. A Meltzer-Richard model of state government

3.1. *Assumptions*

We formalize the basic model following the notation as in MR (1983). In the following analysis we assume that each state takes as given federal taxes and expenditures. The composite state and federal tax function is the result of adding together state and federal taxes. At each level of government, the tax function is assumed to have an income guarantee *r* and a constant marginal tax rate *t* resulting in the following total tax function:

$$T(y) = (t_s + t_f)y - r_s - r_f,$$

where the subscripts *s* and *f* indicate state and federal, respectively. Given the tax structure and preferences summarized in the utility function *U(c, n)*, the labor supply decision is determined by

$$\max_{n,c} U(c, n) \text{s.t. } c = nx(1 - t_f - t_s) + r_s + r_f, \tag{1}$$

where *c* is consumption, *n* is labor supply, and *x* is ability (i.e., the wage rate), and with $c > 0$ and $n \geq 0$.

The solution will have two branches. Individuals above a certain ability level, x_o, will work and have a labor supply function $n(x(1–t_f–t_s), r_s + r_f)$; individuals with ability less than x_o will not participate in the labor market. Assuming that the distribution of abilities follows a cumulative distribution $F(x)$, the percentage of agents not working is given by $F(x_0)$, which we shall call the dependency rate. For simplicity, we shall refer to this dependency rate as *F*.

3.2. *The government budget constraint and voting*

The state government budget constraint is:

$$t_s \int_{x_0}^{\hat{x}} xn(x(1 - t_f - t_s), r_s + r_f)\, dF(x) = \psi r_s, \tag{2}$$

where the parameter ψ measures the state's share of the cost of a dollar's worth of transfers. That cost differs from one because of subsidies received by states from federal matching grant programs.[2] For example, when the matching rate is 3 to 1, ψ = 1/(1+3) = .25. Assuming that leisure is a normal good, we can easily prove that $\partial n/ \partial r_s < 0$, and that $\partial x_0/ \partial r_s < 0$. This implies that, for a given t_s, there is a unique solution for r_s in (2).

Roberts (1977) shows that the equilibrium to the collective choice problem of picking a pair (t_s, r_s) by simple majority rule exists, and that equilibrium pair corresponds to the ideal point of the voter with median ability.

4. Predictions of the model

The solution to the problem is dependent on the form of the individual preferences. In general, that solution is complicated, and the effects of the various parameters will be non-linear. In order to consider the basic predictions of the model, we develop a numerical model where utility is as in MR (1983):

$$U(c, n) = \ln(c + \gamma) + a\ln(1 - n + \lambda). \tag{3}$$

The building blocks of the numerical model are the Stone-Geary utility function above with parameters a = .25, γ = 1.25, and λ = –0.2; a lognormal distribution of abilities with log mean μ and log standard deviation σ, and the three parameters of the federal tax function, t_f = .25, r_f = .054, and the net price after matching rate ψ. We are interested in examining how the equilibrium of the model changes in response to shifts in the level and inequality of the income distribution, and to changes in the matching rate.

We now summarize the results of our numerical analysis.[3] First, increases in the inequality of wages or abilities (as measured by σ) increase the size of government (as measured by the state tax rate, corresponding to t_s above). We also observe that tax rate increases allow for more generous transfers, and that the income effects of the more generous transfers and the disincentive effects of the higher tax rates result in an expanding dependency rate. Those are the basic results at the core of the theoretical analysis in MR (1981), and they provide the main testable implications from the theory.

Second, the hypothesis suggested by the calibrated solution is that government size will increase with aggregate income. That hypothesis is confirmed by the historical statistics of many countries and is commonly known as Wagner's law.[4] The model also suggests that a general rise in income levels should also lead to an increase in transfers as a percentage of average income, but decreased dependency rates.

Third, federal matching rates have a non-monotonic effect on the equilibrium size of state government, as measured by the state income tax rate. Table 2 shows the effects of changing the state share in a dollar of transfers (due to a change in the matching rate) on our variables of interest. The results suggest that dependency rates and transfers as percentage of average income should increase with matching rates. In the extreme cases, when the state's cost share is below 5%, we can see that more than half of the population (including the median voter) chooses not to work.

