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Supermajority voting requirements for tax increases: evidence from the states

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Abstract

This paper measures the effect of state-level supermajority requirements for tax increases on tax rates. Unobserved attitudes towards taxation tend to influence both the adoption of supermajority requirements and tax policy. Consequently, one cannot distinguish between the effect of these requirements and their correlation with these unobserved attitudes. A model is presented in which legislatures controlled by a pro-tax party adopt a supermajority requirement to reduce the majority party agenda control. The propensity of pro-tax states to adopt supermajority requirements results in an underestimate of the true effect of these requirements on taxes. To correct this identification problem, the paper first uses fixed effects to control for unobserved attitudes and then employs instruments that measure the difficulty of amending state constitutions. The paper concludes that supermajority requirements have significantly reduced taxes. © 2000 Elsevier Science S.A. All rights reserved.

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1. Introduction

In each of the years between 1996 and 1999, the US Congress voted on a proposed constitutional amendment to require a two-thirds supermajority legisla-

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tive vote in order to increase taxes through a new tax, rate increase, or expansion of the base. Each time, the proposed requirement fell short of the two-thirds vote necessary to initiate a constitutional amendment. Thirteen states already have similar supermajority requirements in place, and 16 states have recently introduced legislation to enact such requirements (Americans for Tax Reform, 1996).¹ This paper empirically measures the effect of supermajority requirements on taxes, using cross-state variation in supermajority requirements between the years 1963–1995.

At first glance, supermajority requirements appear to have had no effect on taxes. Among the continental 48 states, supermajority states and non-supermajority states had identical average effective tax rates of 7.13% in 1995. If these requirements were randomly assigned to states, one could conclude that supermajority requirements do not reduce taxes. However, states choose to adopt these requirements and may do so for strategic reasons related to tax policy.² This paper argues that underlying state characteristics influence both supermajority requirements and tax policy. Some of these state characteristics, such as income, can be controlled for directly by comparing average tax rates conditional on observable characteristics in a multiple regression framework. Other characteristics, such as citizens' attitudes towards taxation and public services, are unobservable. Consequently, using sample means alone, even conditional on observable characteristics, one cannot distinguish between the effects of supermajority requirements on taxes and the propensity of states with certain attitudes towards taxation to adopt these requirements.

To provide a framework for correcting this identification problem, a theoretical model explores both the adoption of supermajority requirements and the effect of these requirements on tax policy. The model predicts that, in legislatures controlled by the pro-tax party, the median legislator and members of the minority anti-tax party will form a coalition to enact a supermajority constitutional amendment. The median legislator, a member of the majority pro-tax party, is willing to give up his role as the pivotal voter in order to reduce the agenda-setting power of extremists within the pro-tax party. The model illustrates the identification problem described above: states with pro-tax legislatures tend to adopt supermajority requirements. This theoretical prediction is supported anecdotally as Democrat-controlled state legislatures are more likely to adopt supermajority requirements. Consequently, a comparison of sample means, even conditional on observable state characteristics, may tend to understate the effects of supermajority requirements on tax rates.

Empirically, this paper makes two attempts to correct for this identification

¹Georgia, Hawaii, Illinois, Idaho, Maryland, Massachusetts, Minnesota, Michigan, New Mexico, New York, North Carolina, Ohio, Rhode Island, South Carolina, West Virginia, and Wisconsin.

²See Besley and Case (1994) for a general discussion of endogeneity problems when using cross-state policy variation.

problem. First, the econometric model includes state and year fixed effects to better control for unobserved attitudes towards taxation. Second, as motivated by the theoretical model, the paper uses variation in state constitutional amendment rules as instruments for supermajority requirements in a two-stage least-squares framework.

To preview the empirical results, the paper finds a small, statistically insignificant, negative effect of supermajority requirements on taxes when using ordinary least-squares. After correcting for the identification problem due to the correlation between supermajority rules and unobserved attitudes towards taxation, the paper finds a large, statistically significant, negative effect in both the fixed-effects and instrumental variables estimation results. In the uncorrected estimates, the propensity of pro-tax states to adopt supermajority requirements disguises the effects of these rules on tax policy.

2. State supermajority requirements

The tax revolt of the 1970s restricted the power of state and local governments to tax and spend. Although these limits vary widely across states, they can be placed into three broad categories: traditional tax and expenditure limitations, voter approval requirements, and supermajority requirements. Traditional tax and expenditure limitations (in 26 states) limit tax or expenditure growth to the growth rates of personal income, population or inflation. Voter approval requirements (in four states) oblige the legislature to request voter approval in a referendum for all tax increases and new taxes. Supermajority requirements (in 13 states), summarized in Table 1, require a three-fifths, two-thirds, or three-quarters legislative vote in order to approve tax increases or new taxes.³ Among the 13 states adopting supermajority requirements, the Democrats controlled at least one chamber of the legislature in ten states and held the governor's office in 11 states at the time of adoption. Three southern state legislatures, Florida, Louisiana, and Mississippi, passed their supermajority requirements following the Voting Rights Act of 1965, presumably to protect the status quo tax rates in the face of predictable changes in the electorate.

Consider the experience of three states, Nevada, Oregon and Ohio, that have all recently considered adoption of supermajority requirements. In 1996, a former Assemblyman used Nevada's direct legislation provision to place a two-thirds supermajority requirement amendment on the ballot after failing to get legislative

³There are exceptions to this simple classification, as restrictions in three states (Colorado, Florida, and Washington) are hybrids of the three types of requirements. Colorado requires both a supermajority legislative vote and voter approval in a referendum to pass new taxes. Florida requires a supermajority vote only for corporate tax increases over 5%. Washington requires a supermajority vote for tax increases below the spending growth limit but a supermajority requirement and voter approval for tax increases above the spending limit.

Table 1
States with supermajority requirements^a

State	Adopted	Initiated by	Percentage required	Applies to	Legislative majority party	Governor party
Arizona	1992	Voters	2/3	All taxes	Divided	Republican
Arkansas	1934	Legislature	3/4	All except alcohol and sales	Democrat	Democrat
California	1979	Voters	2/3	All taxes	Democrat	Democrat
Colorado	1992	Voters	2/3	All taxes	Republican	Democrat
Delaware	1980	Legislature	3/5	All taxes	Democrat	Republican
Florida	1971	Legislature	3/5	Corporate tax	Democrat	Democrat
Louisiana	1966	Legislature	2/3	All taxes	Democrat	Democrat
Mississippi	1970	Legislature	3/5	All taxes	Democrat	Democrat
Nevada	1996	Voters	2/3	All taxes	Divided	Democrat
Oklahoma	1992	Voters	3/4	All taxes	Democrat	Democrat
Oregon	1996	Legislature	3/5	All taxes	Republican	Democrat
South Dakota	1978	Voters	2/3	Sales and income tax	Republican	Democrat
Washington	1993	Voters	2/3	All taxes	Democrat	Democrat

^a Sources: Rafool (1996) and Book of the States (1963–1995).

approval of his idea in 1993; voters subsequently approved the amendment (Whaley, 1997). Also in 1996, the Oregon legislature initiated a supermajority requirement by a narrow majority.⁴ The vote was sufficient to initiate the supermajority requirement given that Oregon, unlike many other states, requires only a simple legislative majority to initiate a constitutional amendment. Voters approved the amendment by a vote of 75 to 25% (The Bulletin, 1996). In Ohio, voters in 1983 rejected a voter-initiated three-fifths supermajority requirement amendment by a vote of 60% against to 40% in favor after beneficiaries of government programs sponsored a negative publicity campaign (Leonard, 1983). In 1995, the Ohio House passed a three-fifths supermajority requirement by a vote of 62 to 37, requiring bipartisan support to exceed the three-fifths vote needed to initiate a constitutional amendment (Suddes, 1995). Leaders in the Senate never brought the requirement to a vote, claiming that the supermajority requirement would damage the state's AAA bond rating (Davey, 1995). While Republicans controlled the legislatures of both Oregon and Ohio, Democrats controlled the legislature in the other five states with legislatively initiated supermajority requirements. Taken together, the experiences of these three states suggest that both voters and legislatures are instrumental in the adoption of supermajority requirements and that the rules of amending state constitutions are important determinants of adoption.

