The Right Type of Legislator*

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Abstract

Legislative ability is often neglected in models of policy-making. We develop a citizen-candidate model of redistribution between both rich and poor citizens, and between legislative districts, where citizens that are more productive in the private sector are also more effective at directing transfers to their district if elected to the legislature. When competition between legislators to secure funds for their districts is weak, tax rates are set by the median voter of the median district. However, when competition between legislators is strong, all districts prefer legislators who are successful in the private sector. As these citizen-candidates will be richer than the median voter of the median district, this will lead, in equilibrium, to lower redistribution between rich and poor. We show that this result is exacerbated by larger legislatures, and cannot be prevented by policy motivated parties with perfect control over candidate selection. We also show that increasing professionalization, by increasing the wage a politician is paid, exacerbates this problem by making legislators more dissimilar to the median voter, that is, by creating a political class. These results are not just theoretical curiosities, however, as they are useful for organizing stylized facts about taxation, redistribution, and legislators across countries and states.

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> The idea that potential politicians differ in their competence is no different from a standard assumption in labor market models that individuals have specific skills.
> –Besley (2005)

1 Introduction

A central question of political economy is how political factors lead to different tax regimes across places and time. The answers to this question are varied, but often leave out the preferences and abilities of politicians themselves. In this paper, we aim to understand the roll that political ability plays in tax determination.

An important component of political ability can be found, at least in the U.S., in the ability to direct resources, or "pork" back to a legislator's district. Seen as just another dimension of "valence" there are several models that would address its roll in elections, and, to a limited extent, tax policy. But these models simply assume that valence is a characteristic that is just a draw from some distribution. However, when seeing this as a facet of ability, it seems likely that there is a deeper structure linking ability to other traits.

In particular, we adopt a simple assumption: we assume that those that are more successful in the private sector will tend to be more successful as legislators at directing resources back to their district. While we find this assumption unobjectionable, many people find it upsetting once they see our results. As such we pause to discuss it. At its simplest level, this assumption means that whatever tends to make you successful in the private sector also makes you successful in the political sector. If what gets you ahead in the private sector of a country is connections, then connections are also useful, on average, in getting favors for your district. On the other hand, if the ability to work hard is central to private sector success, this will also tend to make you more successful in directing resources back to your district. This could be repeated ad nauseam for characteristics such as charisma, ruthlessness, etc. A more complicated story would see those who prefer high government spending investing their effort in making government spending more efficient—as this will convince even those who prefer less spending to spend more—while those who prefer low spending will invest their effort in moving resources to their district as this—as we shall see—will lead to less spending.[1]

By combining workhorse models of political economy with this simple assumption we arrive at a striking result: in equilibrium every district votes for rich legislators. This allows the rich to implement their ideal tax rate, which will be very low, with equal amounts of government spending across districts. Perhaps more striking, as we elaborate on below, this result is useful in organizing stylized facts about taxes, distribution, and who legislators are.

Our model allows for both redistribution between the rich and the poor, and between legislative districts. Legislators, are citizen candidates (Osborne and Slivinski, 1996; Besley and Coate, 1997). Once elected, these citizen candidates use a two-stage budget allocation process where legislators first vote over taxes using majority rule, and then bargain over the distribution of the budget.[2]

The intuition behind this result is simple: a district's legislator, as one of many, has very little impact on broad policies, such as the tax rate, but a very large impact on the transfers that the district receives. Knowing this, even the median voter in a poor district will ignore a candidate's preferences over redistribution and focus on his superior ability to direct transfers to their district.[3] A deeper intuition comes from seeing the game that a district's median voter plays as a prisoner's dilemma. The equilibrium where all poor voters vote for poor legislators would make all poor voters better off. But, individually, it is strictly dominant for a poor voter to chose a rich legislator.

Before enumerating extensions it is useful to discuss the full structure of the equilibria, as well as briefly discuss the empirical relevance of our core result. When ability to direct funds

[1]A version of our model in which such investments could be made by various types of citizens produced similar results to those we will detail below, but obscured the logic.

[2]Citizen voting in our model is described by the model of Hotelling (1929) and Downs (1957), applied to taxation by Meltzer and Richard (1981). Considering only two classes follows Acemoglu and Robinson (2000, 2001, 2006) and others. The two stage bargaining process we use, with median voting on taxes followed by the legislative bargaining model of Baron and Ferejohn (1989) has been used by Chari, Jones, and Marimon (1997); Persson, Roland, and Tabellini (1997); Von Hagen (1998), among others.

[3]We follow the principal-agent literature in referring to legislators (agents) using masculine pronouns, and citizens (principals), especially the median voter of a district, using feminine pronouns. Note that because a legislator is a citizen candidates they have the same preferences over government spending in their districts as all voters in that district.

to a legislator's own district does not matter at all—say through rules that make it very difficult to target funding—then the equilibria are exactly what one would expect: every district elects a legislator who is the same type as their median voter and the tax rate is that preferred by the median voter of the median district. We call this a *representative equilibrium*. On the other hand, if ability to direct fund matters just a little bit, then the poor in the legislature will form a minimal winning coalition, and many districts with poor median voters will elect rich legislators. These latter voters will know that, in equilibrium, they will not cause the legislature to tip to a rich majority, and hence will chose a rich legislator for their superior abilities. However, the poor legislative minority, knowing that rich legislators will get more than their fair share of tax revenues, will shade the tax rate down to reduce the expropriation of their districts. We call such equilibria *somewhat representative*. Finally, when the ability to direct funds to one's own district matters a lot, then the unique equilibrium will be for every district to elect a rich legislator. This *unrepresentative equilibrium* occurs due to the prisoner's dilemma logic laid out above.

While this result is at odds with standard theoretical intuition, we note that it is also useful for organizing stylized facts about taxes, redistribution, and who legislators are. In particular, the U.S.—where ability to direct resources to a district is quite important (and referred to as "pork")—has lower tax rates than European countries such as the U.K., Italy, and Germany. Moreover, almost every legislator in the U.S. has a college education, whereas in Germany and Italy, approximately one-quarter of legislators have no post-secondardy education (Wessels, 1997; Carnes, 2011). In the U.K., the Labour party famously fielded MPs that were laborers and coal miners. Although parliamentarians in these countries are more representative of the general population of their countries, they are still skewed towards the wealthy, in accordance with our somewhat representative equilibria (Norris, 1997). Finally, in the U.S., support for individual Congressman is quite high, even though overall support of Congress is painfully low. This is also consistent with our unrepresentative equilibrium: individual Congressmen work hard to bring back the pork, while at the same time passing broad policies counter to their constituents' interests.

As the core intuition follows the prisoner's dilemma, it should be no surprise that it is robust to many extensions. The first extension we consider is increasing the size of the legislature, so that each legislator represents a smaller and smaller segment of the population. Two patterns are notable: first, as the size of the legislature grows, the unrepresentative equilibrium becomes unique even when the ability to direct funds to a legislator's district matters very little. That is, paradoxically, more representatives lead to less representative outcomes. This accords with the intuition above: as the size of the legislature grows the influence of any one legislator on broad issues like tax policy shrinks, while the influence on the transfers to his district remains relatively constant. The second pattern of note is that in our model the common pool problem is reversed: more legislative districts lead to less spending, unlike common pool results where the opposite pattern holds.

One might expect that this coordination failure among poor voters might be solved by an outside actor, such as a party. Therefore, we allow parties that are completely motivated by the final tax rate to nominate candidates in each district. The parties are further assumed to have complete control over who runs in each district, that is, candidates come from a closed list rather than nomination through an open primary. The addition of such parties has no effect on the equilibria of the model. The intuition in unrepresentative equilibria is particularly transparent: all districts would like to elect a wealthy legislator, and the party that favors low taxes is happy to nominate one in each district. A similar intuition applies to all of the other equilibria described above: if a district wants to elect either a poor or a rich legislator, then one of the other party will be happy to provide them with such a candidate.

It has also been suggested that paying legislators more will improve the quality of governance. But in our model, the opposite occurs. In particular, as legislators in our model are citizen candidates, paying poor legislators a wage makes their preferences closer to those of rich legislators. As legislative wages rise, the difference between these two types of legislators become closer to each other, and further away from those of poor voters. As rich and poor legislators have similar policy preferences, poor voters prefer the rich legislators for their abilities to direct funds back to their districts. Thus, as legislative wages increase, taxes will decline, and, eventually, equilibria will move from somewhat representative to unrepresentative. This emphasizes the danger of creating a political class whose interests are at odds with those of relatively poor median voters.

Of course, the recommendation to increase the compensation of legislators is made because it is believed that this will improve the selection of candidates who run for office. In our model, selection has a perverse side: if increasing legislative wages make it easier for parties to find successful (rich) candidates who are willing to run, then it will tend to make equilibria less representative. In particular, unrepresentative equilibria are impossible when there are no rich candidates!

The final extension examines a dynamic setting where how much ability matters for distribution across districts can be controlled by the legislature. That is, we allow the legislature to determine a parameter that will either expand or contract the advantage of the rich legislators in bargaining. We examine two possibilities: under rapid institutional change the legislature can determine this parameter each period, whereas under slow institutional change the parameter for the current legislature is determined by the previous legislature. With rapid institutional change, the poor will vote for poor legislators, who will in turn restrict the institutional arrangement so that no legislator has an advantage in bargaining. The outcome will thus be representative. On the other hand, if institutional change is slow, then the representative equilibrium is an absorbing state: in each period only rich legislators will be elected, and they will design institutions so that skill in directing resources towards one district are maximally enhanced, thus assuring that all future legislatures will also be composed only of high types.

Finally, we discuss limitations of our analysis, and suggest policies that may increase the representativeness of legislative government. In particular, we note that the citizen-candidate framework allows no avenue for electoral accountability (Barro, 1973; Ferejohn, 1986).[4] However, if accountability is limited by institutions or behavior, then our results suggest that rents from imperfect accountability will tend to accrue to the rich. We then

[4]The approach in citizen-candidate models is consistent with Fearon (1999), which finds that voters are much better off using elections to select types, rather than disciplining incumbents.

discuss other, extremely tentative, proposals that would ameliorate this result.

1.1 Related Literature

Aside from the workhorse models described above, our work is closely related to papers that examine strategic delegation in politics, and the debate over whether their is a "wealth bias" in U.S. politics.

Our model most closely resembles Chari, Jones, and Marimon (1997), who also examine a model in which voters elect representatives to bargain over tax revenues. The heterogeneity between politicians in this model is limited to how much they value public spending. In the bargaining stage of the model, those that place a high value on government spending are cheaper coalition partners. As such, every district wants to elect a legislator that places a very high value on government spending to maximize the chance that their legislator is included in the coalition. In contrast to our model, the results here are sensitive to the specification of the bargaining protocol. Moreover, the results seem to be more normative in nature as they suggest that government spending in democracies will be "too high", whereas we believe our model is descriptive of broad patterns of taxation, redistribution, and representation.[5]

There is also a small literature that explores how experiences and social structure affect beliefs and preferences over redistribution (Piketty, 1995; Alesina and Angeletos, 2005). Our paper focuses on the preferences of legislators, but additional value may come from examining the belief formation process of legislators, and how this may in turn affect their reaction to informational lobbying.

We have multiple links to the literature that debates whether or not there is a "wealth bias" in U.S. politics. First, the assumption, from the citizen-candidate framework, that a legislator's background matters for their policy preferences is confirmed by Carnes's 2011 empirical findings based on roll-call votes. We build on this by giving a formal-theoretic

[5] Jackson and Morelli (2007) study a similar mechanism where voters elect politicians to bargain with another country over territory. Both countries will chose to elect someone who is overly optimistic about his own county's chances of winning a war as this will allow him to drive a harder bargain with the other country.

basis for why poorer voters would choose to be represented by wealthy legislators with policy preferences that differ from theirs. This is complementary to explanations that focus on differences in campaign resources (Bartels, 2007; Campante, 2011) and the sensitivity of poor voters to the outcomes of richer voters (Bartels, 2007).[6]

Finally, in both the somewhat representative and unrepresentative equilibria of our model poor voters will vote for rich candidates who prefer a low tax rate. Huber and Ting (2013) also explain this behavior, although their mechanism involves parties that can exclude legislators from the opposing party from receiving any funds. In order to not be in the minority, the poor vote for the rich party. It is worth noting that this mechanism relies on powers that there is little evidence that parties have: heterogeneity in federal spending across districts is not well explained by the party of the legislator (Boone, Dube, and Kaplan, 2014). Moreover, coordination could be either on the party of the rich or the party of the poor.