Table 2. Simulation results equilibrium tax and dependency rates with various matching rates

State share of a dollar in transfers	State tax rate	Dependency rate
0.02	0.240	0.629
0.05	0.278	0.459
0.1	0.304	0.317
0.15	0.318	0.241
0.2	0.326	0.190
0.25	0.330	0.152
0.3	0.333	0.124
0.35	0.333	0.104
0.4	0.332	0.086
0.45	0.330	0.071
0.5	0.326	0.058
0.55	0.321	0.048
0.6	0.315	0.039
0.7	0.298	0.025
0.8	0.275	0.015

The relationship between the state's cost share and the state tax rate takes the form of an inverted "u", as Table 2 demonstrates. The tax rate chosen by the median voter increases with the state's cost shares while that parameter is under 30% and decreases when it is above that level. For a given tax rate, increasing the federal cost share leads to an increase in transfers. That creates two incentives for the states: the first is to increase the tax rate in order to maximize the federal subsidy, and the second is to use the increase in transfers to finance tax relief. The logic of the model can be seen clearly when we examine two extreme hypothetical situations. At one extreme, suppose the federal government pays for 100% of the transfers; then the equilibrium tax rate is zero because there is no reason for a median voter to tax herself. At the other extreme, suppose that for each dollar of redistribution made within the state, the federal government imposes a surcharge – i.e., the federal government imposes a negative matching rate. In that case, the median voter would receive so little from redistribution that, in the limit, she will also choose zero taxes. Between the two extremes, the equilibrium tax rate rises and then falls. From an empirical point of view, the non-linearity is an additional testable implication of the model, because it predicts a concave relationship between state tax rates and state shares of redistributive expenditures.

5. Empirical analysis

Meltzer and Richard (1983) attempted to test their hypothesis relating income distribution and government growth by using an extended time series of U.S. federal government spending. As Tullock (1983) pointed out, that approach yields results that are difficult to interpret because both income inequality and government spending have grown at fairly consistent rates over the period investigated by Meltzer and Richard; any comparison of two trends that behave similarly over a time series will yield a high degree of correlation. Thus, the evidence used by MR (1983) as supportive of their theoretical work could be simply evidence, for example, of some institutional changes that have taken place over the time period studied and are not controlled for. We avoid that problem by employing a two-way fixed effects methodology on a panel of states over a period of 13 years. That way, changes over time (that are unrelated to the explanatory variables) are dealt with by the time dummies, and changes across observations due to state idiosyncrasies are captured by the state dummies. Controlling for that set of influences is important, as demonstrated in Masia (1995). Also, this approach allows us to ignore factors that should affect all states in similar ways but that vary from year to year. For example, we can ignore changes in federal policy toward the states, because any effects caused by such changes would be captured by time dummy variables.

5.1. *Data description*

The data set is comprised of a balanced panel of the 50 states over the thirteen year period 1979–1991, yielding a total of 650 observations. Appendix A contains a description of the data sources. Table 3 presents descriptive statistics for the variables of interest: the ratio of the mean to the median income, the dependency rate (measured as the percentage of the state's population under the Aid to Families with Dependent Children and Supplemental Security Income), the state's share of a dollar in transfers, and two measures of government size: Gov1, which includes publicly provided private goods as a percentage of total state income,[5] and Gov2, which includes mostly redistributive funds as a percentage of income. Note that Gov2 only includes funds under federal matching grants, and only includes the state's share of spending on these categories.[6] The table presents unweighted means for the 50 states, with standard deviations in parentheses.

A quick look at Table 3 reveals some interesting facts: first, the income distribution showed some inequality growth over the course of the data; by our measure, the ratio of mean to median earnings among male workers rose from 1.085 to 1.149 over the course of the sample, a substantial increase.[7]