3. Existing evidence

Strong evidence exists that traditional tax and expenditure limitations lead to lower taxes and spending.⁵ Rueben (1995) uses an approach similar to that used here. She recognizes the potential endogeneity of these limitations and uses voter access to direct legislation as an instrumental variable. When using ordinary least-squares and fixed-effects estimators, she finds little evidence of lower spending. However, her instrumental variables estimates suggest that tax and expenditure limitations reduce state general expenditures as a percent of personal income by two percentage points.

One should be skeptical about extrapolating evidence from these traditional limitations to supermajority requirements because they restrain the public sector in very different ways. First, traditional limitations place an external restraint in the form of a binding tax or expenditure cap on the legislature, while supermajority requirements place internal restrictions on the legislature by modifying the rules for passing legislation and increasing the bargaining power of the minority party.

⁴The vote was 16 in favor with 14 against in the Senate and 33 in favor with 27 against in the House. Although Republicans controlled both chambers, the amendment required bipartisan support to pass in the Senate.

⁵See Abram and Dougan (1986), Elder (1992), and Poterba (1996).

Second, almost half of traditional tax and expenditure limitations are statutory while all supermajority requirements are constitutional. Constitutional requirements are typically more difficult to change than statutory requirements (Rafool, 1996). In addition, Bohn and Inman (1996) find that constitutional balanced budget rules are more successful in limiting budget deficits than statutory balanced budget rules. They attribute this difference to the fact that constitutional balanced budget rules typically have stricter enforcement mechanisms.

Four studies on supermajorities are Kenyon and Benker (1984), Crain and Miller (1990), Rafool (1996), and Temple (1997). Kenyon and Benker provide a survey of the various types of fiscal restraints and note that ‘requiring a supermajority vote of the legislature to pass a tax increase in most cases provides the minority party with strong bargaining power in dealing with the majority party.’ Rafool reports that many tax reformers find supermajority requirements more effective than traditional limits and notes that ‘supermajority states report that diligent consensus building by legislative leaders is necessary to gain approval of most tax increases.’ Crain and Miller (1990) regress per-capita growth rates in real state spending over 2-year periods between 1979 and 1986 on indicator variables for the existence of a variety of budget institutions including line-item vetoes, supermajority requirements, and balanced budget requirements. Although they do not control for other determinants of tax rates or the endogeneity of supermajority requirements, they find evidence that supermajority requirements cut the 2-year growth in spending from 2.8 to 1.8%.

Temple (1997) is the only study that addresses the possible endogeneity of supermajority requirements. To control for selection on unobservables, she uses both fixed-effects and a random growth model, a specification used in evaluation of job training programs. The random growth model includes both fixed-effects and a time invariant, state specific growth rate in the unobservable variables. She interprets the random growth model as allowing for the possibility that the decision to adopt a limit is a function of an unobservable state-specific revenue growth rate. Using state-level data from 1970–1994, she concludes that supermajority limitations do not reduce the level of taxation.

4. Theoretical framework

If state representatives were to maximize constituents’ welfare, there would be no need for fiscal restraints such as tax limits and supermajority requirements. Therefore, most existing models of adoption of such restraints assume that voters cannot achieve their most preferred government spending level through the electoral process due to monopoly governments and incomplete voter information (see Brennan and Buchanan, 1980; Inman, 1982). In the absence of restraints, government bureaus can extract surplus from taxpayers and thus have incentives to overprovide public services. Fiscal restraints allow voters to eliminate this over-

provision and implement their most preferred spending level. These models may explain why voters initiated supermajority requirements in seven states. However, these models cannot explain why six legislatures have imposed supermajority requirements on themselves, effectively increasing the bargaining power of minority parties. Given the lack of theoretical explanations for fiscal restraints initiated by legislatures, and the fact that many supermajority rules were adopted in this fashion, I begin with a simple model of legislatively initiated supermajority rules.⁶

Consider a legislature that finances a public good through choice of a flat income tax rate (τ). Each legislator has an ideal tax rate (α_i) between zero and one and preferences over all tax rates given by $U_i(\tau) = -(\tau - \alpha_i)^2$. This utility function is decreasing in distance from the ideal point and is thus single peaked. Jurisdiction income and preference for public services, among other characteristics, determine each legislator's ideal tax rate. The distribution of ideal tax rates in the legislature is given by the cumulative distribution function $F(t) = Pr(\alpha < t)$.⁷

Determination of the tax rate follows two phases: the constitutional phase (in which the legislature chooses a supermajority percentage) and the budgetary phase (in which the legislature chooses a tax rate). The distinction between a constitutional phase and budgetary phase can be justified on two grounds. First, legislatures need to specify the 'rules of the game' before the budget process commences. Second, supermajority requirements are constitutional amendments while tax policy is statutory, and each is thus determined in a different stage of the political process.

Constitutional phase

(1) The committee chair proposes a supermajority percentage (P^{maj}). The minority ranking member simultaneously proposes P^{min} .

(2) Legislators simultaneously vote on the two proposals. A simple majority determines the winner.

(3) The winner of stage #2 faces a status quo of 50%. A simple majority determines the winner. Denote the winning percentage as P and the corresponding pivotal voter (a) by $1 - F(P) = a$.

⁶Political determination of the tax rate draws from the models of Shepsle (1979) and Aldrich (1996). Shepsle developed a model of committee power within a legislature. The important components of his framework are a committee framework (who can submit proposals) and an amendment framework (who can amend proposals). In a closed amendment rule, no one can submit amendment proposals, while in an open amendment rule, amendments to the committee proposal are allowed. Aldrich (1996) added a political party structure to this framework in which the committee chair, a member of the majority party, submits proposals, while the minority party member submits one amendment in an open rule legislature.

⁷For technical convenience, the model employs a continuum of legislators. This assumption allows $F(t)$ to be inverted, yielding a different equilibrium tax rate for each supermajority requirement.

Budgetary phase

(4) The committee chair proposes the tax rate (τ_{pr}).

(5) Legislators simultaneously vote on the proposed tax rate versus the given status quo (τ_{sq}). The proposal requires at least the supermajority percentage if it is a proposed tax increase. Otherwise, a simple majority will defeat the status quo.⁸ Denote the resulting tax rate as τ .

Control of the agenda depends upon the majority party. There are two political parties in the model: the anti-tax party ($\alpha < \underline{\alpha}$) and the pro-tax party ($\alpha > \underline{\alpha}$) where $\underline{\alpha}$ is an arbitrary cutoff level. The majority party is simply the party with the highest representation in the legislature. This paper does not attempt to model the party caucus process; the positions of committee chair and minority ranking member are assigned to the median legislator within the majority and minority parties, respectively. While the median voter model predicts a convergence of platforms, parties may have divergent policy preferences by relaxing the assumption that candidates can commit to implementing their electoral platform and allowing parties to represent different constituencies (Alesina, 1988). Providing an alternative explanation, Aldrich (1983) develops a model in which parties adopt divergent policy positions in order to attract partisan activists who in turn help the parties to achieve their electoral goals.

Proposition 1. *If the pro-tax party controls the legislature and the status quo tax rate is lower than the median legislator's preferred tax rate, then the unique subgame perfect equilibrium has both the committee chair and minority member proposing the supermajority percentage that results in the median legislator's ideal tax rate. That is, $\tau = \alpha_{med}$ and $a = (\alpha_{med} + \tau_{sq})/2 = 1 - F(P)$.*

Proof. See Appendix A.