2 Core Model

In this section we lay out our core model. Successive sections first analyze the equilibrium of this model, and then continue to extend the model in a variety of ways. In particular we will extend this model to see how the equilibrium and conclusions are affected by considering large legislatures, political parties, legislative wages, and dynamic institutional determination. We find that none of these extensions affect the basic equilibrium logic, and many of them exacerbate the unrepresentative conclusions. We conclude with a discussion of how our results allow us to organize broad stylized facts about legislators, taxes, and redistribution, and how best to interpret, and possibly ameliorate, our results.

2.1 Structure and Players

Legislative Districts We model a country populated with a unit measure of citizens, and three equal sized legislative districts, $j \in J = \{1, 2, 3\}$.

[6] In a related analysis, Bai and Lagunoff (2013) explore what data would be needed to uncover a wealth bias in politics.

Citizens: A citizen's utility is determined by his post-tax income plus utility from government spending in her district.

$$u_{ij} = (1 - \tau)y_i + g(T_j)$$

We restrict the tax instrument τ to be linear in income.[7] The amount of transfers to district j, T_j is determined by the legislative process described in Section 2.2. Finally, we use standard assumptions on the utility of government transfers $g' > 0$ and $g'' < 0$. Given an equal expected proportion of tax revenues is transferred to each district, we define $\tau_l^* > \tau_h^*$ as the preferred tax rate of a low- and high-type, respectively.

A citizen's pre-tax income is determined solely by his publicly observable type, $\theta^i \in \{\theta^l, \theta^h\}$, which is either low or high. Specifically, the income of a low type is y_l, and the income of a high type is y_h, with $\eta \equiv y_h/y_l > 1$ is difference in productivity of a high type versus a low type. We will thus occasionally refer to high types as *rich* or *successful*, and low types as *poor* or *unsuccessful*. Overall, a fraction λ of citizens are low types, so the total income of all three legislative districts together is given by $(\lambda + (1 - \lambda)\eta)y_l = \overline{y}$.

For tractability we assume that $g(x) = \frac{x^\alpha}{\alpha}$ with $\alpha < 1$ and, to guarantee the existence of an interior tax rate, we further assume that $3y_l^{1-\alpha} > (\lambda + (1 - \lambda)\eta)^\alpha$.

Candidates and Legislators: Candidates are citizen candidates, meaning that their actions in office are determined solely by their preferences as citizens. For simplicity, we assume that two candidates run in each district, a low-type and a high-type. Because types are publicly known, citizens will know what each candidate will do if elected, and chooses accordingly.

In Section 5 we allow candidates to be selected by one of two parties and placed on a closed list. In Section 6 we allow legislators to be paid an additional, uniform, wage for their service.

[7] Section 8 discusses more complicated tax instruments.

Median Voters: Using standard results, the winning candidate will be chosen by the median voter of each district. We assume that only one district has a high-type median voter.[8]

2.2 Timeline

Our model of elections and legislative policymaking proceeds in three stages. These are:

1. **The voting stage.** Voters vote for one of two citizen-candidates based on the utility they expect to receive with that candidate as their representative to the legislature. That is, the vote will depend on the candidates' types, and the types of the candidates elected by the other two legislative districts.

2. **The tax-policy stage.** Elected legislators vote over a level of taxes using an open rule. As we focus on subgame perfect equilibria, legislators will take into account what will happen in the distributive stage. As the majority of the legislature will always be of the same type, they will have the same most-preferred tax rate. This will be the outcome of the tax policy stage.

3. **The distributive stage.** Distribution of the public budget among the three districts is determined by a legislative bargaining process (Baron and Ferejohn, 1989).

After the distribution stage, incomes are realized, taxes are levied, and tax revenue is distributed according to the decisions described above.

2.3 The Voting and Tax-Policy Stages

The first two stages are governed by standard, median voter results. The median voter of two districts is a low type, and of the third district has a high-type median voter. If tax revenue were equally shared between the districts, the most preferred tax rate of low and

[8]This is not important for our core result, see Proposition 3.

high types, respectively, are:

$$\tau_l^* = \left(\frac{\overline{y}^\alpha}{3y_l}\right)^{\frac{1}{1-\alpha}} < 1 \qquad \text{and} \qquad \tau_h^* = \left(\frac{\overline{y}^\alpha}{3\eta y_l}\right)^{\frac{1}{1-\alpha}} = \frac{\tau_l^*}{\eta^{\frac{1}{1-\alpha}}} < \tau_l^*. \tag{1}$$

In the tax-policy stage, tax preferences will depend on both the the legislator's type, and the type of other legislators in the legislature. However, there will always be at least two legislators who have the same type (and face the same other types in the legislature), and thus will end up with exactly the same most-preferred tax rate. These two (or three) legislators will vote together to establish this as the tax rate.

2.4 The Distributive Stage

While the third, distributive, stage also relies on a standard model, it is in this stage where we tie together productivity in the public and private sector, which leads ultimately to our results. As such, we discuss this stage in greater detail.

As noted above, each district receives public transfers, T_j, funded by a linear tax on income. In the legislative bargaining model of (Baron and Ferejohn, 1989), each legislator is selected with some probability s^j to make a proposal. We assume:

$$s^j = \begin{cases} \frac{1}{\sum_j s^j} & \text{if } \theta^j = \theta^l \\ \beta \frac{1}{\sum_j s^j} & \text{if } \theta^j = \theta^h \end{cases} \tag{2}$$

with $1 \leq \beta < \overline{\beta}$.[9] That is, we assume high types are more productive workers *and* legislative bargainers.[10]

In the Baron and Ferejohn (1989) model with a pre-specified number of bargaining rounds

[9] If β is too high, then electing a single high-type will depress the tax rate so much that a low-type median voter prefers an even share of the revenues resulting from a higher tax rate to a large share of the revenues from a very low tax rate. We rule out this case imposing an upper bound on β. In particular, a low-type will only want to elect a high-type when $(3/(\beta+2))^{\frac{1}{1-\alpha}} > (1-\alpha)/(\beta-\alpha)$.

[10] The concavity of the g function makes all citizens—including legislators—risk averse, meaning that ex-ante they would prefer the expected value of their legislators bargaining efforts to the outcome of the bargaining stage. Our results go through if legislators get the expected value, rather than the outcome of bargaining, see 4.1. We use the bargaining model because it is standard in the literature.

and sufficiently patient legislators, those with higher proposal probabilities are not assured a higher expected share of the spoils. To eliminate such an outcome, we focus on the case where the common discount factor between bargaining rounds approaches 0. In this case, if selected to propose, each legislator will propose that all tax revenue be allocated to his district, and this proposal will pass.[11] Thus, we can write the expected proportion of tax revenue obtained for his district by the legislator from district j as

$$\pi^j_{-j} = \frac{s^j}{\sum_j s^j}.$$

Note that the expected proportion of tax revenue depends on the types of the other two legislators as well, hence the subscript $-j$. In particular this expected proportion can take on six possible values, which we define as

$$\begin{array}{ccc} & \pi^L_{3L} = \frac{1}{3} & \\ \pi^L_{2L} = \frac{1}{\beta+2} < \frac{1}{3} & & \pi^H_{2L} = \frac{\beta}{\beta+2} > \frac{1}{3} \\ \pi^L_{2H} = \frac{1}{2\beta+1} < \frac{1}{3} & & \pi^H_{2H} = \frac{\beta}{2\beta+1} > \frac{1}{3} \\ & \pi^H_{3H} = \frac{1}{3} & \end{array} \tag{3}$$

where, in an abuse of notation, the subscript defines the number, and type, of legislators in the majority, and the superscript defines whether district j is represented by a high-type or low-type legislator.

The existence of different abilities in legislative bargaining is the major way in which our model departs from previous work. We view this difference in abilities as depending both on the legislator themselves, as well as the political institutions which may constrain or bolster such abilities. A focal starting point would be to assume that $\beta = \eta$, and that differences in productivity between the private sector and the legislator are due to institutional details or party structure, which will affect the value of β. For example, equally productive legislators

[11]For low enough discount rates, similar results would obtain (Eraslan, 2002).

in two different legislatures may have substantially different βs, if in one legislature party discipline leaves little room for independent action by legislators.[12]

2.5 Equilibrium

We focus on subgame perfect equilibria, and define a concept we will use to judge the robustness of equilibria to coordinated deviations.

Definition 1 *An* **equilibrium** *is a subgame-perfect Nash equilibria. A* **stage-strong equilibrium** *is an equilibrium where there are no joint deviations within a single stage of the game that make at all deviating players weakly better off, and one player strictly better off.*

In our environment, there will be no strong Nash Equilibria. This occurs because voters in multiple districts may jointly deviate with legislators from several districts and agree that they will elect those legislators, and the legislators, if chosen to propose in the legislative bargaining part of the game, will propose an equal distribution of tax revenue between those districts. However, this deviation is not even sequentially rational. On the other hand, coalition proof equilibria (Bernheim, Peleg, and Whinston, 1987; Bernheim and Whinston, 1987) requires only that joint deviations to other equilibria not benefit the coalition of deviators, and hence, any unique equilibrium is coalition proof. Stage-strong equilibria are thus more robust to deviations than coalition proof equilibria, and are also sequentially rational.

The equilibria of this model, and the extensions we study in this paper, tend to fall into three types. To fix terminology, we define the following:

Definition 2

1. *We say an equilibrium is* **representative** *if the tax rate is the same as the most preferred tax rate of the median voter of the median district,* τ_l^*.
2. *We say an equilibrium is* **somewhat representative** *if there is an over-representation of high-types in the legislature, and the equilibrium tax rate* $\tau \in (\tau_h^*, \tau_l^*)$.

[12] NOTE: We might want to add HERE the alternative explanation in terms of legislative bills introduced.

3. *We say an equilibrium is* **unrepresentative** *if all districts elect high-type legislators, and the tax rate is that most preferred by a high-type citizen, τ_h^*.*[13]

3 Core Result

Our core result shows that when there is little competition between legislators to bring tax-revenue back to their district, fairly standard redistributive results apply. However, as competition becomes more fierce, no district wants to reduce their transfers by electing a low-type legislator, and thus, only high-type legislators will be elected in equilibrium. Because high-type legislators are richer, they have a personal preference for lower taxation, which has profound implications for tax policy.

Central to this result is the following inequality

$$\left(\frac{\pi_{2H}^H}{\pi_{2L}^L}\right)^{\frac{1}{1-\alpha}} \leq \frac{(\tau_l^* \overline{y})^\alpha - 3\alpha\tau_l^* y_l}{(\tau_h^* \overline{y})^\alpha - 3\alpha\tau_h^* y_l}. \tag{4}$$

The left-hand side of the equation is the increase in tax revenues that a median voter (or district) would receive from electing a high-type over a low-type when the other two districts elect one high-type and one-low type. That is, when the median voter is pivotal for whether the legislature will be controlled by low-types or high types. The right-hand side is the ratio of utilities for a low-type median voter if all three legislators elected low- or high-type legislators. The specific role of this inequality will be made clear in the ensuing discussion of our core result, especially in Table 1.

Proposition 1

1. *If $\beta = 1$, then in every equilibrium the low-type median voters will elect low-type legislators. The high-type median voter, is indifferent between electing a low- or high-type legislator. The tax rate will be τ_l^*, and all three districts get an equal proportion of the tax revenues, in expectation.*

[13] We do not conduct a welfare analysis. Although our discussion makes implicit normative judgements by calling a particular equilibrium structure "unrepresentative", a welfare analysis depends heavily on how distortionary taxation is. In our analysis there is no such distortion, so the representative equilibrium produces higher aggregate welfare than any other equilibrium structure. However, if taxes are extremely distortionary, other equilibria may be welfare maximizing.