Table 3. Descriptive statistics for key state government variables, 1979–1991

Year	Mean/median income	Gov1	Gov2	Dependency rate	State share
1979	1.086 (.04)	.043 (.013)	.018 (.006)	.041 (.021)	.405 (.079)
1980	1.082 (.04)	.045 (.013)	.019 (.006)	.042 (.015)	.405 (.079)
1981	1.085 (.04)	.047 (.014)	.019 (.007)	.039 (.020)	.409 (.078)
1982	1.089 (.05)	.049 (.016)	.019 (.007)	.037 (.014)	.409 (.078)
1983	1.091 (.05)	.049 (.016)	.018 (.006)	.038 (.015)	.406 (.085)
1984	1.093 (.04)	.044 (.016)	.018 (.006)	.038 (.015)	.406 (.085)
1985	1.089 (.04)	.046 (.014)	.019 (.006)	.037 (.015)	.405 (.085)
1986	1.090 (.04)	.046 (.017)	.019 (.006)	.038 (.014)	.402 (.085)
1987	1.090 (.04)	.047 (.014)	.019 (.006)	.038 (.013)	.393 (.085)
1988	1.093 (.03)	.046 (.013)	.019 (.006)	.038 (.013)	.390 (.089)
1989	1.137 (.04)	.046 (.013)	.020 (.006)	.038 (.014)	.389 (.091)
1990	1.141 (.04)	.048 (.013)	.021 (.006)	.042 (.013)	.386 (.093)
1991	1.149 (.04)	.054 (.015)	.024 (.006)	.046 (.013)	.382 (.094)

SD in parentheses

Further, the size of government grew under each metric; by combining the two measures, we see the percentage of state income used for covered programs increase from .061 to .078, an increase of nearly 28%. The average state cost share of transfers has decreased slightly over the sample period, and the dependency rate has increased slightly. In fact, without further analysis one might conclude that the data merely confirm and extend the empirical results found by MR (1983), as income inequality, government size, and dependency rates have all risen over the period examined, just as the model predicts.

5.2. *Regression results*

As mentioned above, without further analysis one might conclude that our data support the hypotheses presented in MR (1981) and in Section 3 above. Fortunately, our panel data provide a great deal of variation that is not immediately evident upon inspection of Table 3. In order to take full advantage of the data richness, we employ fixed effects methodology, thereby effectively controlling for individual state and time effects and allowing us to focus more clearly on the variables of interest. Our first task is to estimate the model suggested by MR (1983) without the corrections exposited in Section 3 above, but correcting for state fixed effects. In order to be consistent with the original work, we use ln $t(1\text{-}F)$, ln $t_2(1\text{-}F)$, and ln $t_3(1\text{-}F)$ as dependent variables in the equations, where F is the dependency rate as defined by MR (1983)

Table 4. Fixed effects estimation of original Meltzer/Richard model

Dependent variable	ln (*m*–1)	$1/y_d$	R^2
ln *t*(1–F)	–.05 (–5.77)	9879 (11.96)	.93
ln t_2(1–F)	–.007 (–.52)	4290 (3.43)	.91
ln t_3(1–F)	–.076 (–6.91)	12175 (12.32)	.92

t-ratios in parentheses

to include AFDC, SSI, and OASDI recipients,[8] t_2 refers to public provision of private goods, t_3 refers to pure redistribution, and *t* is the sum of the first two measures. The independent variables include ln(*m*–1), where *m* is the ratio of the mean to the median income, and l/y_d, the inverse of the median voter's income. Those variables result from their linearization of the system to generate model predictions, an approach that provides essentially similar predictions to those found in Section 4. The surprising results are presented in Table 4.[9]

The results are completely inconsistent with the findings of MR (1983). The model predicts a positive elasticity of government size with respect to the independent variable of +1. MR (1983) found elasticities that ranged from .34 to .71. In contrast, we find *negative* elasticities that are very small in magnitude (but are significant in two of the three cases). However, as explained in detail in Section 4 above, it is important to control for price variables faced by the state median voter in order to put the model to a proper test. Thus, we estimate new equations to test the hypotheses suggested by our numerical analysis.

The main hypotheses of the model that emerge from the numerical analysis are not different in spirit from the predictions of MR (1981) – the main prediction remains that as the ratio of mean to median voter income increases, government size should increase. An additional implication of our numerical analysis is that when price matters (e.g., in programs of redistribution where funds are matched by the federal government), we expect to see the state share exhibit an inverted "u" effect on state dollars spent on redistribution.