The legislature enacts a supermajority requirement in order to reduce the agenda-setting power of the pro-tax party in favor of the median legislator within the entire legislature. When the anti-tax party controls the legislature, the median legislator prefers a tax rate above the committee chair and thus the legislature does not adopt a supermajority requirement. Similarly, when the status quo tax rate is higher than that preferred by the median legislator, the legislature does not adopt a supermajority requirement because the median legislator prefers a tax decrease.

Fig. 1 illustrates the equilibrium. In the constitutional phase, legislators choose

⁸To keep the analysis simple, the model does not allow for supermajority percentages less than 50% or supermajority requirements for tax decreases (as no states have adopted these). If supermajority requirements for tax decreases were allowed, legislatures controlled by the anti-tax party would adopt supermajority requirements for tax decreases when the status quo tax rate is above the median legislator's ideal tax rate.

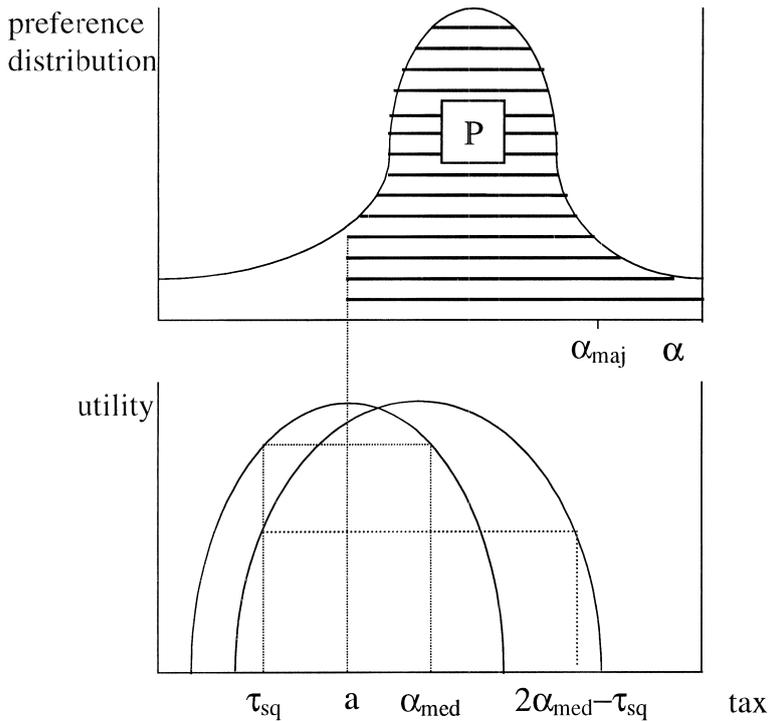


Fig. 1. Median legislator's ideal supermajority percentage (P).

between the status quo of 50% (which results in tax rate $2\alpha_{\text{med}} - \tau_{\text{sq}}$, the tax rate for which the median legislator is indifferent to the status quo) and the shaded area P (which results in the median legislator's ideal tax rate α_{med}). The median legislator and all legislators with a lower ideal tax rate prefer the proposal to the status quo and it wins. Thus, the legislature adopts a supermajority requirement such that the pivotal voter (a) associated with the supermajority percentage is just indifferent between the status quo tax rate (τ_{sq}) and the median legislator's ideal tax rate (α_{med}). The majority chair prefers a supermajority percentage lower than P but any offer lower than P in stage #1 will lose to the minority member's proposal of P . Similarly, the minority member prefers a supermajority percentage higher than P but any offer higher than P in stage #1 will lose to the majority chair's proposal of P . Thus, both offering P is a mutual best response.

The intuition behind this result is that the median legislator, a member of the majority party, joins a coalition with members of the minority party in order to approve a supermajority constitutional amendment. The median legislator is willing to give up the role of pivotal voter in the budgetary phase in return for a more favorable policy outcome, namely the median legislator's ideal tax rate. The

minority member and the median legislator exploit their first mover advantage, recognizing the effect of the supermajority percentage on the budgetary phase. The presence of competing proposals in the constitutional phase drives the proposals towards the median legislator's ideal outcome, similar in spirit to the Downsian median voter theorem for electoral competition. In this case, a very simple amendment structure is enough to eliminate the agenda-setting power of the majority chair and give the median legislator his ideal tax rate.

This model can be modified to allow for a voter initiated, rather than a legislatively initiated, supermajority requirement. For voter initiated amendments, the state must have direct legislation, a procedure that allows voters to place constitutional amendments directly on the ballot. If the median voter is the same as the median legislator, the extension is trivial; the median voter will enact the same supermajority requirement as the median legislator. If the median voter is different from the median legislator, the legislator and voters will prefer different supermajority requirement percentages. Assuming the median voter prefers a lower tax rate than the median legislator (perhaps due to a revenue maximizing government), the voter will prefer a higher supermajority percentage. In this case, the supermajority requirement enacted will depend upon whether the constitution is more easily amended through voter or legislative initiative.

It is worth noting which assumptions are for convenience and which are crucial in the model. The simultaneous amendment in stage 1 is for convenience; other approaches to modeling open rules, such as a sequential amendment process, yield the same equilibrium. The assumption of single-peaked utility, but not the parametric utility specification, is crucial to the analysis; this assumption guarantees the existence of an equilibrium in stage 1 by restricting the possibility of cycling. Last, the difference in amendment structure between the constitutional and budgetary phase (no amendment in stage 4) is crucial to the analysis. The motivation for this assumption is the difference in timing between the budget (set annually or biennially) and constitutional amendments (can be proposed anytime). Due to the timing of the budget, legislatures have adopted a more formal institutional framework of administrative rules and committee responsibilities, increasing the agenda-setting power of the majority party. State constitutional amendments will certainly have formal administrative procedures and the majority party may still have agenda control. Nevertheless, the agenda control should be less than in budget negotiations and therefore the model makes the simplifying assumption of open rule framework for the constitutional phase and closed rule framework for the budgetary phase.⁹

⁹Robinson (1963) and Smith (1989) provide some evidence for this assumption from the US Congress. On page 44, Robinson finds that one-third of all closed rules between 1939 and 1960 related to fiscal matters while none related to bills on rules. More recently, Smith presents data on the percentage of closed rules in the House by committee jurisdiction. All Budget Committee legislation (but only 63% of Rules Committee legislation) was considered under a closed rule between 1975 and 1985.

This model illustrates the endogeneity of the supermajority variable as pro-tax states will choose to adopt supermajority requirements. Thus, a simple cross-sectional regression analysis will understate the effect of these requirements on taxes. This paper makes two attempts to correct this endogeneity empirically. First, using panel data, fixed effects are employed to control for both national trends and time-invariant state differences in unobserved attitudes towards taxation. Second, the use of instrumental variables attempts to empirically separate the effects of supermajority requirements from the propensity of pro-tax states to adopt such requirements. These instrumental variables need be highly correlated with the likelihood of supermajority requirement adoption, and affect taxes only indirectly, through the supermajority requirement. To provide theoretical motivation for instruments used to correct this endogeneity, this paper now relaxes the assumption of constitutional amendments by simple majority in stage 3. Approximately one-half of states and the federal government require more than a simple majority to initiate a constitutional amendment.

Proposition 2. *The equilibrium budgetary phase supermajority percentage (P) is weakly decreasing in the vote required for a constitutional amendment (Q).*

Proof. See Appendix A.

The intuition behind Proposition 2 is straightforward. There is an inverse relationship between supermajority percentages and equilibrium tax rates. Thus, legislators with ideal tax rates greater than the median legislator will need to approve the supermajority requirement if it requires more than a simple majority. To obtain this support, the majority chair and minority member may need to offer lower supermajority percentages. If the vote required for amendment is sufficiently high, a legislature that would adopt a requirement under a simple majority for amendments will not adopt a supermajority requirement.