2. *If $\beta > 1$, and* (4) *holds, there are two types of equilibria:*

   (a) *All three districts elect high-type legislators, the tax rate is $\tau_h^* < \tau_l^*$, and all three districts get an equal proportion of the tax revenues, in expectation.*

   (b) *Two districts elect a low-type legislator, and one a high-type legislator. The tax rate is $\tau_{2L}^* < \tau_l^*$, and the district that elects a high-type will get a higher proportion of tax revenue in expectation. This equilibrium is stage-strong.*

3. *If $\beta > 1$, and* (4) *does not hold, then in the unique equilibrium, all three districts elect high-type legislators, the tax rate is $\tau_h^* < \tau_l^*$, and all three districts get an equal proportion of the tax revenues, in expectation. If $\frac{\beta+2}{3} > \eta \left(\frac{1-\alpha}{\eta-\alpha}\right)^{1-\alpha}$ this equilibrium is stage-strong.*

We call the equilibrium in part 3 of the proposition an *unrepresentative equilibrium.*

When $\beta = 1$, then (3) shows that $\pi_{3L} = \pi_{2L}^L = \pi_{2L}^H = \pi_{2H}^L = \pi_{2H}^H = \pi_{3H} = 1/3$. That is, no matter what type of legislator a district elects, they will receive the exact same amount of the tax revenue, in expectation. Thus, the median voter of each district will focus on the effect that her legislator will have on the tax rate. As such, the median voters would choose to elect someone who favors exactly the same tax rate that they do. Given that two districts have low-type median voters, the high-type median voter knows that their legislator will have no effect on the tax rate, and thus will be indifferent between electing a low- and a high-type.

When $\beta > 1$ there is the potential for redistribution not just between rich and poor, but also between districts. This creates different incentives, especially for low-type median voters. In particular, if both of the other districts are electing a high-type, then a low-type median voter will want to elect a high-type as well. This produces the first equilibrium in part 2 of our main result. However, this equilibrium is not stage-strong. In particular, if two districts with low-type median voters deviated to elect low-type candidates, these districts would be strictly better off (although the third district would still want to elect a high-type). When (4) holds, this deviation is also an equilibrium, and it is stage-strong. However, when (4) does not hold, then this deviation cannot be sustained as an equilibrium. In particular, for this deviation to be an equilibrium requires two districts with low-type median voters to want to elect a low-type when the high district is electing a high type, which will not be the case if (4) does not hold.

Note that the value of β largely determines what type of equilibrium outcomes can be supported. In particular, when β is high enough, only high-types will be elected to the legislature. To see this, note that:

$$\frac{d}{d\beta}\left(\frac{\pi_{2H}^{H}}{\pi_{2L}^{L}}\right)^{\frac{1}{1-\alpha}} = \frac{1}{1-\alpha}\left(\frac{\pi_{2H}^{H}}{\pi_{2L}^{L}}\right)^{\frac{\alpha}{1-\alpha}} \frac{2(\beta(\beta+1)+1)}{(2\beta+1)^2} > 0,$$

so the left-hand-side of (4) is increasing in β. As the right-hand-side can be shown to be $\frac{(1-\alpha)\eta^{\frac{1}{1-\alpha}}}{\eta-\alpha}$, it is constant in β. Thus, there exists a level of β^* such that, for $\beta > \beta^*$ the only equilibria outcomes will be such that only high-types are elected.

Finally, it is worth noting that at the "focal" level of $\beta = \eta$, that is, when productivity in the private sector is the same as in the legislature, the unrepresentative equilibrium will always hold.

Corollary 2 *If $\beta = \eta$ then only high-type legislators will be elected.*

Condition (4) simplifies to

$$\left(\frac{\beta(\beta+2)}{2\beta+1}\right)^{\frac{1}{1-\alpha}} \leq \frac{\eta^{\frac{1}{1-\alpha}}(1-\alpha)}{\eta-\alpha},$$

which, when $\eta = \beta$ further simplifies to

$$\left(\frac{\beta+2}{2\beta+1}\right)^{\frac{1}{1-\alpha}} \leq \frac{1-\alpha}{\beta-\alpha}$$

which never holds.[14] The result then follows from point 3 of Proposition 1.

[14] Footnote 9 gives that $\beta < \overline{\beta}$ if and only if $(3/(\beta+2))^{\frac{1}{1-\alpha}} > (1-\alpha)/(\beta-\alpha)$, and notice that $((\beta+2)/(2\beta+1))^{\frac{1}{1-\alpha}} > (3/(\beta+2))^{\frac{1}{1-\alpha}}$ because $(\beta+2)/(2\beta+1) > 3/(\beta+2)$ and $1/(1-\alpha) > 1$.

3.1 Building the Core Result

3.1.1 The Legislative Stages

The expected outcome of the distributive stage is mechanically determined by the types of the three legislators, and can be found in (3). As we focus on sub-game perfect equilibria, the legislators will take this expected distribution into account when voting over the tax rate. If the legislature is composed entirely of high- or low-types, then, in expectation, all three districts will receive the same proportion of tax revenue $\pi_j = 1/3$ for all j. Thus, $\tau_{3L} = \tau_l^*$, and $\tau_{3H} = \tau_h^*$, which are the ideal tax rates of high- and low-type citizens, respectively. The legislative majority could also consist of two low types or two high types, which leads to two other potential values of the tax rate:

$$\tau_{2L}^* = (3\pi_{2L}^L)^{\frac{1}{1-\alpha}}\tau_l^* \qquad \text{and} \qquad \tau_{2H}^* = (3\pi_{2H}^H)^{\frac{1}{1-\alpha}}\tau_h^* \tag{5}$$

Note that as $\pi_{2H}^H > \pi_{3H}^H = \frac{1}{3}$, $\tau_{2H}^* > \tau_h^*$, and as $\pi_{2L}^L < \pi_{3L}^L = \frac{1}{3}$, $\tau_{2L}^* < \tau_l^*$. Moreover, when β is particularly large, it may be the case that $\tau_{2L}^* < \tau_h^*$. This occurs because when β is large, with relatively high probability all tax revenue will go to the high-type legislator's district. Anticipating the outcome of the distributive stage, a majority composed of low-type legislators will set a relatively low tax rate in the tax-policy stage to prevent their districts from being expropriated. Similarly, it may be the case that $\tau_{2H}^* > \tau_l^*$. While these are theoretical possible, these patterns never obtain in equilibrium.

3.1.2 The Election Stage

Although the median voter in a district can only chose a legislator for her district, her utility will depend on the types of the legislators elected from other districts as well, see (3) and (5). It is thus quite useful to look at what type of legislator a median voter would want to elect, given the types of legislators elected from the other two districts. As, in equilibrium, a voter's beliefs about the types of the legislators elected by other districts must be correct, these preferences will shape the median voter's vote choice.

Table 1: Median Voter Incentives

If the other two districts elect	A low type median voter will want to elect a	A high-type median voter will want to elect a
Two low types:	high type	high type
A low type and a high type:	low type if: $\left(\frac{\pi_{2H}^{H}}{\pi_{2L}^{L}}\right)^{\frac{1}{1-\alpha}} \leq \frac{(\tau_l^* \overline{y})^\alpha - 3\alpha\tau_l^* y_l}{(\tau_h^* \overline{y})^\alpha - 3\alpha\tau_h^* y_l}$, otherwise, a high type	high type
Two high types:	high type	high type

The preferences of median voters, conditional on the types elected in other districts, are summarized in Table 1. A high-type median voter will always want to elect a high-type. This is due to the fact that the high-type legislator will share the same preferences over taxation as a high-type citizen, and will be better able to direct resources to his own district. To put this another way, a high-type legislator will always act optimally from a high-type median voter's point of view.

Regardless of the value of β, a low-type median voter will also want to elect a high-type legislator whenever the other two legislative districts elect either no high-type legislators or no low-type legislators. In particular, if the low-type median voter's choice will not change tax policy too much—which is always the case when the other two districts both elect high types or low types and β is close to one—he will prefer to have a high-type representing them because of a high-type's superior ability in procuring transfers for his district. However, when a low-type median voter will decide whether the majority coalition in legislature is composed of high types or low types, then the median voter must way the benefits of a high-types ability to direct resources (the left-hand-side of the inequality), against the fact that electing a high-type means that high-types will set the tax rate (the right-hand-side of the inequality).

This inequality (also shown in (4)) is crucial in understanding the unrepresentative third part of our main result. When it fails to hold, then a low-type median voter will not want to elect a low-type legislator, even when they know that they will be changing the control of the legislature from high-types to low-types. Thus, two low-type districts cannot commit to each other to both elect low-types, as even if one followed through on its promise, the other would be strictly better off by electing a high-type.

3.2 Weighted Voting

It may seem strange that the relative skill of high-type legislators in apportioning funds is not reflected in the tax-setting stage. A potential way to mitigate this asymmetry is to assume that high-type legislators have a higher voting weight in the tax-setting stage. This will not generally affect the result, and, when it does, will make the unrepresentative equilibrium hold whenever $\beta > 1$.

To see this, consider each of the four possible sets of legislator-types that can be elected. If all three legislators are high types or low types, then the addition of voting weights will have no effect on the equilbria. Similarly, if there are two high-type legislators, and only one low-type legislator, then high types are already setting the tax rate, and thus the addition of voting weights will not alter the outcome. Finally, if there are two low-type legislators, one of two things may happen. If the voting weight of the single high-type legislator is not enough for them to determine taxes in the first stage, then nothing will change. If, on the other hand, one high-type legislator can control the tax setting process, then there is no benefit to a low-type median voter of electing a low-type legislator, as they will not affect the tax rate, and will direct a smaller amount of tax revenues to their district, in expectation. As such, a low-type median voter will elect a high-type legislator for parameter values that they would have otherwise elected a low-type legislator if there were no voting weights.

4 Large Legislatures

Up until this point we have considered a country with three legislative districts to give the simplest possible expression to the mechanism underlying our model. Here, we extend the model to consider $2n+1$ legislative districts. This reinforces the intuition in the introduction: as the size of the legislature grows, the effect of a legislator's ability to direct resources to his district is relatively constant, while his effect on tax policy shrinks. As such, low types want to elect high-type legislators for lower and lower values of β. As a result, the unrepresentative equilibrium becomes the unique equilibrium for lower and lower levels of β.

This result has an interesting interpretation: adding more representatives to a legislature makes the legislature less representative.

We assume that most legislative district have a low-type median voter, and $z \in \{0, 1, 2, \ldots, n\}$ districts have a high type median voter. Note that this nests the core model: that model is just the case where $n = 1$ and $z = 1$. Using the definition of s^j in (2), and generalizing the notation in (3) we have:

$$\pi^L_{(n+1)L} = \frac{1}{n\beta + (n+1)} \qquad \pi^H_{(n+1)H} = \frac{\beta}{(n+1)\beta + n}$$

The incentives for different types of median voters, are similar to those in Table 1. In particular, high-type median voters always want to elect high-type legislators, and low-type median voters wish to elect high-type legislators, except, possibly when they are pivotal. The condition for when a pivotal low-type median voter wants to elect a low type is whenever

$$\left(\frac{\pi^H_{(n+1)H}}{\pi^L_{(n+1)L}}\right)^{\frac{1}{1-\alpha}} \leq \frac{(\tau_l^* \overline{y})^\alpha - (2n+1)\alpha\tau_l^* y_l}{(\tau_h^* \overline{y})^\alpha - (2n+1)\alpha\tau_h^* y_l} \tag{6}$$

Proposition 1 is then straightforward to generalize:[15]

Proposition 3 *Assume $\beta > 1$.*

[15] We ignore the case where $\beta = 1$, as the outcome should be clear.