We test the predictions of our model in three separate equations. The three dependent variables are Gov1, Gov2, and *F*, where Gov1 and Gov2 are the proportions of state dollars spent on publicly provided private goods and on redistribution, each as a percentage of state income, and the dependency rate excludes Social Security recipients but includes AFDC and SSI beneficiaries.[10] The independent variables for the Gov1 equation are identical to those used in MR (1983), because the price of transfers should not effect the demand for non-redistributive goods. In the other equations, we add the log of the state share and the square of the log of the state share, to test for the

Table 5. Fixed effects estimation of the adapted model, including state share variables

Dep. variable	ln (m–1)	$1/y_d$	ln (share)	(ln (share))^2	R^2
ln Gov1	.04* (2.67)	4448* (2.89)	–	–	.87
ln Gov2	–.28* (–4.44)	28268* (4.33)	1.47 (.70)	.50 (.50)	.50
ln F	.003* (1.96)	–214 (–1.28)	.056 (1.11)	.046* (2.02)	.50

t-statistics in parentheses.
* indicates significance at 5% level.

inverted "u" relationship predicted by the theory. The results are presented in Table 5.

Several econometric issues deserve mention here. First, the results are weighted GLS estimates. We tested for heteroscedasticity by regressing uncorrected errors on a set of state and time dummies. The F-statistics for the regressions were always significant; therefore, we used the square roots of the predicted values from those regressions as weights. Second, it is conceivable that the errors are autocorrelated within states. Appendix B presents results for regressions run after correcting for potential autocorrelation. No significant changes to the results reported were found. Third, it is possible that the share, income, and ratio variables are all determined to some extent by government policy, although we feel it is far more likely that policies at the federal level, which are exogenous to the states, have a much more important effect on those variables. In any case, we used data on age distributions and income rankings as instruments for the possibly endogenous variables. That, too, failed to alter the substance of the results.[11]

The substance of the results is this: after including the state share variables and separating out the dependency rate and government size effects, there is still little evidence to support the theory. It is true that in two of the three equations the sign on the income distribution variable is correct and significantly different from zero, but the magnitude of the elasticity is quite small. More importantly, for redistributive expenditures, we see a relatively large and significant *negative* elasticity of government size with respect to increases in inequality. In other words, a one percent increase in the ratio of the mean to the median income is associated with about a 1/4 percent *decrease* in the size of redistributive spending as a percentage of state income. As in the original model, that directly contradicts the theory we have exposited so far. Furthermore, the coefficients on the state cost share variables are not generally significant; that also argues against the theory we have laid out.

At this stage, it is tempting to claim that the model has failed. However, there is a potentially important variable that we have not controlled for: the

mobility of taxpayers. States face an important mobility constraint that the federal government can largely ignore. If taxpayers in a state are unhappy with the tax system in their state, it is fairly easy for most to relocate to a neighboring state. Citizens of a country cannot vote with their feet so easily, and must resort to the ballot box and their elected officials to change the tax system. In the next section, we first consider how to incorporate this constraint into the voters decision, and then give the model one last chance to redeem itself by reestimating the equations while attempting to control for mobility.

6. The state government budget constraint with mobility

6.1. *Introducing mobility into the model*

Taxation models often lack what is known in the incentive compatibility literature as a participation constraint. While the design of incentive schemes in private contracts must allow for the inducement of participation of both parties, such is not the case when we consider federal government policy. The simple fact is that the federal government has a monopoly on the power and the ability (however imperfect) to coerce citizens into paying taxes. However, when we venture into the policy feasibility frontier of state and local governments, we immediately need to include a notion akin to the participation constraint. Much as a worker can refuse to accept a bad contract in order to pursue a better option, a voter can vote with her feet. That simple fact has important implications for the problem of determining the size of government, as work by Epple and Romer (1991) and others has shown.

The mobility and the existence of adjustment costs add another layer to the consumer problem. Taxing a certain type of worker “too hard” might lead to their emigration, while over-subsidizing other types might lead to their immigration. The equilibrium involves gaming among the median voters of the various jurisdictions. A change in policy implies migratory movements that imply a change in the composition of the population and, subsequently, a change in the median voter’s type. The new median voter chooses new policies, and the cycle continues. In order to carry out our analysis, we assume that this process produces a unique and stable equilibrium, where the choices of policy by the median voter do not induce migratory movements that change the median voter’s identity. The main point is that the migration considerations might provide an additional constraint on the size of government, and that as the migration constraint is eased, government size could increase in some situations where it was otherwise constrained.