This variable, the vote required for a constitutional amendment, affects the likelihood of supermajority adoption and does not affect the budgetary phase directly. In a general sense, the vote required for a constitutional amendment measures the difficulty of amending the constitution. The paper employs two additional instruments that measure this difficulty: voter access to constitutional amendment through direct legislation and the number of legislative sessions required to consider an amendment.

5. Empirical model and results

The parameters of the following model are estimated:

$$TAX\ RATE_{it} = \alpha * SUPER_{it} + \beta' X_{it} + u_{it}$$

The complexity of state tax codes makes measurement of the tax rate difficult; this paper uses per-capita effective tax rate (i.e. state tax revenues divided by income). The variable $SUPER_{it}$ is the legislative percentage required to pass a tax increase. The vector X_{it} includes indicators for the existence of a traditional tax limit, the existence of a traditional expenditure limit, party control of both legislative chambers, and the presence of a Democrat governor, state per-capita income, and state per-capita federal grants.¹⁰ Table 2 provides summary statistics for these variables.

In addition to the supermajority variable, the set of control variables includes both traditional tax limitations and expenditure limitations. Excluding these variables could lead to omitted variable bias if states choose one type of limitation from many options or if states tend to adopt both supermajority rules and other fiscal restraints. Including traditional tax and expenditure limitations also allows for comparison of the effects of different types of limitations, at least in the fixed-effects results.

The paper uses data from several sources. The Census Bureau annual publication *State Government Finances* provides data on income, grants, taxes and expenditures. The Council of State Governments *Biennial Book of the States* provides data on party representation and the constitutional variables. Rafool (1996) provides information on supermajority requirements and traditional tax and expenditure limitation. Finally, Bohn and Inman (1996) provide data on balanced budget rules. The data span state fiscal years 1963 through 1995.¹¹ The sample size is 1584 observations after excluding Minnesota and Nebraska from the original sample of 1650.¹²

As a benchmark against which to compare the endogeneity-corrected results, column 1 of Table 3 provides the OLS estimation results. The supermajority

¹⁰Alt and Lowry (1994) use similar legislative control variables.

¹¹The timing of the election cycle relative to the budgetary cycle is an important data issue. States hold elections in November of even years and inaugurate new legislators in the following January. Twenty-one states have biennial budgetary cycles while 29 have annual budget cycles. To see how the cycles interact, consider the state legislators inaugurated in January 1997. In states with biennial budget cycles set in odd years, these legislators will set the FY 1998–1999 budget in June of 1997, assuming a July 1 fiscal year begin date. In states with biennial budget cycles set in even years, these legislators will set the FY 1999–2000 budget in June of 1998. Finally, in states with annual budget cycles, the legislators will set the FY 1998 budget in June 1997 and the FY 1999 budget in June 1998. The empirical analysis below accounts for these different budget cycles by ensuring that the party variables are set according to who was in office when the FY budget was set. Of course, not all tax policy is set in the budget negotiations. States may need to raise taxes during the fiscal year in order to avoid deficit carryovers. However, these tax changes should be small relative to the official budget cycle.

¹²These states are excluded because this paper controls for legislative party representation and these states have non-partisan elections.

Table 2
Descriptive statistics^a

Variable	Description	Average ^b (S.D.)	Source
Tax rate	Fiscal year effective state tax rate	0.0712 (0.0236)	Census State Government Finances
Supermajority percentage	Legislative vote required to raise taxes (0.5 if no supermajority)	0.5172 (0.0530)	Rafool (1996)
Both chambers Democrat	Indicator for Democrat control of both legislative chambers	0.5758 (0.4944)	Book of the States
Both chambers Republican	Indicator for Republican control of both legislative chambers	0.2317 (0.4220)	Book of the States
Governor Democrat	Indicator for Democrat governor	0.6073 (0.4885)	Book of the States
Income	Calendar year per-capita income (in thousands)	15.9300 (3.7881)	Census State Government Finances, 1963–1995
Grants	Fiscal year per-capita federal grants (in thousands)	0.5501 (0.2793)	Census State Government Finances
Direct legislation	Indicator for voter access to constitutional amendment through direct legislation	0.2860 (0.4520)	Book of the States
Legislative vote	Legislative vote required to initiate constitutional amendment	0.5991 (0.0803)	Book of the States
Sessions required	Number of legislative sessions needed to consider amendment (either 1 or 2)	1.2620 (0.4399)	Book of the States
Tax limit	Dummy for presence of traditional tax limitation	0.0366 (0.1879)	Rafool (1996)
Expenditure limit	Dummy for presence of traditional expenditure limitation	0.1326 (0.3392)	Rafool (1996)

^a Forty eight states (Nebraska and Minnesota excluded due to non-partisan elections), fiscal years 1963–1995.

^b All monetary values in 1995 dollars.

Table 3
Determinants of state tax rates (standard errors)

Dependent variable	OLS	Fixed effects	2SLS 1st stage	2SLS 2nd stage	2SLS 1st stage	2SLS 2nd stage
	(1)	(2)	(3)	(4)	(5)	(6)
	Tax rate	Tax rate	Super-majority	Tax rate	Super-majority	Tax rate
Supermajority percentage	-0.0057 (0.0102)	-0.0359** (0.0155)		-0.2136** (0.0509)		-0.1843** (0.0673)
Tax limit	-0.0067** (0.0029)	-0.0064** (0.0029)	0.0232** (0.0071)	0.0003 (0.0036)	0.0313** (0.0070)	-0.0007 (0.0039)
Expenditure limit	0.0048** (0.0016)	-0.0004 (0.0018)	0.0093** (0.0040)	0.0072** (0.0019)	0.0125** (0.0040)	0.0069** (0.0019)
Both chambers Democrat	0.0043** (0.0014)	0.0018 (0.0015)	0.0159** (0.0035)	0.0077** (0.0018)	0.0145** (0.0035)	0.0072** (0.0019)
Both chambers Republican	-0.0034** (0.0017)	-0.0018 (0.0015)	0.0032 (0.0041)	-0.0027 (0.0019)	0.0019 (0.0041)	-0.0028 (0.0018)
Governor Democrat	0.0008 (0.0011)	-0.0017* (0.0009)	0.0020 (0.0027)	0.0010 (0.0012)	0.0007 (0.0027)	0.0009 (0.0012)
Income	-0.0001 (0.0002)	0.0021** (0.0004)	-0.0013** (0.0004)	-0.0004* (0.0002)	-0.0011** (0.0004)	-0.0003* (0.0002)
Grants	0.0378** (0.0020)	-0.0098** (0.0029)	0.0169** (0.0051)	0.0406** (0.0024)	0.0121** (0.0051)	0.0402** (0.0024)
Direct legislation			0.0202** (0.0033)			
Legislative vote			-0.0298 (0.0184)		-0.0752** (0.0171)	
Sessions required			-0.0120** (0.0033)		-0.0186** (0.0031)	
Constant	0.0525** (0.0060)		0.5432** (0.0150)	0.1597** (0.0264)	0.5842** (0.0137)	0.1446** (0.0349)
R^2	0.219	0.580	0.094		0.072	
Sample size ^a	1584	1584	1584	1584	1584	1584

^a Forty eight states (Nebraska and Minnesota excluded due to non-partisan elections), fiscal years 1963–1995.

* Denotes 90% significance. ** Denotes 95% significance.

coefficient is small and statistically insignificant, suggesting that supermajority requirements do not reduce taxes. As demonstrated in the theoretical section, pro-tax states may tend to adopt supermajority requirements, imparting a downward bias in the supermajority coefficient.