1. *If* (6) *holds, then every stage-strong equilibrium the legislature will be composed of* $n+1$ *low types and* n *high types, and the tax rate will be* $((2n+1)\pi^L_{(n+1)L})^{\frac{1}{1-\alpha}}\tau_l^* < \tau_l^*$.
2. *If* (6) *does not hold, then the unique equilibrium will be for every district to elect a high-type legislator, and the tax rate will be* τ_h^*. *If* $\frac{z}{2n+1} > \frac{1}{\beta-1}\left(\eta\left(\frac{1-\alpha}{\eta-\alpha}\right)^{1-\alpha} - 1\right)$ *this equilibrium is stage-strong.*

High-type median voters always elect a high-type legislator. Thus, when (6) holds, $n-z$ of the low-type median voters will elect high-type legislators. This makes the remaining $n+1$ low-type median voters pivotal, and thus, they will prefer to elect a low-type legislator. On the other-hand, if (6) does not hold, then low-type median voters always wish to elect high-type legislators, no matter who is elected in every other district. As electing a low-type legislator is strictly dominated, the unique equilibrium will be for every district to elect a high-type legislator.

Note the close similarity between (6) and (4). While the right-hand-side (when reduced to primitives) is always equal to $\frac{\eta^{\frac{1}{1-\alpha}}(1-\alpha)}{\eta-\alpha}$, which is constant in n, the left-hand-side is increasing in n. Stated differently, holding β constant, as n grows there is a point where equilibria switch from a mixed legislature, to the unrepresentative equilibrium with a legislature composed only of high types. Indeed, the proof of Proposition 3 proceeds by showing that the most difficult defection of low-type median voters to rule out is when $n = 1$, and then shows that Proposition 1 holds. The next corollary makes this point precise.

Corollary 4 *If*

$$\left(\frac{\beta}{\eta}\right)^{\frac{1}{1-\alpha}} > \frac{1-\alpha}{\eta-\alpha} \tag{7}$$

then there exists an n^**, such that if* $n > n^*$ *only high-types are elected in equilibrium. Otherwise, for all* $n > 1$*, in all stage-strong equilibria* $n+1$ *low-type and* n *high-type legislators are elected.*

4.1 Common Pool Problems

A standard issue discussed in political economy textbooks is the common pool effect (Persson and Tabellini, 1994), which predicts that government spending is increasing in the number of legislators who are taking from the "common pool". In particular, each legislator decides on how much money they want to spend in their district, setting the marginal benefit of spending equal to the marginal cost of increased taxation on their district. As spending on a legislator's district will only increase the tax rate by an amount proportional to one over the number of districts, more districts means that the marginal cost of taxation is lower, and thus, the budget, and tax rate will increase with the number of legislators.

In our core model the common pool problem does not exist, indeed, the tax rate is strictly decreasing in the number of districts. However, this is due to a number of factors. First, the fact that apportionment is done through bargaining, means that adding additional districts increases risk. As citizens are risk-averse over government spending, adding districts reduces their ideal amount of government spending. Moreover, the way we have modeled the utility of government spending implies that it is being spent on local public goods, and as districts become smaller, the effectiveness of this spending goes down.

To remove these additional factors and emphasize the role of the unrepresentative equilibrium in reversing the common pool problem, we thus examine a slightly different citizen utility function, and a different procedure for apportioning tax revenues. In particular, we assume that spending in each district is divided according to the population in that district, and each district gets the expected value of its legislator's take from bargaining. That is, replace citizen utility with the following:

$$u_{ij} = (1-\tau)y^i + \frac{1}{\alpha}\left(\frac{\pi^j \tau \overline{y}}{1/(2n+1)}\right)^{\alpha} \tag{8}$$

Then, defining τ_n^* as the tax rate implemented when there are n legislators, we have:

Proposition 5 *τ_n^* is decreasing in n.*

There are two reasons that taxes decrease when n increases, even with the alternative utility function in (8). First, using (8), the tax rate in the minimally representative equilibria is $((2n+1)\pi^L_{(n+1)L})^{\frac{\alpha}{1-\alpha}}\tau_l^*$. In this formulation, τ_l^* is constant in n, and $(2n+1)\pi^L_{(n+1)L}$ is decreasing in n as closer and closer to 50% of the districts are represented by high types.

Further, if β satisfies (7), then when $n > n^*$, the tax rate is τ_h^*, which is also independent of n.[16] It is then straightforward to show that $((2n^*+1)\pi^L_{(n^*+1)L})^{\frac{\alpha}{1-\alpha}}\tau_l^* > \tau_h^*$. Thus, the tax rate will either be smoothly decreasing in n, or will decrease smoothly in n up until a point when the equilibrium switches from minimally representative to unrepresentative, at which there will be a sudden decrease in the tax rate, and taxes will be constant for all $n > n^*$.

This result is also a more precise statement of a phrase we have used several time, that more representation decreases representativeness. If $\beta > 1$, no equilibria will be representative *except* in the case when $n = 0$. That is, when there is only one district, the implemented tax rate will be τ_l^*, otherwise, the tax rate will be $\tau_{2L}^* < \tau_l^*$. For any $n > 0$, it will be the case that $\tau_n^* < \tau_l^*$, and indeed, the higher n is, the further the tax rate will be from that preferred from that of the median voter.

5 Parties

We now add a party stage to the beginning of the game (before the election stage), in which two policy motivated parties simultaneously introduces a slate of three citizen-candidates, one for each legislative district. We assume that parties have complete control over candidate selection, that is, candidates are on a closed list.

The two parties are $j \in \{L, H\}$. In particular, we assume that party L, the party of labor, has a preference for high tax rates, and party H, the party of hoity-toity citizens, has a preference for low tax rates. Labeling the tax rate chosen by the legislature as τ^*, and the most preferred tax rates by each party as (τ_L, τ_H), the utility of the two parties can be given as:

$$U_L = f_L(|\tau^* - \tau_L|)$$

$$U_H = f_H(|\tau^* - \tau_H|)$$

[16]With the utility function given in (8), (7) is slightly different:

$$\left(\frac{\beta}{\eta}\right)^{\frac{\alpha}{1-\alpha}} > \frac{1-\alpha}{\eta-\alpha}$$

.

we assume each f_j is strictly decreasing, so is maximized when $\tau^* = \tau_j^*$. Except where noted, we assume that the ideal tax rates of the parties match those of the low- and high-type citizens: $\tau_L = \tau_l^*$ and $\tau_H = \tau_h^*$.[17]

The addition of policy-motivated parties changes our main result very little.

Proposition 6 *The patterns described in Proposition 1 are robust to the addition of policy motivated parties with full control over candidate nomination.*

The structure of the equilibria are unchanged by the inclusion of policy motivated parties. In particular, although the low-party can supply low-type candidates to every district, this will not change the way that voters want to vote. Moreover, if voters in a district want to elect a high-type, then the high-party is more than happy to supply a high-type candidate for them.

There is one difference in the logic between this proposition and Proposition 1. When (4) holds, but $\frac{\beta+2}{3} < \eta \left(\frac{1-\alpha}{\eta-\alpha}\right)^{1-\alpha}$, the reason the unrepresentative equilibrium is not stage strong is slightly different. To support the unrepresentative equilibria (where both parties nominate high types in all districts), the low-party must believe that if it nominates low types in the low and middle district, and a high type in the high district, then all three voters would elect high types. As this is a subgame-perfect equilibrium of the continuation subgame, it is an equilibrium. However, this continuation play is not stage strong: in particular a deviation at that stage by the low and middle districts would make them both strictly better off. As such, the unrepresentative equilibria is not stage strong.

5.1 Party Discipline

Suppose, in addition to the closed list, parties can somehow discipline its members to adopt tax rates other than those they most prefer. In particular, as a reduced form of a model where parties can enforce imperfect discipline suppose that they can promise voters that

[17] This in not necessary for any result, but is an appealing source of the parties' policy preferences. What is necessary is that out of the four possible tax rates that can occur in equilibrium, $U_L(\tau_h^*) < U_L(\tau_{2L}^*) < U_L(\tau_{2H}^*) < U_L(\tau_l^*)$, and $U_H(\tau_l^*) < U_H(\tau_{2H}^*) < U_L(\tau_{2L}^*) < U_H(\tau_h^*)$.

politicians from their party, if elected, will vote for a tax rate that is at most Δ_τ away from their ideal tax rate.

This will obviously increase the tax rate in two circumstances: when the equilibrium would already be unrepresentative without party discipline, or when Δ_τ is large, that is when $\Delta_\tau \approx \tau_l^* - \tau_h^*$. However, in between these circumstances lives a region of Δ_τ where the ability of parties to discipline their legislators actually leads to lower tax rates.

Proposition 7 *If* (4) *holds, then there exists some Δ_τ^* such that when $\Delta_\tau \in (\Delta_\tau^*, \tau_{2L}^* - \tau_h^*)$ then the tax rate will be lower in equilibrium when parties can discipline their legislators than when they cannot.*

To understand this result, note that when (4) holds the stage-strong equilibria is somewhat unrepresentative. Then, consider the lower bound of Δ_τ in the proposition. At this level, it will be the high-type party, not the low-type party, that will take advantage of the ability to discipline its politicians. In particular, they will promise that high types elected from their party will implement a tax rate of $\tau_h^* + \Delta_\tau$, which will be sufficient to change the equilibria from somewhat representative to unrepresentative, and, correspondingly the tax rate from τ_{2L}^* to $\tau_h^* + \Delta_\tau < \tau_{2L}^*$. The low party will n eed to respond by also nominating high types and promising a tax rate of $\tau_h^* + \Delta_\tau$—if it failed to do so then the high-party would promise a lower tax rate—that is still greater than or equal to $\tau_h^* + \Delta_\tau^*$—and win making the low type party strictly worse off.[18]

This result previews the discussion of accountability in Section 8, where we note that imperfect accountability may actually lead to less-representative outcomes than no accountability of politicians.

6 Legislative Wages

[18]A similar logic applies if parties are able to promise a specific value of β as long as the low-party cannot promise $\beta = 1$. We consider the case where β can be changed to any value in $[1, \infty)$ in Section 7.

Many scholars have suggested that professionalization of legislatures may improve aggregate outcomes and the quality of government, see e.g. Besley (2007). In our model, increased professionalization creates a political class that has less in common with their constituents, and therefore will select policies that are biased away from those preferred by their constituents. As this political class becomes distinct enough from their constituents, the policy differences between high- and low-type legislators will narrow from the perspective of low-type median voters. As such, when choosing between a high-type and a low-type legislator with similar policy preferences, a low-type median voter will opt for the high-types superior bargaining ability.

In particular we model legislative professionalization as increasing the wages to legislators. While this may seem reductionist, we note that even though legislative wages are nominally quite low, at least in the US, former legislators often go on to lucrative careers in lobbying or banking. Knowledge of these future wages may shape current preferences over taxes.[19]

Each legislator is paid a wage $\widetilde{w} = wy_l$ (note that w can be much less than 1). This wage is in addition to the legislator's private sector earnings, and is subject to taxation. As legislators are citizen candidates, this wage will drive a wedge between the ideal tax rate of a legislator of a given type and a citizen of the same type. If this wage is high enough, low-type and high-type legislators will become very similar in terms of their tax policy preferences. This will result in low-type voters favoring high-types even when the difference in legislative ability is quite small. The ideal tax rates of a low- and high-type legislators are:

$$\tau^*_{lw} = \left(\frac{(\lambda + (1-\lambda)\eta)^\alpha}{3(1+w)y_l^{1-\alpha}}\right)^{\frac{1}{1-\alpha}}$$

$$\tau^*_{hw} = \left(\frac{(\lambda + (1-\lambda)\eta)^\alpha}{3(\eta+w)y_l^{1-\alpha}}\right)^{\frac{1}{1-\alpha}}$$

As expected, the ideal tax rates of both types decrease with the legislative wage, w, although the ideal tax rate of a low-type legislator decreases faster than that of the high-type legislator. This leads to the following result.

[19]This may shape both their preferences over tax levels *and* types of taxes, see Section 8.