Table 6. Fixed effects estimation of the adapted model, including state share variables and neighbouring state tax rates

Dep. variable	ln (m–1)	$1/y_d$	ln share	(ln share)^2	ln tax	R^2
ln Gov1	.04* (2.47)	4449* (2.93)	–	–	–.32* (–2.57)	.88
ln Gov2	–.28* (–4.44)	28931* (4.49)	1.17 (.57)	.33 (.34)	.51 (1.30)	.50
ln F	.003* (2.08)	–215 (1.28)	.043 (.84)	.041* (1.73)	.01 (1.10)	.51

t-statistics in parentheses
* denotes significance at 5% level.

6.2. *Empirical estimation with control for mobility*

We wish to incorporate and test the idea that as the mobility constraint is eased, some states are able to increase the size of government when they previously would have been constrained not to do so. We include that idea by incorporating information about nearby states as an additional determinant of state spending behavior. The analysis is somewhat similar in spirit to the approach taken in Case, Rosen, and Hines (CRH) (1993), who investigated the influence of state spending policies on the spending policies of other states.[12] In particular, first we divide the states into nine regions (following the method of division used by the Census Bureau). Next, we calculate total tax collections as a percentage of state income for each state. Finally, for each state we calculate the regional average tax rate *excluding* the given state. That gives us a rough measure of what each state faces in terms of tax competition from nearby states.[13] We re-estimated the regressions from Section 5 after including the log of the tax variable. The results are presented in Table 6.[14]

The table reveals that attempting to control for migration affects neither the magnitude nor the significance of the coefficient estimates presented above in Table 5. In fact, the only time the coefficient on the tax variable is significant, it has the sign opposite to what theory predicts. That somewhat mysterious result is interesting in its own right because it confirms the results found by CRH (1993). CRH tried several different definitions of "neighboring" states. They were concerned with spillover effects in state spending, and were looking to establish positive correlations between increased spending in "similar" states. They established a high positive correlation when they defined "similar" to mean similar racial composition, but when they used geographic proximity as the metric of similarity, they found a negative correlation, as we do.[15] Clearly, accounting for migration does not provide the evidence necessary to accept the theory we have exposited.

7. Discussion

7.1. *Comments*

There are several possible comments about this work that we wish to address here. First, the time series that we have used might not be long enough for changes in the income distribution to induce changes in the size of government. However, the growth in both the inequality of income distribution and in the size of government over our sample period is clear, and that this overall simultaneous growth does not lead to a positive relationship as estimated in our rigorous analysis is, to our minds, a telling fact.

Another potential criticism is the use of state government size independent of other measures of government size. It is true that state governments are not completely autonomous, and that mandates from the federal government obviate much of the need for decisionmaking at the state and local level. In that sense, ours might be too strong a test of the model, because it might not be reasonable to expect that implemented policies are what the median voter would choose. However, if we assume that federal government behavior affects most state governments in a similar way, or even that it affects individual state governments differently, but differently in similar ways over time, then our fixed effects estimation should minimize the problem. Furthermore, it should still be the case that something about state government spending is decided at the state level each year; in this sense, the state decision provides a valid test of the theory.

Third, in our analysis we have ignored the fact that state tax systems differ in their progressivity. Our assumption of a linear tax precludes the inclusion of tax progressivity as a choice variable of the median voter, yet state tax systems differ widely in their use of regressive and progressive tax instruments. It is likely that the choice of progressivity (which should be endogenous to the model but which would add an even greater layer of complexity to the analysis) has important implications for the choice of redistributive spending levels. We leave it to future research to develop a model that incorporates that choice.

Finally, our analysis ignores institutional, political, and bureaucratic considerations, although fixed effects estimation certainly offsets some of those problems in that many state institutions are quite stable over the time period studied and are filtered out of the analysis. The need to correct the remainder of this shortcoming is discussed further below.