The fixed-effects model includes both state and time dummy variables in order to control for cross-state and temporal preference variation. Note that fixed effects will not capture state-specific temporal changes in preferences. In this case, fixed effects will reduce, but not eliminate, the bias relative to the OLS estimates.¹³ This paper chooses the fixed-effects specification over random effects because the use of random effects requires the assumption that the state and year effects are random variables that are uncorrelated with the explanatory variables. Therefore, random effects would not help in solving the endogeneity problem.¹⁴

Focusing on the two-way fixed-effects parameter estimates in column 2, introduction of a two-thirds supermajority requirement is associated with a 0.6-percentage point decrease in the tax rate, a decrease of 7 percent relative to the sample average.¹⁵ Similarly to supermajority requirements, traditional tax limitations are associated with a 0.6-percentage point decrease in the tax rate, while expenditure limitations appear to have no effect upon the tax rates. Inclusion of fixed effects causes the traditional tax limitation and supermajority requirement parameters to move in opposite directions, relative to the OLS estimates. Perhaps pro-tax states adopt supermajority requirements for the reasons described in this paper while anti-tax states adopt traditional tax limitations as a contingency against losing legislative control. States with Democrat legislatures have high tax rates while those with Republican legislatures and Democrat governors have lower tax rates although the legislative coefficients are statistically insignificant. Increases in per-capita income and decreases in grants are associated with higher tax rates. This evidence is consistent with the median voter model, as governments should offer lower taxes in response to grants because income and lump sum grants are viewed as fully fungible.

The second approach for correcting the endogeneity problem is the use of instrumental variables. Three instruments measure the difficulty in changing the constitution: the availability of voter direct legislation, the legislative vote required to initiate a constitutional amendment, and the number of legislative sessions needed to consider an amendment.¹⁶ Poterba (1996) suggests using constitutional

¹³ Assuming that both the state and year effect are positively correlated with the supermajority variable.

¹⁴ A Hausman test for fixed-effects versus random effects, not reported here, supports the use of fixed-effects.

¹⁵ $(-0.0359) \times (0.67 - 0.50) = -0.006$.

¹⁶ Three states (Connecticut, Hawaii, and New Jersey) allow passage in one legislative session with a supermajority or two sessions with a simple majority. This paper interprets these as one session and a supermajority vote required.

variables as instruments for analysis of budget rules, and Rueben (1995) uses a direct legislation instrument in her study of state tax and expenditure limits.

Voter direct legislation allows citizens to circumvent the legislative process and place constitutional amendments directly on the ballot, making adoption of constitutional amendments easier. In one-half of the states with supermajority requirements, voters initiated the amendment. Many states adopted direct legislation in the early 1900s as part of the Populist movement (Magleby, 1984). Matsusaka (1995) finds evidence that states with direct legislation laws had a four percent lower spending level than states without direct legislation between 1960 and 1990, presumably due to adoption of budget rules such as tax and expenditure limitations and supermajority requirements. He also finds that states with direct legislation have more decentralized spending (at the local rather than state level) and rely more on charges relative to taxes. Regarding the potential endogeneity of direct legislation rules, he argues that these rules are independent of unobserved state characteristics due to their historical nature.

Many states and the federal government require more than a simple majority to initiate a constitutional amendment, making such amendments more difficult to enact. This requirement should reduce the likelihood of supermajority requirement adoption because it requires the support of more legislators. For example, the US House would have already passed a supermajority requirement for tax increases were the constitution to require only a simple majority in order to initiate an amendment.¹⁷

As of 1995, 12 states required approval of two legislative sessions to initiate an amendment making the amendment process longer and more difficult. For example, the 1997–1998 Wisconsin Assembly voted in favor of a supermajority requirement but the amendment cannot proceed until the 1999–2000 Assembly also passes it.¹⁸ After the next elections, the legislature may change political leadership and not approve the amendment.

These three measures will only be valid instruments if they are uncorrelated with unobserved attitudes towards taxation and do not have a direct effect on tax policy outcomes. Note that these constitutional amendment rules, with the exception of direct legislation, were typically adopted as part of states' original constitutions. In addition, they apply to all amendments, not only the adoption of supermajority requirements. Steuneberg (1992) and Gerber (1996) show how direct legislation can influence legislative outcomes when legislative and voter preferences diverge. In these models, the implicit threat of voter initiated legislation forces legislatures to alter tax and spending policy. These models suggest that direct legislation is an important direct determinant of tax rates and

¹⁷This assumes, of course, that legislators vote sincerely.

¹⁸The Senate also needs to approve the amendment in both sessions.

thus may be an invalid instrument. To address this issue, this paper estimates instrumental variables models both with and without the direct legislation instrument. In addition, Hausman tests support the exogeneity of all three instruments.¹⁹

In column 3, the first stage provides empirical support for the two assertions in Proposition 1. The positive sign on the both chambers Democrat variable supports the first assertion that the legislatures controlled by the pro-tax party adopt supermajority requirements. The positive coefficient on the both chambers Democrat variable for all tax rate regressions in Table 3 provides the link between the Democrats and the pro-tax party.²⁰ The negative sign on the income variable provides support for the second assertion that legislatures adopt supermajority requirements when the status quo tax rate is lower than the median legislator's preferred rate. Recessions, times of low income, leave governments with revenue below that needed to balance the budget. To increase revenues, governments must increase tax rates; thus, in recessions the status quo rate is lower than median legislator's preferred rate.²¹ This result is consistent with the adoption of supermajority requirement in the late 1970s and early 1990s, both times of fiscal stress for state governments. The negative legislative vote coefficient provides support for Proposition 2, although the coefficient is statistically insignificant. The other two instruments have the expected sign; states with direct legislation and those that require only one legislative session are more likely to adopt supermajority requirements. The sign on all three instruments demonstrates that states with more easily amended constitutions are more likely to adopt, and tend to have higher, supermajority percentages.

In the second stage, reported in column 4, the supermajority coefficient becomes large. Introduction of a two-thirds supermajority leads to a 0.036 decrease in the

¹⁹The Hausman test for endogenous instruments focuses on a subset of suspect instruments and compares the parameters of the full model to a just-identified model that does not use the suspect instruments. This paper performs three sets of Hausman tests; for each the just identified model includes one of the three instruments while the other two are considered suspect. The results from all three tests fail to reject the exogeneity of the instruments at standard significance levels. Of course, if all three instruments are invalid, this test is unreliable because it rests on the assumption that the one included instrument is valid.

²⁰If party representation provided an exact measure of unobserved attitudes towards taxation, then the OLS estimates would be unbiased. This paper takes the position that party control proxies for the legislature's attitudes towards taxation while recognizing that the parties represent different preferences in different states and that there is also preference variation among legislators within the party. Thus, party representation only weakly captures unobserved attitudes towards taxation.

²¹Given that this model is pooled both over time and across states, most of the variation in income is probably across states, rather than over time. However, a model with fixed-effects, not reported here, also has a negative income coefficient.

tax rate, a decrease of 50% relative to the sample average. The tax limitation variable becomes small and statistically insignificant from zero. Surprisingly, the traditional expenditure limitation leads to a higher tax rate. The two-stage least-squares estimation makes no attempt to correct for the possible endogeneity of traditional tax and expenditure limitations which may be endogenous for reasons similar those for the supermajority variable. This endogeneity may explain the reversal of signs in these coefficients between the fixed-effects and two-stage least-squares results. See below for a specification treating these limitations as endogenous. The legislative variables have the same sign as the fixed-effects estimates while the governor, income, and grants variables all have the opposite sign. The negative income coefficient suggests that the public budget share is declining in income. A positive coefficient on grants may reflect a propensity for the federal government to target grants towards states with a strong unobserved preference for public services leading to a positive correlation between grants and tax rates. Columns 5 and 6 present results excluding direct legislation from the set of instruments. The results are similar to the full model, both in the first and second stages, suggesting that direct legislation is a valid instrument.