Proposition 8 *If $\beta > 1$, and the legislative wage w is high enough, then in all pure-strategy subgame-perfect equilibria only high-type legislators will be elected, and the tax rate will be τ^*_{hw}.*

To understand the intuition, note that a low-type median voter whose vote is pivotal for whether the majority of the legislature consists of low- or high-types will want to elect a high type if:

$$\left(\frac{\pi^H_{2H}}{\pi^L_{2L}}\right)^{\frac{1}{1-\alpha}} \leq \frac{(\tau^*_{lw}\overline{y})^\alpha - 3\alpha\tau^*_{lw}\theta}{(\tau^*_{hw}\overline{y})^\alpha - 3\alpha\tau^*_{hw}\theta}, \tag{9}$$

which is similar to (4). Note that the left-hand side of (9) is always greater than 1, and as w grows, the right-hand side converges to 1. Thus, as w grows large, eventually (9) will be violated.

However, it is not always the case that increasing legislator wages will make low-type citizens worse off. Indeed, when $w = 0$, the numerator of the right-hand-side of (9) equals a low-type citizen's utility function at its maximal value. This implies that a small increase in the wage rate will not change the numerator at $w = 0$, but it will decrease the denominator.[20] This makes it possible that a relatively small wage may cause (9) to hold where it would not have before, and lead to a low-type majority in equilibrium. While this low-type majority in the legislature will implement a tax-rate that is different than the ideal tax rate of low-type citizens τ^*_l (due to the legislative wage), it may still make low-type citizens much better off.

Overall, this suggests that there is a downside to paying legislators more: it will make them sufficiently different from the people they represent, resulting in lower taxation than the median voter prefers. Moreover, if the legislative wage is high enough, it will shrink the difference between all legislators sufficiently that low-type median voters, (correctly) view low- and high- type legislators as close enough substitutes on tax policy, and opt for the high-type legislator's superior ability to direct tax revenue to their district, depressing tax rates even further.

[20] In particular, it is easy to show that the derivative of the right-hand-side of (9) is positive at $w = 0$ and that the right hand side is maximized at a positive level of w.

6.1 Wages and Candidate Selection

Of course, when previous scholars have extolled the benefits of legislative professionalization, the mechanism they have in mind is that increased compensation will attract better types—those with more human capital, perhaps—to the legislature. This is a mechanism that we did not take into account in the above section. Therefore, we use a crude model of candidate entry and assume that in each district a high-type candidate runs with independent probability $\rho(w)$, which is increasing in w.[21] This type of selection means that higher legislative wages will tend to make equlibria more unresponsive.

Proposition 9 *Suppose β is high enough so that* (9) *does not hold. Then, if a high type runs in any district he will be elected. Thus:*

1. *The probability of a representative equilibrium is* $(1 - \rho(w))^3$.
2. *If a high type is elected in any districts, low-types in other districts would be strictly better off if a high-type ran in their district.*

The first part of the proposition is straightforward: if high-types need wages to be convinced to run, and wages are low enough that no high-types end up running, then all legislators will be low types. Moreover, if this is the case, then raising w will only increase the probability of somewhat responsive or unresponsive equilibria as high types begin to run with increased frequency in all districts.

The second part is equally intuitive: if (9) does not hold, then according to the incentives in Table 1, low-type median voters in other districts would prefer to elect high types. This implies that low types in those districts would be better off if they could elect a high type. This emphasizes another channel through which legislative wages may make low types worse off: once another district has a high type, all low types would like to be represented by one. This reinforces the prisoner's dilemma logic discussed earlier, and can be seen as an "arms race" between low-type voters.

[21] The usual reason for such a reduced form, that those with higher skills have higher outside options does not hold in this case because legislators are assumed to maintain their private sector wages. However, there are other assumptions that would yield the same result, such as the assumption that high-types have a higher value of leisure.

7 Dynamic Institutional Determination

Our crucial parameter β captures in a uncomplicated, yet useful way the institutional details that determine the advantage enjoyed by a high-type legislator in apportioning funds to his district. Up until this point we have assumed β to be an exogenously given parameter. In this section we take a first step toward relaxing this exogeneity assumption by considering a dynamic extension of our model in which the legislature can also determine the value of β.[22]

Obviously, once the game at the heart of our model is repeated, anything can happen. So is there anything to learn by examining a repeated version of this game? Interestingly, there is: by considering a legislature that can determine its own rules, we can draw implications about the speed of institutional change. In particular, we show that when institutional change is sufficiently slow, the unrepresentative equilibrium will be an absorbing state, whereas the representative or somewhat representative equilibria, will not be. That is, over a long enough time horizon the model will get "stuck" in the unrepresentative equilibrium. On the other hand, if institutional change is rapid, that is, institutions can be changed each period, then a representative equilibrium will obtain in each period.

The asymmetry in "stickiness" of the two types of equilibria, along with the fact that there are no obvious costs to institutional change presents a rare example of rapid institutional change perhaps being preferable to slow institutional change.

For each period we return to the core model and make an additional assumption: we allow the median voter of the middle district to be a high-type median voter with common-knowledge probability $1 - p = \varepsilon$, where ε is small. That is, the low district will have a low-type median voter, the high district will have a high-type median voter, and the middle district will usually have a low-type median voter, but occasionally may have a high-type median voter. The type of the middle district's median voter is realized before the voting stage of the game. We also assume that all players have a common discount factor $\delta < 1$.

To focus on how institutional details determine outcomes and change, we focus on markov-perfect equilibria. To avoid issues of the state variable encoding entire histories,

[22]McKelvey and Riezman (1992) study seniority in legislatures in a similar way.

we restrict β to take on one of two values $\beta \in \{1, \beta_{max}\}$, where β_{max} is a large value of β, possibly unbounded, such that (6) does not hold.[23] The state variable will thus be composed of the identity of the middle district's median voter, and the value of β at the beginning of the stage.

We begin by presuming that institutional change is slow: in particular, the institutional details β in a given period are set by the previous period's legislature. We further assume that in the first period $\beta = 1$. Then we have:

Proposition 10 *If $\delta < \delta^*(p)$ then in each period the markov-perfect equilibrium will be representative until the first period when the median voter of the middle district is a high type. Thereafter $\beta = \beta_{max}$, and the equilibrium will be unrepresentative.*

If $\delta > \delta^*(p)$ then the stage-strong markov-perfect equilibrium will be representative if the median voter of the middle-district is a high-type, or the median voter of the middle district is a low-type for at least two periods.

The threshold that distinguishes between these two types of equilibria is set by the low-type median voters when $\beta = \beta_{max}$. Electing low-types in the current period results in a current period loss because low-type legislators will be completely out-bargained (and expropriated) by the single high-type legislator. On the other hand, the low-type legislator will set $\beta = 1$ for the next period. The value of this policy, however, must be discounted both by δ and by the probability that the middle-district's median voter will be a high-type in the next period $(1 - p)$. In many cases the short-term loss will outweigh the long-term gain. When the short-term loss outweigh the long-term gain, even low-type median voters prefer to elect a high-type in the current period. High-type legislators will perpetuate the $\beta = \beta_{max}$ status quo, and so equilibria will always be unrepresentative.

Alternatively, if the current legislature is able to set its own institutional rules, then a low-type median voter will face no conflict between the current period and future periods. In particular, if the majority of the legislature is composed of low types, then they will vote to set $\beta = 1$ in the current period, tax revenues will be equally apportioned (in expectation), and the tax rate set by the legislature will be the ideal tax rate of a low-type. That is

[23] In particular β_{max} can be larger or smaller than $\overline{\beta}$.

Proposition 11 *When institutional change is fast, then the tax rate will be the ideal tax rate of the median voter in the middle district.*[24]

Note that slow institutional change entails two separate sources of inefficiency with respect to the case of fast institutional change. First, as it might be expected, when policy preferences change, policy will not reflect the desires of voters for at least one period. Secondly and more dramatically, when $\delta < \delta^*(p)$, as soon as a high-type is elected in the middle district, he becomes *de facto a dictator*. If voters are very impatient (δ is low), then even when the median voter of the middle-district is (almost) always a low-type, the equilibrium will remain in the unrepresentative state, just because once, long ago, the middle district had a high-type median voter.

8 Accountability and other ways to Align Incentives

This paper studies redistribution across income classes and legislative districts. Augmenting workhorse political economy models with the simple assumption that those who are more successful in the private sector will tend to be more successful as legislators at directing resources to their districts. This leads to a few, stark, results: First, the rich will always be over-represented in legislatures. Second, this will reduce taxes below the rate preferred by the median voter of the median district. Third, when the ability to direct resources to one's district is especially important, then all districts will elect rich legislators, and the tax rate will be the rich's most preferred tax rate.

These results are robust to, and indeed are exacerbated by, many conventional remedies for political agency problems. First, larger legislatures are more likely to be unrepresentative: that is, more representation may actually make government less representative. Second, allowing parties to select legislative candidates and put them on a closed list has no effect on equilibria. Third, paying legislators a wage tends to make equilibria unrepresentative as it creates a political class: a group of people whose interests are more closely aligned with each

[24] The proof of this result is straightforward and therefore omitted.

other (and the rich) than with their poor constituents. Finally, when extending the model to allow dynamic institutional determination, allowing institutional change to be rapid, that is, changed by each legislature restores representative equilibria. On the other hand, delaying institutional change even slightly, or making it difficult through super-majority requirements, will mean that unrepresentative equlibria are “sticky”: once an unrepresentative equilibria is reached, it will stay the equilibria for the rest of time.

While we do not believe our results should be taken literally, we do think they should be taken seriously as they allow us to organize stylized facts about taxes, redistribution, and who legislators are. In particular, the U.S.—where ability to direct resources to a district is quite important—has lower tax rates than European countries such as the U.K., Italy, and Germany. Moreover, almost every legislator in the U.S. has a college education, whereas in Germany and Italy, approximately 30% of legislators lack tertiary education (Wessels, 1997; Carnes, 2011). In the U.K., the Labour party famously fielded MPs that were laborers and coal miners. Although parliamentarians in these countries are more representative of the general population of their countries, they are still skewed towards the wealthy, in accordance with our somewhat representative equilibria. Finally, in the U.S., support for individual Congressman is quite high, even though overall support of Congress is painfully low. This is also consistent with our unrepresentative equilibrium: individual Congressmen work hard to bring back the pork, while at the same time passing broad policies counter to their constituents’ interests.

8.1 Accountability

If we do take our results seriously, what can they tell us about how to make legislatures more (or less, if that is one’s taste) representative? An obvious first conclusion is that allowing or encouraging legislators to direct resources back to their district will tend to make legislatures less representative. Reducing this practice may result in more representative outcomes: in the U.K., which we suggest is in a somewhat representative equilibrium, almost all bills must come from the leadership of the parties, and back-bench parliamentarians are restricted to only 20 (across all parliamentarians) private bills per year. In contrast, in the U.S., a typical year will see members of congress introduce over 5,000 bills.

Less obvious conclusions follow from examining an important implicit assumption of our model: in particular, our adoption of the citizen-candidate framework means that there is no scope for ex-post accountability of politicians.[25] That is, the citizen-candidate framework does not allow re-election incentives to be used by constituents to incentivize their legislators to vote for tax policies which may be against the legislator's interests. However, following the logic in Section 5.1, some degree of accountability is more likely to lead to unrepresentative equilibria as accountability will increase the tax rate favored by high-type legislators, making them more appealing.[26]

Although this implicit assumption is too stark, it should be noted that there are many reasons to believe that full accountability of politicians is not possible, and that we should instead focus on aligning politicians' interests with voters' through means other than elections. In particular, it has been shown that factors such as inter- and intra-group conflict and multiple political issues reduce accountability (Padró-i-Miquel, 2007; Padró i Miquel and Snowberg, 2012; Hatfield and Padró-i-Miquel, 2012). Moreover, it is well-known that voters are only very dimly aware of their representatives' votes on a wide range of issues.