7.2. *Does the median voter model explain the size of government?*

The model we have considered and tested is essentially a voting model of the size of government, where a median voter gets to choose a policy subject to some constraints. In particular, it is assumed that there are no implementation problems once the median voter's ideal policy has been determined, and that the ideal size of government is determined only by economic considerations (how the tax choice will affect labor supply, migration, etc.). While that has been an influential model in the public choice literature, our data and analysis fail to provide support for the basic predictions of the model – namely, that a large proportion of the increase in the size of government can be attributed to particular changes in the income distribution. Thus, we conclude that the answer to the question "does the median voter model explain the growth of government?" must be "no."

There are several bodies of literature that might provide better insight into the data. One relies on altruism as a motive for redistribution, a line of research began by Hochman and Rogers (1969). That approach was used, among others, by Orr (1976) to study AFDC and by Clarke (1995) to examine state supplements to SSI. The relationship between charity and income distribution was investigated by Bergstrom, Blume, and Varian (BBV) (1986). Their model demonstrates that as the income distribution becomes more unequal, there will be more charity from the upper levels of income. The increased private charity crowds out government charity, so that as income inequality increases, government size (as measured by redistributive spending) decreases. It would be interesting to apply that type of analysis to a rigorous model of state government size, and test it accordingly.

A second strand of literature that might be incorporated is the theory of institutional and bureaucratic politics. There is some evidence in the public choice literature (see, for example, Gilligan and Matsusaka, 1994; Matsusaka, 1992; Alm and Evers, 1991) that institutional and bureaucratic behavior lead to overprovision of certain types of government services – despite of the wishes of the median voter. That literature demonstrates that changes in the structural composition of state or national legislatures, interest group activity, and changes in voter perception and information are important determinants of what is politically feasible in budgeting, and, by extension, are determinants of the overall size of the budget. Given the failure of the model we have presented, it might be that such an approach (or some combination of the above approaches) can offer a more adequate and persuasive explanation of the growth of government. In particular, our results are not inconsistent with many of the arguments found in Peltzman's (1980) model. That model has no firm prediction about the relationship between the overall income distribution and government size, but it suggests that as income inequality

within voting coalitions grows, government size should shrink (the opposite result to MR, 1981). Peltzman's model has a less elegant economic interpretation than the one we have presented, but has room for politics and reelection concerns. As with the BBV model mentioned above, we leave it for future work to put a variant of Peltzman's model to similarly rigorous testing.

A third point of approach would be to focus more attention on determining who the relevant median voter really is. Voter turnout varies over the income distribution, so the individual with median income overall is probably not the *voter* with the median income – in fact, the median income voter will likely be above the overall median income for society (see Abrams and Lewis, 1987). We need to work out the implications of including endogenous voter participation in models of government size. A more comprehensive model might avoid the bias caused by our assumption of full voter turnout.

8. Conclusion

In this paper, we have taken the original and influential model of Meltzer and Richard (1981) as a starting point to investigate the possible relationship between income distribution and government size. We subjected the spirit of their model to a more ambitious testing framework than has previously been employed. In order to do so, we needed more data richness than was available at the national level, and that led us to rework the model for use with state governments. We then tested the model using fixed effects estimation, a more satisfying and rigorous approach than what was possible given the data in Meltzer and Richard (1983). The novelty of our approach is that in adapting the model for state government, we incorporated fiscal federalism and migration issues into the analysis. However, empirical support for the basic hypotheses of the model was minimal at best. Furthermore, in some cases the evidence we found was in direct contradiction to the predictions of the model.

Ultimately, we have provided strong evidence against the model; therefore, our research does not confirm the original Meltzer and Richard model. That suggests that new models of the size of government that might incorporate the behavior of elected officials or interest groups (perhaps along the lines of Peltzman, 1980) or of the motivations for redistributive spending (as in BBV, 1986) ought to be developed and tested in a similarly rigorous manner. Another alternative might be to extend our model further to include tax system progressivity as another choice variable. We look forward to undertaking such work in the future.