The fixed-effects and two-stage least-squares models separately attempt to correct the endogeneity problem; the results complement each other in the sense that both find negative and statistically significant supermajority requirement effects. However, the magnitude of the supermajority coefficient and the signs of the other control variables are significantly different across the two specifications. As mentioned earlier, fixed effects will reduce, but not eliminate, the bias relative to OLS if there are within-state temporal changes in attitudes towards taxation. The fact that some states adopt supermajority requirements during the sample period while other states do not suggests that state attitudes may change over time. The correlation between the Democrats share of the presidential vote in each state in 1960 and 1994, a measure of persistence of preferences within a state, is 0.38.²² Similarly, Erikson et al. (1993) find a correlation of 0.56 in state ideology, measured using opinion polls, between the periods 1947–1964 and 1976–1988. These relatively low correlations demonstrate the variation in state preferences over time; this variation may explain the weaker results found in the fixed-effects specification.

Alternatively, the two-stage least-squares results may be overstated. As a sensitivity test of the instrumental variables estimator, Table 4 provides selected

²²These years are chosen as the president in office in the first and last sample year. Including presidential vote share instead of state legislative and governor party variables in the econometric specification does not qualitatively alter the results.

Table 4
Selected regression coefficients (standard errors) for alternative 2SLS specifications^a

Specification	Instrument for tax and exp limits		Include state and year effects		Exclude Midwest states	
	2SLS 1st stage (1)	2SLS 2nd stage (2)	2SLS 1st stage (3)	2SLS 2nd stage (4)	2SLS 1st stage (5)	2SLS 2nd stage (6)
Dependent variable	Super-majority	Tax rate	Super-majority	Tax rate	Super-majority	Tax rate
Supermajority percentage		-0.0579 (0.2227)		-0.0361 (0.1199)		-0.0977** (0.0351)
Direct legislation	0.0228** (0.0032)		0.0276** (0.0057)		0.0451** (0.0039)	
Legislative vote	-0.0209 (0.0183)		0.0278 (0.0374)		0.0497** (0.0216)	
Sessions required	-0.0119** (0.0033)		0.0082 (0.0075)		-0.0141** (0.0035)	
R ²	0.085		0.773		0.203	
Sample size ^b	1584	1584	1584	1584	1254	1254

^a Each regression also includes tax limit, expenditure limit, both chambers Democrat indicator, both chambers Republican indicator, governor Democrat indicator, income, grants and a constant as control variables. Columns (3) and (4) also include state and year indicator variables.

^b Forty eight states (Nebraska and Minnesota excluded due to non-partisan elections), fiscal years 1963–1995. In columns 5 and 6, ten other Midwest states, North Dakota, South Dakota, Kansas, Iowa, Missouri, Wisconsin, Illinois, Michigan, Indiana, and Ohio were excluded.

* Denotes 90% significance. ** Denotes 95% significance.

coefficients from three alternative two-stage least-squares regressions.²³ First, given that traditional tax and expenditure limitations may also be endogenous, columns 1 and 2 provide results in which both supermajority requirements and these traditional limitations are treated as endogenous variables in the two-stage least-squares model. The supermajority coefficient of -0.058 is relatively close to the fixed-effects coefficient of -0.036 . The statistical insignificance of this two-stage least-squares coefficient reflects the lack of instrument power in a just-identified model relative to an overidentified model.²⁴

Second, the fixed-effects model uses variation in supermajority requirements *within* states and years, while the two-stage least-squares model uses variation in amendment procedures *across* states and years. As a specification with more consistent sources of variation, columns 3 and 4 present two-stage least-squares results including state and year indicators. The direct legislation instrument has a sign equal to and magnitude similar to the original two-stage least-squares coefficient while the other two instruments have a different sign and are statistically insignificant. This insignificance reflects the lack of time-series variation in these two instruments.²⁵ In the second stage, the supermajority coefficient of -0.0361 is very close to the fixed-effects coefficient of -0.0359 .²⁶ Again, the statistical insignificance of this two-stage least-squares coefficient reflects the lack of time-series variation in the instruments.

Third, columns 5 and 6 present results excluding the states of the Midwest Census region. This group of states may be an influential outlier given that they

²³In addition to these three alternative specifications, the paper estimates six specifications as a robustness check; these results, not reported here, are available from the author. First, using the government expenditure rate instead of the tax rate as the dependant variable finds similar, but slightly stronger, results for all models except the two-stage least-squares regression (excluding the direct legislation instrument) in which the supermajority coefficient is statistically insignificant. Perhaps the threat of direct legislation forces legislatures to alter their spending, but not their tax, policy. The next five alternative specifications yielded qualitatively similar results for all estimation procedures. First, Nebraska and Minnesota are included and the party variables are dropped. Second, Florida's supermajority rule, which applies only to corporate taxes, a small percentage of their total tax base, is set to 0.50. Third, the supermajority variable is specified as a dummy variable. Fourth, Alaska and Hawaii are excluded because they are typically considered fiscal outliers. Finally, the dependent variable and all monetary variables are specified in natural logs. In summary, the model is robust to alternative specifications as almost all supermajority coefficients remain negative and statistically significant.

²⁴The second-stage traditional tax and expenditure limitation coefficients, not presented here, are -0.0826 and 0.0342 , respectively, and both are statistically insignificant.

²⁵Between 1963 and 1995, six states changed their constitutional direct legislation provision, four states changed their legislative vote required to amend the constitution and three states changed the number of sessions required to the constitution.

²⁶The second-stage coefficients are also similar to the fixed-effects coefficients. This similarity probably reflects the increase in the first-stage R^2 from 0.094 to 0.773 when including fixed-effects. If this first-stage R^2 were equal to 1, then the fixed-effects and two-stage least-squares coefficients would exactly coincide since the first-stage would provide a perfect prediction of supermajority percentages.

have above average access to direct legislation, below average presence of supermajority requirements, and below average tax rates.²⁷ While direct legislation is a good predictor of supermajority requirements across all states, it is a poor predictor for these Midwest region states, leading to an inflated coefficient when correlating low tax rates with above average access to direct legislation, a proxy for supermajority requirements. When excluding these states, the supermajority coefficient falls significantly, from -0.214 to -0.098 , suggesting that supermajority requirements are associated with a 23% reduction in tax rates. Taken together, these three specifications suggest that the baseline instrumental variable results may be overstated and that 8 to 23% is a more appropriate range for the percentage reduction in taxes attributable to supermajority requirements.

6. Conclusion

The results of this paper support the hypothesis that supermajority requirements are effective in reducing taxes at the state level. The paper has presented a theoretical framework for understanding both the effects of legislative supermajorities upon fiscal outcomes and reasons why states may adopt supermajority requirements. In the model, the median legislator, a member of the majority party, forms a coalition with the minority party to enact supermajority requirements in order to reduce the power of the majority party agenda setter. The model illustrates the endogeneity of supermajority requirements as pro-tax states adopt such requirements, a hypothesis that is supported empirically as Democrat-controlled legislatures are found more likely to adopt supermajority requirements. The model also provides a framework for selecting instrumental variables.

The empirical results suggest that supermajority requirements have powerful effects. Using standard OLS estimation the paper finds small, statistically insignificant effects. In the endogeneity-corrected estimates, these requirements are found to decrease the tax rate relative to the sample average in a statistically significant manner, by 8% in fixed-effects estimation and 50% in instrumental variables estimation, although adjustments to the instrumental variables model shrink the range to between 8 and 23%.

These results are stronger than those found in previous work. While the results match Crain and Miller (1990) in sign, they are not directly comparable because that paper uses growth rates in spending while this paper uses levels of taxes. Temple (1997) finds statistically insignificant effects. As motivated in the theoretical model, this paper focuses on political control variables while Temple focuses on demographic variables. Also, most states adopted their supermajority

²⁷In all, 47% of the Midwest region observations and 24% of the observations from other regions have direct legislation. Only one Midwest state, South Dakota has a supermajority requirement and the Midwest region has an average tax rate of 6.3%, relative to a tax rate of 7.3% for the other regions.

requirement during the 1970s and 1990s, but not the 1980s, suggesting a non-linear trend in unobserved attitudes towards taxation. Thus, Temple's use of a linear time trend in unobservables may not completely correct for the endogeneity of supermajority requirements. Rueben (1995) finds that tax and expenditure limitations have no effect using an OLS or fixed-effects model but stronger effects using direct legislation as an instrumental variable. She finds that a binding state limit reduces general fund revenues as a percent of personal income by 2 percentage points. Here, supermajority requirements are found to reduce tax revenues as a percent of personal income by 3.6 percentage points in the baseline specification and up to 1.7 percentage points in the alternative specifications.