This suggests that the best way to interpret our results is that in the presence of imperfect accountability, the possibility of redistribution across districts will mean that the rich will be over-represented in legislatures, and they will take the rents afforded to them by imperfect accountability to pass policies favorable to the rich.

This interpretation becomes particularly stark when we consider more complex tax instruments, like the possibility of differentially taxing income from labor and capital. As the rich are more likely to hold capital, then our model would imply that taxes will tend to be tilted away from capital income and towards labor income. Moreover, as those without

[25] Two implicit assumptions that are unimportant are that the correlation between private- and public-sector ability is perfect and ability is observable. If the correlation were imperfect (but positive), and ability unobservable, then private-sector success would be a signal of public-sector ability, and our results would go through with little modification.

[26] Of course, if accountability is perfect, then the policy outcome will be representative of the median voter's preferences, even if the legislature is not descriptively representative.

capital income are less-likely to be aware of discrepancies between labor and capital income taxation, this provides a further incentive to tilt taxation in this way.[27]

8.2 Aligning Incentives

If accountability is destined to be incomplete, then we must examine other ways to align the incentives of politicians and voters. Some already exist, such as the idea that politicians (in the U.S. at least) must put there assets into a "blind trust". The idea behind such an instrument is that by not allowing politicians to know where their investments lie they will not be tempted to bias policy towards the interests of one company or industry. However, as all of these investments will tend to be in capital, politicians will still have an incentive to favor policies that will increase the capital share at the expense of the labor share.

The "blind trust" model suggests two interesting, albeit somewhat impractical, policies that may help to align politician's incentives with those of the median voter. First, politicians could be given the option (or compelled) to invest their wealth in securities with payoffs tied to the economic well-being of the median household in their district, or in the country. As these securities would likely need to be subsidized, they would be like giving politicians stock options in their district, or country as a whole. Second, legislators could be allowed to pay the tax *amount* of the median voter in their district. This would, in our model, align the preferences of the legislator and the median voter in their district.

These suggestions are obviously imperfect: the securities described above may lead politicians to implement policies with short-term benefits and long-term costs to the median of their district, and charging legislators the median tax amount in their district only works in our model because the rich and poor both value spending in their district equally. However flawed these proposals may be, they emphasize that political institutions may cause large and unexpected divergences between the incentives of politicians and their constituents, and

[27] A number of particularly absurd examples of this principle can be found in the U.S. tax code: hedge fund managers are allowed to represent their income as capital income, subject to a much lower rate of taxation, and there are three different ways that a person can make expenditures on private jets tax deductible (Kristof, 2014).

that improved accountability alone cannot solve these problems.

A Proofs

Before proceeding to proofs it is useful to define some notation that will be useful here, but is not particularly useful in the main document. In particular, define:

$$\begin{array}{rr} \varepsilon_{3L} \equiv f(|\tau_l^* - \tau_l^*|) & \varepsilon_{0H} \equiv f(|\tau_h^* - \tau_l^*|) \\ \varepsilon_{2L} \equiv f(|\tau_l^* - \tau_{2L}^*|) & \varepsilon_{1H} \equiv f(|\tau_h^* - \tau_{2L}^*|) \\ \varepsilon_{1L} \equiv f(|\tau_l^* - \tau_{2H}^*|) & \varepsilon_{2H} \equiv f(|\tau_h^* - \tau_{2H}^*|) \\ \varepsilon_{0L} \equiv f(|\tau_l^* - \tau_h^*|) & \varepsilon_{3H} \equiv f(|\tau_h^* - \tau_h^*|) \end{array}$$

Note that when β is close to one, these can be easily ranked:

$$\varepsilon_{3L} > \varepsilon_{2L} \ > \ \varepsilon_{1L} > \varepsilon_{0L}$$
$$\varepsilon_{0H} < \varepsilon_{1H} \ < \ \varepsilon_{2H} < \varepsilon_{3H},$$

although when β is larger, other orderings are possible, this will be the ranking in all equilibria.

Proof of Proposition 3: Define $\xi \equiv \lambda + (1-\lambda)\eta$, so that we have when there are $2n+1$ districts:

$$\begin{aligned} \overline{y} &= \xi y_l \\ \tau_l^* &= \left(\frac{\xi^\alpha}{(2n+1)y_l^{1-\alpha}}\right)^{\frac{1}{1-\alpha}} \\ \tau_h^* &= \left(\frac{\xi^\alpha}{(2n+1)\eta y_l^{1-\alpha}}\right)^{\frac{1}{1-\alpha}} = \frac{\tau_l^*}{\eta^{\frac{1}{1-\alpha}}} \end{aligned} \tag{10}$$

as defined in (1). Define $\pi_{rk}^{k'}$ as the probability that a legislator of type $k' \in \{L, H\}$ has proposal power in each round of legislative bargaining when the majority is composed of $r \geq n+1$ legislators of type $k \in \{L, H\}$. Taking first order conditions this implies that the tax rate set by the legislature will be:

$$\tau^*_{rL} = \left((2n+1)\pi^L_{rL}\right)^{\frac{1}{1-\alpha}} \tau^*_l$$

when the majority of the legislature is low types, and

$$\tau^*_{rH} = \left((2n+1)\pi^H_{rH}\right)^{\frac{1}{1-\alpha}} \tau^*_h$$

when the majority of the legislature are high types, where τ^*_l and τ^*_h are the tax rates set by the legislature when it is composed entirely of low types or high types respectively, as defined in (10).

In what follows we will use the notation $u_h(k|(2n+1-(j+1))L, lH)$ to denote the utility of a high-type median voter of electing a legislator of type $k \in \{L, H\}$ when there are j high-type legislators that have been elected to the legislature ($u_l(k|(2n+1-(j+1))L, jH)$ in the case of a low-type median voter).

Consider the incentives of a high type median voter when the majority of the legislature is low types, and there are $j < n$ high types that have been elected to the legislature. The utility that a high-type median voter will get when electing a high-type legislator is:

$$\begin{aligned} u_h(H|(2n+1-(j+1))L, jH) &= (1 - \left((2n+1)\pi^L_{(2n+1-(j+1))L}\right)^{\frac{1}{1-\alpha}} \tau^*_l)\eta y_l \\ &\quad + \pi^H_{(2n+1-(j+1))L} \frac{\left(\left((2n+1)\pi^L_{(2n+1-(j+1))L}\right)^{\frac{1}{1-\alpha}} \overline{y}\tau^*_l\right)^\alpha}{\alpha} \\ &= \eta y_l + \frac{\left(\pi^L_{(2n+1-(j+1))L}\right)^{\frac{1}{1-\alpha}} \xi^{\frac{\alpha}{1-\alpha}}}{\alpha} \left(\frac{\pi^H_{(2n+1-(j+1))L}}{\pi^L_{(2n+1-(j+1))L}} - \alpha\eta\right) \end{aligned}$$

and, correspondingly, the utility that a high-type median voter will get when electing a low-type legislator is

$$u_h(L|(2n+1-(j+1))L, jH) = \eta y_l + \frac{\left(\pi^L_{(2n+1-j)L}\right)^{\frac{1}{1-\alpha}} \xi^{\frac{\alpha}{1-\alpha}}}{\alpha} (1 - \alpha\eta).$$

After substituting the expression for the πs and simplifying, a high-type will want to elect a high-type if and only if

$$(\beta - \alpha\eta)\left(\frac{1}{(j+1)\beta + 2n + 1 - (j+1)}\right)^{\frac{1}{1-\alpha}} - (1-\alpha\eta)\left(\frac{1}{j\beta + 2n + 1 - j}\right)^{\frac{1}{1-\alpha}} > 0.$$

Since the left-hand-side of the inequality is increasing in η and setting $\eta = 1$ gives the corresponding expression for when a low-type will want to elect a high-type, both a low-type and a high-type will want to elect a high-type when low-types are in the majority (and doing so will not change the majority) if and only if

$$\left(\frac{\beta - \alpha}{1-\alpha}\right) > \left(1 + \frac{\beta - 1}{j\beta + 2n + 1 - j}\right)^{\frac{1}{1-\alpha}}. \tag{11}$$

Notice that the right-hand-side of (11) is maximized when $j = 0$ and $n = 1$, i.e. when there are three districts and two of them are electing low types. Hence (11) will hold whenever

$$\frac{\beta - \alpha}{1-\alpha} - \left(\frac{\beta + 2}{3}\right)^{\frac{1}{1-\alpha}} > 0 \tag{12}$$

Notice that the left-hand-side of (12) is concave in β, it is equal to zero when $\beta = 1$ and its derivative with respect to β evaluated at $\beta = 1$ is positive. Hence, there exists a unique $\overline{\beta} > 1$ such that for $\beta < \overline{\beta}$ (11) holds for all j and n. This also serves as the condition in Footnote 9. In a similar way it can be shown that both high and low-type median voters prefer to elect a high-type when the majority is composed of high-types, and doing so will not change which type is in the majority.

Next, consider the preferences of a voter when other districts have elected n high-types and n low types, i.e. when the voter is pivotal. Clearly, a high type median voter will always want to elect a high-type. By doing so she can shift the majority of the legislature in her favor and elect a high-type representative for her district. On the other hand, a low-type median voter will want to elect a low-type when her choice will be pivotal in shifting the majority of the legislature from high-types to low-types when $u_l(L|nL, nH) \geq u_l(H|nL, nH)$, that is:

$$\left(\frac{\pi^H_{(n+1)H}}{\pi^L_{(n+1)L}}\right)^{\frac{1}{1-\alpha}} \leq \frac{(\tau_l^*\overline{y})^\alpha - (2n+1)\alpha\tau_l^* y_l}{(\tau_h^*\overline{y})^\alpha - (2n+1)\alpha\tau_h^* y_l}$$

which is the same as (6), and can be simplified to

$$\left(\frac{\beta(n\beta + (n+1))}{(n+1)\beta + n}\right)^{\frac{1}{1-\alpha}} \leq \frac{\eta^{\frac{1}{1-\alpha}}(1-\alpha)}{\eta - \alpha}.$$

In the case of three districts, i.e. $n = 1$ that minimizes the left hand side of the inequality, the condition further simplifies to

$$\left(\frac{\beta(\beta+2)}{2\beta+1}\right)^{\frac{1}{1-\alpha}} \leq \frac{\eta^{\frac{1}{1-\alpha}}(1-\alpha)}{\eta - \alpha}.$$

When (6) holds, then pure-strategy equilibria will have two forms. Either $n+1$ districts will elect low type legislators and n districts will elect high-type legislators, or all $2n+1$ districts will elect high type legislators.

Consider the first type. This is an equilibrium as anyone who is electing a high-type legislator is not pivotal, and thus would prefer to elect a high-type. Any median voter who is electing a low-type legislator is pivotal, so, as (6) holds, they prefer to elect a low-type.

Consider now the second type. This is an equilibrium as the median voter in every district is not pivotal, they prefer to elect a high type.

Now, we show there exist no other pure-strategy equilibria. Take as a candidate equilibrium one where $j < n$ districts elect high types, and the rest of the districts elect high-types. Then the median voter of every district that is electing a low-type is not pivotal, and would prefer to elect a high-type. Thus, this cannot be an equilibrium. Similar logic applies when the candidate equilibrium calls for $j' < n$ districts to elect low types, and the rest to elect high-types.

Finally, we show that the equilibrium of the second type is not stage strong, but equilibria of the first type are. In the equilibrium of the second type the tax rate is τ_h^* and each district gets an equal share of tax revenue. It will be a profitable deviation for $n+1$ low-type districts to elect low-types if

$$\left(\frac{\pi^H_{(2n+1)H}}{\pi^L_{(n+1)L}}\right)^{\frac{1}{1-\alpha}} < \frac{(\tau_l^*\overline{y})^\alpha - (2n+1)\alpha\tau_l^* y_l}{(\tau_h^*\overline{y})^\alpha - (2n+1)\alpha\tau_h^* y_l}.$$

As $\pi^H_{(2n+1)H} = \frac{1}{3} < \pi^H_{(n+1)H}$, this implies that

$$\left(\frac{\pi^H_{(2n+1)H}}{\pi^L_{(n+1)L}}\right)^{\frac{1}{1-\alpha}} < \left(\frac{\pi^H_{(n+1)H}}{\pi^L_{(n+1)L}}\right)^{\frac{1}{1-\alpha}} < \frac{(\tau_l^*\overline{y})^\alpha - (2n+1)\alpha\tau_l^* y_l}{(\tau_h^*\overline{y})^\alpha - (2n+1)\alpha\tau_h^* y_l}$$

as (6) holds. Thus, there is a profitable deviation for $n+1$ low types, and the equilibrium of the second type is not stage strong.