Notes

1. Note that even though some similarities exist in the implications for the empirical strategy, this argument differs from the argument made by Besley and Case (1995), where moral hazard in the behavior of government officials leads imperfectly informed voters to resort to yardstick competition to assess government performance.
2. In particular, we are interested in the price of two major redistributive programs mainly administered by states: AFDC and Medicaid.
3. Full simulation results and details on calibration are available from the authors.
4. For elaboration, see Mueller (1989), Chapter 17. In the specification used to calibrate the model, the relationship between the size of government and income depends crucially on the utility parameter γ . A Cobb-Douglas utility function ($\gamma = 0$) implies no relationship between aggregate levels of income and the size of government, while a negative γ implies that t_s decreases with aggregate income.
5. This type of spending, while not purely redistributive in nature, reallocates resources from some groups to other groups. Meltzer and Richard exclude from their measure "pure" public goods, such as police protection and defense, and we follow that convention.
6. See Appendix B for details on spending category definitions. We are aware that there is some arbitrary judgment in these classifications, but our goal was to follow MR (1983) as closely as possible, so that any rejection of the model would not be imputed to the data classification.
7. Of course, there are many possible measures of income inequality, many of which show an even more substantial increase in income inequality in the 1980s. However, this ratio is what is suggested by the theory in MR (1981), which we have tried to follow closely throughout. Our use of male worker data probably understates the inequality, as low earning unemployed citizens are excluded. However, that might be offset by the fact that our ratio might be a more adequate representation of the ratio of the mean to the median *voter*, assuming that employed people are more likely to vote.
8. This dependency rate is different to the one we use later; the reason for that is explained below.
9. We do not include estimated coefficients of the dummies in the tables. Results are corrected for heteroscedasticity. Regressions of squared errors on a set of year and state dummies rejected the null hypothesis of no heteroscedasticity; the square roots of the predicted values of this regression were used as weights in the subsequent fixed effects estimation. The substantive results did not change with the correction.
10. MR (1983) include Social Security beneficiaries in their estimation. However, Social Security is a federally administered program, with little or no contribution from the states. We are interested in the proportion of voters dependent on state programs. As a precaution, we estimated the equations including the Social Security recipients, and this did not affect the results.
11. The use of instrumental variables did not make the coefficients on any of the variables significant. In addition, we tried several variants of the inverse of income variable and the income ratio variable, and a variety of instruments; the results we report here were quite robust to all of these experiments.
12. We shall discuss the similarity of our results below.
13. We considered several alternatives to this specification. Most notable among these was inclusion of the average top marginal tax rate in neighboring states. That was intended to capture the idea that states are most concerned with losing their high income taxpayers to nearby states, who pay high taxes but can also afford to move. However, the approach suffered from long standing institutional differences in state tax structures – in particular, some states have entrenched property taxes and seem to be ideologically opposed to income taxes, while others tax income heavily, at the expense of lower sales taxes or property taxes. By using total tax collections as a percentage of income, we avoid issues

of state tax structures and concentrate on the total tax effort of states, but ignore issues of comparative regressivity of state taxes – that is, a rich person might not mind a state that taxes heavily if it taxes regressively.

14. The comments on methodology in the footnote in Section 4 above regarding autocorrelation and instrumental variables applies here as well. The results presented, as in the previous section, have been corrected for heteroscedasticity using the procedure described above.
15. Because we are concerned with migration, it is clear that, for our purposes, geography should be the main consideration when determining what makes states "neighbors."

References

Abrams, B.A. and Dougan, W.R. (1986). The effects of constitutional restraints on government spending. *Public Choice* 49: 101–116.

Abrams, B.A. and Lewis, K. (1987). A median-voter model of economic regulation. *Public Choice* 52: 125–142.

Alm, J. and Evers, M. (1991). The item veto and state government expenditures. *Public Choice* 49: 101–116.

Bergstrom, T.; Blume, L. and Varian, H. (1986). On the private provision of public goods. *Journal of Public Economics* 29: 25–49.

Besley, T. and Case, A. (1995). Incumbent behavior: Vote-seeking, tax-setting, and yardstick competition. *American Economic Review* 85: 24–45.

Case, A.; Rosen, H. and Hines, J. (1993). Budget spillovers and fiscal policy interdependence. *Journal of Public Economics* 52: 285–307.

Clarke, G.R.G. (1995). How can we explain declining state aid to the aged poor? Manuscript. University of Rochester.

Epple, D. and Romer, T. (1991). Mobility and redistribution. *Journal of Political Economy* 99: 828–858.

Gilligan, T.W. and Matsusaka, J.G. (1994). Deviations from constituent interest: The role of legislative structure and political parties in the states. Working paper. University of Southern California.