The federal government and sixteen states are now considering adopting supermajority requirements. The shift in attention by tax reformers to supermajority requirements is consistent with the results of this paper: constitutional supermajority requirements have powerful effects in reducing taxation.

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Appendix A. Proof of Propositions

Notes:

(a) The following two restrictions are placed upon the parameters in both proofs to follow:

$$\alpha_{\text{med}} \leq (\alpha_{\text{maj}} + \tau_{\text{sq}})/2 \quad 1$$

$$\tau_{\text{sq}} \geq (\alpha_{\text{min}} + \tau_{\text{sq}})/2 \quad 2$$

These restrictions guarantee an interior solution by ensuring that the majority chair and minority member cannot achieve their ideal pivotal voter (alternatively, their ideal supermajority percentage) and thus cannot achieve their ideal tax rate. Restriction 1 states that the median legislator, the upper bound on the set of permissible pivotal voters, is below the majority chair's ideal pivotal voter (the right hand side). Similarly, restriction 2 states that the status quo tax rate, the effective lower bound on the set of permissible pivotal voters, is above the

minority member’s ideal pivotal voter (the right hand side).²⁸ These restrictions simplify the analysis by providing an interior solution in stages 1 and 4, those in which proposals are made. The results of Propositions 1 and 2 are invariant to these restrictions.

(b) The proofs assume that legislators vote for their preferred outcome. This rules out equilibrium where all legislators vote for an option not preferred by the majority; this can be supported as a Nash equilibrium because a deviation by one voter cannot change the outcome.

Proof of Proposition 1. In order to show uniqueness, the proof will proceed by backwards induction.

Stage 5: A tax increase will be approved if the supermajority pivotal voter prefers it:

$$(\tau - a)^2 \leq (\tau_{sq} - a)^2$$

A tax decrease will be approved if the median legislator prefers it:

$$(\tau - \alpha_{med})^2 \leq (\tau_{sq} - \alpha_{med})^2$$

Stage 4: Since the majority chair can guarantee himself the status quo tax rate and $\tau_{sq} < \alpha_{med} < \alpha_{maj}$ by assumption, he will never propose a tax decrease. The proposed tax rate is given by:

$$\tau_{pr} = \operatorname{argmax} - (\tau - \alpha_{maj})^2$$

$$\text{subject to: } (\tau - a)^2 \leq (\tau_{sq} - a)^2$$

Forming the Lagrangian,

$$L = -(\tau - \alpha_{maj})^2 + \lambda[(\tau_{sq} - a)^2 - (\tau - a)^2]$$

Maximizing this expression with respect to τ , the first-order conditions are given by:

$$\lambda = (\alpha_{maj} - \tau) / (\tau - a) \tag{1}$$

$$\lambda[(\tau_{sq} - a)^2 - (\tau - a)^2] = 0 \tag{2}$$

Case 1: if $\lambda = 0$, then $\tau = \alpha_{maj}$, the chair’s ideal point. For this to be a solution, the constraint must hold at $\tau = \alpha_{maj}$:

$$(\tau_{sq} - a)^2 > (\alpha_{maj} - a)^2$$

²⁸The status quo tax rate is the effective upper bound because for all pivotal voters below the status quo tax rate, the resulting tax rate is the status quo tax rate because these pivotal voters will not approve a tax increase.

This inequality means that the pivotal voter prefers α_{maj} to τ_{sq} . Now, if $\tau_{\text{sq}} > a$, the constraint requires $\tau_{\text{sq}} > \alpha_{\text{maj}}$, which violates the assumption of the proposition. If $\tau_{\text{sq}} \leq a$, the constraint requires $a > (\alpha_{\text{maj}} + \tau_{\text{sq}})/2$ but this violates assumption 1 in the note above.

Case 2: if $\lambda > 0$, the conditions reduce to the following two equations:

$$\lambda = (\alpha_{\text{maj}} - \tau)/(\tau - a) > 0 \quad (3)$$

$$(\tau_{\text{sq}} - a)^2 = (\tau - a)^2 \quad (4)$$

If $a < \tau_{\text{sq}}$, then (4) reduces to $\tau = \tau_{\text{sq}}$, a solution that also satisfies (3).

If $a \geq \tau_{\text{sq}}$, then (4) reduces to $\tau = 2a - \tau_{\text{sq}}$, a solution that satisfies (3) if $a < (\alpha_{\text{maj}} + \tau_{\text{sq}})/2$ (assumed in the note above).

Now the solution to stage 4 is:

$$\tau(a) = \begin{cases} \tau_{\text{sq}} & \text{if } a < \tau_{\text{sq}} \\ 2a - \tau_{\text{sq}} & \text{if } a \geq \tau_{\text{sq}} \end{cases}$$

Stage 3: At this point, restrict the space of possible pivotal voter proposals²⁹ to $[\tau_{\text{sq}}, \alpha_{\text{med}}]$ because for all pivotal voters less than τ_{sq} , the resulting tax rate will be τ_{sq} . Now, reformulate the utility function in terms of a :

$$V_i(a) = -(2a - \tau_{\text{sq}} - \alpha_i)^2$$

This utility is single peaked about $(\alpha_i + \tau_{\text{sq}})/2$.

The proposed pivotal voter (a^{pr}) will defeat the status quo pivotal voter (α_{med}) if preferred by the median legislator:

$$(2a^{\text{pr}} - \tau_{\text{sq}} - \alpha_{\text{med}})^2 \leq (\alpha_{\text{med}} - \tau_{\text{sq}})^2$$

Notice that this inequality binds at the endpoints of the policy space $[\tau_{\text{sq}}, \alpha_{\text{med}}]$ and the maximizer $(\alpha_{\text{med}} + \tau_{\text{sq}})/2$ is contained within the policy space. By single-peakedness, the median legislator will choose all proposed pivotal voters over the status quo.

Stage 2: Again, the winner of this stage is the proposal favored by the median legislator. The majority proposal (a^{maj}) defeats the minority proposal (a^{min}) if:

$$(2a^{\text{maj}} - \tau_{\text{sq}} - \alpha_{\text{med}})^2 \leq (2a^{\text{min}} - \tau_{\text{sq}} - \alpha_{\text{med}})^2$$

Assume ties are broken by coin toss.

Stage 1: To complete the proof, show that $a^{\text{maj}} = a^{\text{min}} = (\alpha_{\text{med}} + \tau_{\text{sq}})/2$ is the unique mutual best response. The majority chair proposes as high a pivotal voter as possible, subject to acceptance by the median legislator. Similarly, the minority

²⁹It is easier to focus on pivotal voter proposals, but there is always a corresponding supermajority percentage proposal given by $a = 1 - F(P)$.

member proposes as low a pivotal voter as possible, subject to acceptance by the median legislator. Thus the best responses are:

$$\begin{aligned}
 a^{\text{maj}}(a^{\text{min}}) &= (\alpha_{\text{med}} + \tau_{\text{sq}})/2 + |(1/2)(\tau_{\text{sq}} + \alpha_{\text{med}}) - a^{\text{min}}| - \varepsilon && \text{if } a^{\text{min}} \neq (1/2)(\tau_{\text{sq}} + \alpha_{\text{med}}) \\
 &\text{any} && \text{if } a^{\text{min}} = (1/2)(\tau_{\text{sq}} + \alpha_{\text{med}}) \\
 a^{\text{min}}(a^{\text{maj}}) &= (\alpha_{\text{med}} + \tau_{\text{sq}})/2 - |(1/2)(\tau_{\text{sq}} + \alpha_{\text{med}}) - a^{\text{maj}}| + \varepsilon && \text{if } a^{\text{maj}} \neq (1/2)(\tau_{\text{sq}} + \alpha_{\text{med}}) \\
 &\text{any} && \text{if } a^{\text{maj}} = (1/2)(\tau_{\text{sq}} + \alpha_{\text{med}})
 \end{aligned}$$

for small ε (more technically, the best response does not exist; a smaller ε can always be found).