To see that all equilibria of the first type are stage strong, consider a potential deviation in which the low-type voters in j of the districts that are supposed to elect low-type legislators (in equilibrium) instead defect and vote for, and elect, high-type legislators. This will be a profitable deviation if:

$$\left(\frac{\pi^H_{(n+j)H}}{\pi^L_{(n+1)L}}\right)^{\frac{1}{1-\alpha}} > \frac{(\tau_l^*\overline{y})^\alpha - (2n+1)\alpha\tau_l^* y_l}{(\tau_h^*\overline{y})^\alpha - (2n+1)\alpha\tau_h^* y_l}.$$

However, as $\pi^H_{(n+j)H} < \pi^H_{(n+1)H}$, it follows from (6) that

$$\left(\frac{\pi^H_{(n+j)H}}{\pi^L_{(n+1)L}}\right)^{\frac{1}{1-\alpha}} < \left(\frac{\pi^H_{(n+1)H}}{\pi^L_{(n+1)L}}\right)^{\frac{1}{1-\alpha}} < \frac{(\tau_l^*\overline{y})^\alpha - (2n+1)\alpha\tau_l^* y_l}{(\tau_h^*\overline{y})^\alpha - (2n+1)\alpha\tau_h^* y_l}$$

so there is no coalition of low-type voters who were supposed to vote for low-type candidates who would be made strictly better off by voting for (and electing) high-type candidates. As high-type voters do not affect the outcomes in any district, we do not need to consider deviations by them.

Next, consider a deviation in which the low-type voters in j' districts that are supposed to elect high-type legislators (in equilibrium) instead defect and vote for, and elect, low-type legislators. Had these voters complied with their equilibrium strategies, they would have received:

$$y_l + \frac{\left(\pi^L_{(n+1)L}\right)^{\frac{1}{1-\alpha}} \xi^{\frac{\alpha}{1-\alpha}}}{\alpha} \left(\frac{\pi^H_{(n+1)L}}{\pi^L_{(n+1)L}} - \alpha\right)$$

while deviating gives:

$$y_l + \frac{\left(\pi^L_{(n+j'+1)L}\right)^{\frac{1}{1-\alpha}} \xi^{\frac{\alpha}{1-\alpha}}}{\alpha} (1-\alpha)$$

After substitutions, and noticing that the utility gain from sticking with the equilibrium strategy is minimized when $n = 1$, $j' = 1$, we obtain the same condition (12) we derived earlier. Hence, the deviation will not be profitable as long as $\beta < \overline{\beta}$, which it is, by assumption. Thus, there is no coalition of low-type voters who were supposed to vote for high-type candidates who would be made strictly better off by voting for (and electing) low-type candidates. Note that none of the above relationships depend on the number of high-type median voters, z, which will always elect high-types in equilibria.

As all stage-strong equilibria are also equilibria, and we have identified all pure-strategy equilibria, we have thus identified all pure-strategy stage-strong equilibria when (6) holds.

When (6) does not hold, then electing a low-type legislator is strictly dominated, so every district will want to elect a high-type legislator. As such, this is the unique equilibrium. As the payoff to defection for low types is largest when they all defect to vote for a low-type legislator, this equilibrium will be stage strong when this deviation is not profitable for a low type.

Specifically, if

$$u_l(H|(2n)H) - u_l(L|(2n-z)L, zH) =$$

$$\frac{\xi^{\frac{\alpha}{1-\alpha}}}{\alpha(z\beta + (2n-z+1))^{\frac{1}{1-\alpha}}} \left(\left(\frac{z\beta + (2n-z+1)}{2n+1}\right)^{\frac{1}{1-\alpha}} \frac{\eta-\alpha}{\eta^{\frac{1}{1-\alpha}}} - (1-\alpha)\right) > 0$$

the the equilibria will be stage strong. Simplifying leads to the following conditions for stage-strongness:

$$\frac{z}{2n+1} > \frac{1}{\beta-1}\left(\left(\frac{1-\alpha}{\eta-\alpha}\right)^{1-\alpha} \eta - 1\right),$$

which can be rewritten as

$$\left(\frac{z(\beta-1)}{2n+1}+1\right)^{\frac{1}{1-\alpha}} > \frac{\eta^{\frac{1}{1-\alpha}}(1-\alpha)}{\eta-\alpha},$$

which is the same as found in the proposition. To see that this condition is not redundant, i.e. whenever the unrepresentative equilibrium is unique then it may or may not be stage-strong, notice that the right-hand-side of the latter inequality is equal to the right hand side of (6). Furthermore

$$\text{LHS of (6)} = \left(\frac{\beta(n\beta+(n+1))}{(n+1)\beta+n}\right)^{\frac{1}{1-\alpha}} > \left(\frac{z(\beta-1)}{2n+1}+1\right)^{\frac{1}{1-\alpha}},$$

where the inequality follows from

$$\left(\frac{\beta(n\beta+(n+1))}{(n+1)\beta+n}-1\right)\frac{1}{\beta-1} > \frac{1}{2} > \frac{z}{2n+1}.$$

■

Proof of Proposition 5: Using the utility function in (8) we have that

$$\tau_l^* = \frac{\xi^{\frac{\alpha}{1-\alpha}}}{y_l} \quad \text{and} \quad \tau_h^* = \frac{\xi^{\frac{\alpha}{1-\alpha}}}{\eta^{\frac{\alpha}{1-\alpha}}y_l} = \frac{\tau_l^*}{\eta^{\frac{\alpha}{1-\alpha}}}$$

and that equilibria will be minimally representative when

$$\left(\frac{\pi^H_{(n+1)H}}{\pi^L_{(n+1)L}}\right)^{\frac{\alpha}{1-\alpha}} \leq \frac{(\tau_l^*\overline{y})^\alpha - \alpha\tau_l^* y_l}{(\tau_h^*\overline{y})^\alpha - \alpha\tau_h^* y_l}$$

Note that the equilibrium tax rate in the minimally representative equilibria will be $((2n+1)\pi^L_{(n+1)L})^{\frac{\alpha}{1-\alpha}}\tau_l^*$, which will be decreasing if $(2n+1)\pi^L_{(n+1)L}$ decreasing. Thus, to show this is true we have:

$$\frac{d(2n+1)\pi^L_{(n+1)L}}{dn} = \frac{d}{dn}\left(\frac{2n+1}{n\beta+(n+1)}\right) = \frac{1-\beta}{(n\beta+(n+1))^2} < 0.$$

We now turn our attention to the case where the equilibrium passes from minimally representative to unrepresentative as n increases above n^*. At n^* the condition for a minimally representative equilibrium gives

$$\eta^{\frac{1}{1-\alpha}}(\pi^L_{(n^*+1)L})^{\frac{\alpha}{1-\alpha}} = (\pi^H_{(n^*+1)H})^{\frac{\alpha}{1-\alpha}}\frac{\eta-\alpha}{1-\alpha}$$

and $((2n^*+1)\pi^L_{(n^*+1)L})^{\frac{\alpha}{1-\alpha}}\tau^*_l > \tau^*_h$ if and only if

$$((2n^*+1)\pi^L_{(n^*+1)L})^{\frac{\alpha}{1-\alpha}} > \frac{1}{\eta^{\frac{1}{1-\alpha}}}$$

or, if and only if

$$\left(\frac{\beta(2n^*+1)}{(n^*+1)\beta+n^*}\right)^{\frac{\alpha}{1-\alpha}}\frac{\eta-\alpha}{1-\alpha} > 1$$

Note that

$$\left(\frac{\beta(2n^*+1)}{(n^*+1)\beta+n^*}\right)^{\frac{\alpha}{1-\alpha}}\frac{\eta-\alpha}{1-\alpha} > \frac{\eta-\alpha}{1-\alpha} > 1$$

as $\frac{\beta(2n^*+1)}{(n^*+1)\beta+n^*}$ is increasing in β, so is minimized at 1 when $\beta = 1$, and $\eta > 1 > \alpha$. Therefore, $((2n^*+1)\pi^L_{(n^*+1)L})^{\frac{\alpha}{1-\alpha}}\tau^*_l > \tau^*_h$. ■

Proof of Proposition 6: Table A.1 displays the payoffs each party would receive if they played various actions when $\beta > 1$ but (4) holds. The strategies of the parties are the candidates that the parties nominate in each district: in particular L, L, H means that the party nominated a low-type candidate in the low district, a low-type candidate in the middle district, and a high-type candidate in the high district. The equilibria are identified in the red boxes and the heavy dashed boxes in the lower right corner. The heavy dashed boxes are equilibria that are not stage strong as they rely on not stage-strong equilibria of the voting stage off the equilibrium path. These equilibria are as described in the proposition.

Table A.2 displays the payoffs each party would receive if they played various actions when (4) does not hold. As can be seen, these all involve the high party playing H, H, H. All these equilibria are being supported (or are) by the equilibria where the low party plays L, L, L. However, this equilibria is not stage strong when the condition in Theorem 3 is not met, so therefore there are no equilibria that are stage-strong unless the condition in Theorem 3 is met. When it is met, all equilibria are stage-strong. ■

Proof of Proposition 8: Reducing the right hand side of (9) to primitives we have:

$$\frac{(\tau_{lw}^* \overline{y})^\alpha - 3\alpha\tau_{lw}^*\theta}{(\tau_{hw}^* \overline{y})^\alpha - 3\alpha\tau_{hw}^*\theta} = \frac{(1+w-\alpha)(\eta+w)^{\frac{1}{1-\alpha}}}{(\eta+w-\alpha)(1+w)^{\frac{1}{1-\alpha}}}$$

and the limit of this quantity, as $w \to \infty$ is 1, so for w high enough, it will be less than the left-hand side (which is greater than 1), and thus, the unique equilibria will be the unrepresentative equilibrium. Furthermore, the left-hand side of (9) is greater than 1 for $\beta > 1$. Thus, as w grows, the left-hand-side will eventually be less than the right-hand-side, which guarantees that (9) will not hold, and then all pure-strategy subgame-perfect equilibria will be as described in the second part of Theorem 1. ■