Hochman, H. and Rodgers, J. (1969). Pareto optimal redistribution. *American Economic Review* 59: 542–557.

Masia, N. (1995). Essays on the political economy of government spending. Ph.D. Dissertation. University of Rochester.

Matsusaka, J.G. (1992). Economics of direct legislation. *Quarterly Journal of Economics* 107: 541–571.

Meltzer, A. and Richard, S. (1981). A rational theory of the size of government. *Journal of Political Economy* 89: 914–927.

Meltzer, A. and Richard, S. (1983). Test of a rational theory of the size of government. *Public Choice* 41: 403–418.

Mueller, D.C. (1989). *Public Choice II*. Cambridge, UK: University Press.

Orr, L. (1976). Income transfers as a public good: An application to AFDC. *American Economic Review* 66: 359–371.

Peltzman, S. (1980). The growth of government. *The Journal of Law and Economics* 23: 209–289.

Roberts, K.W.S. (1977). Voting over income tax schedules. *Journal of Public Economics* 8: 329–340.

Romer, T. (1975). Individual welfare, majority voting, and the properties of a linear income tax. *Journal of Public Economics* 4: 163–186.

Tullock, G. (1983). Comment. *Public Choice* 41: 819–822.

Appendix A: Spending category definitions and data sources

We followed Meltzer and Richard's (1983) categories of spending as closely as possible, although there are some areas of spending where states spend nothing. MR break spending into two categories: public provision of private goods, and pure redistribution. We needed to go one step further and separate matched from unmatched redistributed funds, as this affects the state government budget constraint. Matched funds actually represent the largest share of redistributive spending (these include Medicaid and Aid to Families with Dependent Children).

A. Public supply of private goods includes:
1. Higher education
2. Local schools
3. Other education
4. Hospitals (excluding Medicaid)
5. Sanitation
6. Other natural resources
7. Non-highway transportation
8. Utilities
9. Liquor stores

B. Pure redistribution includes:
1. AFDC*
2. Medicaid*
3. Unemployment compensation
4. Supplemental security income
5. Housing and urban renewal
6. Other insurance

* indicates programs with federal matching funds

Data sources

Income distribution: US Bureau of the Census, *CPS Outgoing Rotation Group Extracts: 1979–91*, on CD ROM; mean and median wage data extracted from employed males usual weekly earnings.

State government spending by category: U.S. Bureau of the Census, *State Government Finances in . . .*, for each year 1979–91, series GF–3; Tables 9, 10, and 11.

Other state characteristics (includes dependency rates, tax collections, total state income, age and population distributions, and regional price indexes): U.S. Bureau of the Census, *Statistical Abstract of the United States*, each year 1980–1993.

Matching rates. U.S. House of Representatives, *Green Book*, 1979–91.

Appendix B: Regression results with autocorrelation correction

We present here the results when we correct for potential autocorrelation in our data. There are no important differences between the results presented here and the results presented in the main body of the paper; in particular, these regression offer no further evidence in support of the theory.

Table B.1. Autocorrelation-corrected fixed effects estimation of the adapted model, including state share variables

Dep. variable	ln (m–1)	$(1/y_d)$	ln share	$(\text{ln share})^2$	R^2
ln Gov1	.02 (1.62)	3595* (3.67)	–	–	.96
ln Gov2	–.41* (–5.28)	31767* (3.67)	.98 (.37)	.27 (.21)	.55
ln F	.007* (3.53)	–797* (–3.34)	.24* (2.79)	.13* (3.02)	.47

t-statistics in parentheses
∗ indicates significance at 5% level.

Table B.2. Autocorrelation-corrected fixed effects estimation of the adapted model, including state share variables and neighbouring state tax rates

Dep. var	ln (m–1)	$(1/y_d)$	ln share	$(\text{ln share})^2$	ln tax	R^2
ln Gov1	–.03 (–.88)	2452 (.64)	–	–	–1.18* (–4.34)	.80
ln Gov2	–.40* (–5.29)	38673* (4.68)	5.16* (1.82)	2.01 (1.48)	.05 (.10)	.56
ln F	.007* (3.52)	–800* (–3.37)	.24 (2.74)	.12* (2.99)	.001 (.06)	.47

t-statistics in parentheses
∗ denotes significance at 5% level.