Thus, the unique mutual best response is $a^{\text{min}} = a^{\text{maj}} = (\tau_{\text{sq}} + \alpha_{\text{med}})/2$.

Proof of Proposition 2. Stages 4–5 are unchanged.

Stage 3: There are now two pivotal voters, the median legislator (α_{med}) and the constitutional amendment critical voter (b) defined by $Q = F(b)$ (if the constitutional pivotal voter prefers a supermajority requirement proposal over the status quo of 50%, then all with ideal tax rates below b must also prefer it). Thus, in stage #3, the pivotal voter proposal (a^{pr}) is approved if $(2a^{\text{pr}} - \tau_{\text{sq}} - b)^2 \leq (2\alpha_{\text{med}} - \tau_{\text{sq}} - b)^2$. That is, when $a^{\text{pr}} \geq \tau_{\text{sq}} + b - \alpha_{\text{med}}$.

Stage 2: There are three cases to consider:

Case (a) Both proposals will be accepted in stage 3 (i.e. a^{maj} and a^{min} exceed $\tau_{\text{sq}} + b - \alpha_{\text{med}}$).

Here, the median legislator is decisive and will choose whichever proposal is ‘closer’ to $(\alpha_{\text{med}} + \tau_{\text{sq}})/2$.

Case (b) One proposal will be accepted in stage 3 (i.e. either a^{maj} or a^{min} exceed $\tau_{\text{sq}} + b - \alpha_{\text{med}}$).

In this case, voters are essentially choosing the stage 3 winner. If $\max\{a^{\text{maj}}, a^{\text{min}}\}$ wins stage 2, it will win stage 3. Otherwise, α_{med} wins stage 3. The median legislator prefers all percentages to α_{med} and will thus vote for $\max\{a^{\text{maj}}, a^{\text{min}}\}$ along with all legislators preferring tax rates below α_{med} .

Case (c) Neither proposal will be accepted in stage 3 (i.e. a^{maj} and a^{min} are below $\tau_{\text{sq}} + b - \alpha_{\text{med}}$).

Voting in stage 2 is irrelevant in this case. Assume $\max\{a^{\text{maj}}, a^{\text{min}}\}$ wins.

Stage 1: There are two cases to consider:

Case (a): Stage 2 supermajority pivotal voter will approve median legislator’s ideal percentage:

$$(\alpha_{\text{med}} + \tau_{\text{sq}})/2 \geq \tau_{\text{sq}} + b - \alpha_{\text{med}} \text{ or equivalently,}$$

$$b \leq (3\alpha_{\text{med}} - \tau_{\text{sq}})/2$$

The best responses for this case is similar to that for stage 1 of Proposition 1 with the exception of proposals below the cutoff $\tau_{\text{sq}} + b - \alpha_{\text{med}}$:

$$\begin{aligned}
 a^{\text{maj}}(a^{\text{min}}) &= (\alpha_{\text{med}} + \tau_{\text{sq}})/2 + |(1/2)(\tau_{\text{sq}} + \alpha_{\text{med}}) - a^{\text{min}}| - \varepsilon && \text{if } a^{\text{min}} \neq (1/2)(\tau_{\text{sq}} + \alpha_{\text{med}}) \text{ and } a^{\text{min}} \geq \tau_{\text{sq}} + b - \alpha_{\text{med}} \\
 &\text{any} && \text{if } a^{\text{min}} = (1/2)(\tau_{\text{sq}} + \alpha_{\text{med}}) \\
 &\alpha_{\text{med}} && \text{if } a^{\text{min}} < \tau_{\text{sq}} + b - \alpha_{\text{med}} \\
 a^{\text{min}}(a^{\text{maj}}) &= (\alpha_{\text{med}} + \tau_{\text{sq}})/2 - |(1/2)(\tau_{\text{sq}} + \alpha_{\text{med}}) - a^{\text{maj}}| + \varepsilon && \text{if } a^{\text{maj}} \neq (1/2)(\tau_{\text{sq}} + \alpha_{\text{med}}) \text{ and } a^{\text{maj}} \geq \tau_{\text{sq}} + b - \alpha_{\text{med}} \\
 &\text{any} && \text{if } a^{\text{maj}} = (1/2)(\tau_{\text{sq}} + \alpha_{\text{med}}) \\
 &\tau_{\text{sq}} && \text{if } a^{\text{maj}} < \tau_{\text{sq}} + b - \alpha_{\text{med}}
 \end{aligned}$$

Thus, the unique mutual best response is $a^{\text{min}} = a^{\text{maj}} = (\tau_{\text{sq}} + \alpha_{\text{med}})/2$.

Case (b): Stage 2 supermajority pivotal voter will not approve median legislator's ideal percentage:

$$(\alpha_{\text{med}} + \tau_{\text{sq}})/2 < \tau_{\text{sq}} + b - \alpha_{\text{med}} \text{ or equivalently,}$$

$$b > (3\alpha_{\text{med}} - \tau_{\text{sq}})/2$$

Now $\tau_{\text{sq}} + b - \alpha_{\text{med}}$ will always be accepted if proposed. Therefore, for the minority member $a^{\text{min}} = \tau_{\text{sq}} + b - \alpha_{\text{med}}$ is a best response unless $a^{\text{maj}} = \tau_{\text{sq}} + b - \alpha_{\text{med}}$; anything is a best response to $a^{\text{maj}} = \tau_{\text{sq}} + b - \alpha_{\text{med}}$. The majority chair can do no better than to match a^{min} .

Thus, the mutual best response is $a^{\text{min}} = a^{\text{maj}} = \tau_{\text{sq}} + b - \alpha_{\text{med}}$. Finally, the feasibility condition $a \leq \alpha_{\text{med}}$ requires $b \leq 2\alpha_{\text{med}} - \tau_{\text{sq}}$ (this cutoff is the tax rate in the absence of a supermajority requirement).

Summarizing,

$$\begin{aligned}
 a &= (\tau_{\text{sq}} + \alpha_{\text{med}})/2 && \text{if } b \leq (3\alpha_{\text{med}} - \tau_{\text{sq}})/2 \\
 &\tau_{\text{sq}} + b - \alpha_{\text{med}} && \text{if } (3\alpha_{\text{med}} - \tau_{\text{sq}})/2 < b \leq 2\alpha_{\text{med}} - \tau_{\text{sq}} \\
 &\alpha_{\text{med}} && \text{if } b > 2\alpha_{\text{med}} - \tau_{\text{sq}}
 \end{aligned}$$

Using the fact that $\partial P/\partial Q = (\partial P/\partial a)(\partial a/\partial b)(\partial b/\partial Q)$, we can write:

$$\begin{aligned}
 \partial P/\partial Q &= 0 && \text{if } b < (3\alpha_{\text{med}} - \tau_{\text{sq}})/2 \text{ or } b > 2\alpha_{\text{med}} - \tau_{\text{sq}} \\
 \partial P/\partial Q &= (\partial P/\partial a)(\partial b/\partial Q) < 0 && \text{if } (3\alpha_{\text{med}} - \tau_{\text{sq}})/2 < b < 2\alpha_{\text{med}} - \tau_{\text{sq}}
 \end{aligned}$$

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