Proof of Proposition 10: Let us first consider an equilibrium in which a hight-type median voter always elects a high-type legislator who will set $\beta = \beta_{max}$ for the next period, and a low-type median voter always elects a low-type legislator who will set $\beta = 1$ for the next period. We can compute value functions for these strategies

$$V_l(L|L,H;\beta=1) = U_l(L|L,H;\beta=1) + \delta\left(pV_l(L|L,H;\beta=1) + (1-p)V_l(H|L,H;\beta=1)\right)$$

$$V_l(H|L,H;\beta=1) = U_l(H|L,H;\beta=1) + \delta\left(pV_l(L|L,H;\beta=\beta_{max}) + (1-p)V_l(H|L,H;\beta=\beta_{max})\right)$$

$$V_l(L|L,H;\beta=\beta_{max}) = U_l(L|L,H;\beta=\beta_{max}) + \delta\left(pV_l(L|L,H;\beta=1) + (1-p)V_l(H|L,H;\beta=1)\right)$$

$$V_l(H|L,H;\beta=\beta_{max}) = U_l(H|L,H;\beta=\beta_{max}) + \delta\left(pV_l(L|L,H;\beta=\beta_{max}) + (1-p)V_l(H|L,H;\beta=\beta_{max})\right),$$

and a low-type median voter will always elect a low-type legislator who will set $\beta = 1$ if and only if

$$V_l(L|L,H;\beta=\beta_{max}) > V_l(H|L,H;\beta=\beta_{max}),$$

which implies

$$V_l(L|L,H;\beta=1) > V_l(H|L,H;\beta=1).$$

To save on notation, let

$$\Delta_1 \equiv U_l(H|L,H;\beta=\beta_{max}) - U_l(L|L,H;\beta=\beta_{max}) = \frac{\pi_{2L}^{L\frac{1}{1-\alpha}}\xi^{\frac{\alpha}{1-\alpha}}(\eta-\alpha)}{\alpha\eta^{\frac{1}{1-\alpha}}}\left(\left(\frac{\pi_{2H}^H}{\pi_{2L}^L}\right)^{\frac{1}{1-\alpha}} - \frac{(\tau_l^*\overline{y})^\alpha - 3\alpha\tau_l^* y_l}{(\tau_h^*\overline{y})^\alpha - 3\alpha\tau_h^* y_l}\right)$$

$$= \frac{\xi^{\frac{\alpha}{1-\alpha}}(\eta-\alpha)}{\alpha(\beta_{max}+2)^{\frac{1}{1-\alpha}}\eta^{\frac{1}{1-\alpha}}}\left(\left(\frac{\beta_{max}(\beta_{max}+2)}{2\beta_{max}+1}\right)^{\frac{1}{1-\alpha}} - \frac{\eta^{\frac{1}{1-\alpha}}(1-\alpha)}{\eta-\alpha}\right) > 0$$

$$\Delta_2 \equiv U_l(L|L,H;\beta=1) - U_l(L|L,H;\beta=\beta_{max}) = \frac{\xi^{\frac{\alpha}{1-\alpha}}(1-\alpha)}{\alpha(\beta_{max}+2)^{\frac{1}{1-\alpha}}}\left(\left(\frac{\beta_{max}+2}{3}\right)^{\frac{1}{1-\alpha}} - 1\right) > 0$$

$$\Delta_3 \equiv U_l(H|L,H;\beta=1) - U_l(H|L,H;\beta=\beta_{max}) = \frac{\xi^{\frac{\alpha}{1-\alpha}}(\eta-\alpha)}{\alpha 3^{\frac{1}{1-\alpha}}\eta^{\frac{1}{1-\alpha}}}\left(1 - \left(\frac{3\beta_{max}}{2\beta_{max}+1}\right)^{\frac{1}{1-\alpha}}\right) < 0$$

Since at $\beta = \beta_{max}$, 4 does not hold it follows that $\Delta_1 < \Delta_2 < -\Delta_3$. Furthermore, we have that $V_l(L|L,H;\beta=\beta_{max}) > V_l(H|L,H;\beta=\beta_{max})$ if and only if

$$\delta > \delta^*(p) = \frac{\Delta_1}{p\Delta_2 + (1-p)\Delta_3} \text{ and } p > p^* = \frac{\Delta_1 - \Delta_3}{\Delta_2 - \Delta_3}$$

where $\delta^*(p^*) = 1$ and $\delta^*(p)$ is decreasing in p for $p \in (p^*, 1)$. Substituting, we get

$$\delta > \delta^*(p) = \frac{\left(\frac{\beta_{max}(\beta_{max}+2)}{2\beta_{max}+1}\right)^{\frac{1}{1-\alpha}} - \frac{\eta^{\frac{1}{1-\alpha}}(1-\alpha)}{\eta-\alpha}}{p\frac{\eta^{\frac{1}{1-\alpha}}(1-\alpha)}{\eta-\alpha}\left(\left(\frac{\beta_{max}+2}{3}\right)^{\frac{1}{1-\alpha}} - 1\right) + (1-p)\left(\frac{\beta_{max}+2}{3}\right)^{\frac{1}{1-\alpha}}\left(1 - \left(\frac{3\beta_{max}}{2\beta_{max}+1}\right)^{\frac{1}{1-\alpha}}\right)} \quad (13)$$

and

$$p > p^* = \frac{\left(\frac{3\beta_{max}}{2\beta_{max}+1}\right)^{\frac{1}{1-\alpha}} - 1}{\frac{\eta^{\frac{1}{1-\alpha}}(1-\alpha)}{\eta-\alpha}\left(1 - \left(\frac{3}{\beta_{max}+2}\right)^{\frac{1}{1-\alpha}}\right) - \left(\left(\frac{3\beta_{max}}{2\beta_{max}+1}\right)^{\frac{1}{1-\alpha}} - 1\right)} > \frac{1}{2}$$

It is easy to check that a high-type median voter will always elect a high-type legislator who will set $\beta = \beta_{max}$. Hence, when (13) holds, there is an equilibrium such that if the median voter of the middle district is a low-type, she will elect a low-type legislator, and the legislature will set $\beta = 1$ in the next period. Whenever the median voter of the middle district is a high type, she will elect a high-type legislator, and the legislature will set $\beta = \beta_{max}$ in the next period. However, since $V_l(H|H,H;\beta = \beta_{max}) > V_l(L|H,H;\beta = \beta_{max})$, there is also an equilibrium where the legislature will consist of two low types and a high type until the first period when the median voter of the middle-district is a high type. Thereafter $\beta = \beta_{max}$, and all three districts will elect high-types, who will set tax τ_h^*. An argument similar to the one used in Proposition 3) is enough to conclude that only the former equilibrium is stage-strong.

When (13) is violated, $V_l(H|L,H;\beta = \beta_{max}) > V_l(L|L,H;\beta = \beta_{max})$. Hence the legislature will consist of two low types and a high type and β will be equal to 1 until the first period when the median voter of the middle-district is a high type. Thereafter $\beta = \beta_{max}$, and all three districts will elect high-types, who will set tax τ_h^*. This equilibrium is stage-strong if and only if $V_l(H|H,H;\beta = \beta_{max}) > V_l(L|L,H;\beta = \beta_{max})$, which is true for β_{max} large enough, or δ small enough.

■

Table A.1: Subgame-perfect continuation payoffs for parties when (4) holds.

Low Party, High Party	L, L, L	L, L, H	L, H, L	L, H, H	H, L, L	H, L, H	H, H, L	H, H, H
L, L, L	$\varepsilon_{3L}, \varepsilon_{0H}$	$\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{3L}, \varepsilon_{0H}$	$\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{3L}, \varepsilon_{0H}$	$\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{3L}, \varepsilon_{0H}$	$\varepsilon_{2L}, \varepsilon_{1H}$ / $\varepsilon_{0L}, \varepsilon_{3H}$
L, L, H	$\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{2L}, \varepsilon_{1H}$ / $\varepsilon_{0L}, \varepsilon_{3H}$	$\varepsilon_{2L}, \varepsilon_{1H}$ / $\varepsilon_{0L}, \varepsilon_{3H}$
L, H, L	$\varepsilon_{3L}, \varepsilon_{0H}$	$\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{1L}, \varepsilon_{2H}$	$\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{0L}, \varepsilon_{3H}$ / $\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{0L}, \varepsilon_{3H}$
L, H, H	$\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{1L}, \varepsilon_{2H}$	$\varepsilon_{1L}, \varepsilon_{2H}$	$\varepsilon_{0L}, \varepsilon_{3H}$ / $\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{0L}, \varepsilon_{3H}$ / $\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{0L}, \varepsilon_{3H}$	$\varepsilon_{0L}, \varepsilon_{3H}$
H, L, L	$\varepsilon_{3L}, \varepsilon_{0H}$	$\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{3L}, \varepsilon_{0H}$	$\varepsilon_{2L}, \varepsilon_{1H}$ / $\varepsilon_{0L}, \varepsilon_{3H}$	$\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{1L}, \varepsilon_{2H}$	$\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{0L}, \varepsilon_{3H}$
H, L, H	$\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{2L}, \varepsilon_{1H}$ / $\varepsilon_{0L}, \varepsilon_{3H}$	$\varepsilon_{2L}, \varepsilon_{1H}$ / $\varepsilon_{0L}, \varepsilon_{3H}$	$\varepsilon_{1L}, \varepsilon_{2H}$	$\varepsilon_{1L}, \varepsilon_{2H}$	$\varepsilon_{0L}, \varepsilon_{3H}$	$\varepsilon_{0L}, \varepsilon_{3H}$
H, H, L	$\varepsilon_{3L}, \varepsilon_{0H}$	$\varepsilon_{0L}, \varepsilon_{3H}$ / $\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{0L}, \varepsilon_{3H}$	$\varepsilon_{2L},, \varepsilon_{1H}$	$\varepsilon_{0L}, \varepsilon_{3H}$	$\varepsilon_{1L}, \varepsilon_{2H}$	$\varepsilon_{0L}, \varepsilon_{3H}$
H, H, H	$\varepsilon_{0L}, \varepsilon_{3H}$ / $\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{0L}, \varepsilon_{3H}$ / $\varepsilon_{2L}, \varepsilon_{1H}$	$\varepsilon_{0L}, \varepsilon_{3H}$	$\varepsilon_{0L}, \varepsilon_{3H}$	$\varepsilon_{0L}, \varepsilon_{3H}$	$\varepsilon_{0L}, \varepsilon_{3H}$	$\varepsilon_{0L}, \varepsilon_{3H}$	$\varepsilon_{0L}, \varepsilon_{3H}$

Table A.2: Subgame-perfect continuation payoffs for parties when (4) does not hold.

Low Party, High Party	L, L, L	L, L, H	L, H, L	L, H, H	H, L, L	H, L, H	H, H, L	H, H, H
L, L, L	ε_{3L}, ε_{0H}	ε_{2L}, ε_{1H}	ε_{2L}, ε_{1H}	ε_{1L}, ε_{2H}	ε_{2L}, ε_{1H}	ε_{2L}, ε_{1H}	ε_{1L}, ε_{2H}	ε_{0L}, ε_{3H}
L, L, H	ε_{2L}, ε_{1H}	ε_{2L}, ε_{1H}	ε_{1L}, ε_{2H}	ε_{1L}, ε_{2H}	ε_{1L}, ε_{2H}	ε_{1L}, ε_{2H}	ε_{0L}, ε_{3H}	ε_{0L}, ε_{3H}
L, H, L	ε_{2L}, ε_{1H}	ε_{1L}, ε_{2H}	ε_{2L}, ε_{1H}	ε_{1L}, ε_{2H}	ε_{1L}, ε_{2H}	ε_{0L}, ε_{3H}	ε_{1L}, ε_{2H}	ε_{0L}, ε_{3H}
L, H, H	ε_{1L}, ε_{2H}	ε_{1L}, ε_{2H}	ε_{1L}, ε_{2H}	ε_{1L}, ε_{2H}	ε_{0L}, ε_{3H}	ε_{0L}, ε_{3H}	ε_{0L}, ε_{3H}	ε_{0L}, ε_{3H}
H, L, L	ε_{2L}, ε_{1H}	ε_{1L}, ε_{2H}	ε_{1L}, ε_{2H}	ε_{0L}, ε_{3H}	ε_{2L}, ε_{1H}	ε_{1L}, ε_{2H}	ε_{1L}, ε_{2H}	ε_{0L}, ε_{3H}
H, L, H	ε_{1L}, ε_{2H}	ε_{1L}, ε_{2H}	ε_{0L}, ε_{3H}	ε_{0L}, ε_{3H}	ε_{1L}, ε_{2H}	ε_{1L}, ε_{2H}	ε_{0L}, ε_{3H}	ε_{0L}, ε_{3H}
H, H, L	ε_{1L}, ε_{2H}	ε_{0L}, ε_{3H}	ε_{1L}, ε_{2H}	ε_{0L}, ε_{3H}	ε_{1L}, ε_{2H}	ε_{0L}, ε_{3H}	ε_{1L}, ε_{2H}	ε_{0L}, ε_{3H}
H, H, H	ε_{0L}, ε_{3H}	ε_{0L}, ε_{3H}	ε_{0L}, ε_{3H}	ε_{0L}, ε_{3H}	ε_{0L}, ε_{3H}	ε_{0L}, ε_{3H}	ε_{0L}, ε_{3H}	ε_{0L}, ε_{3H}

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